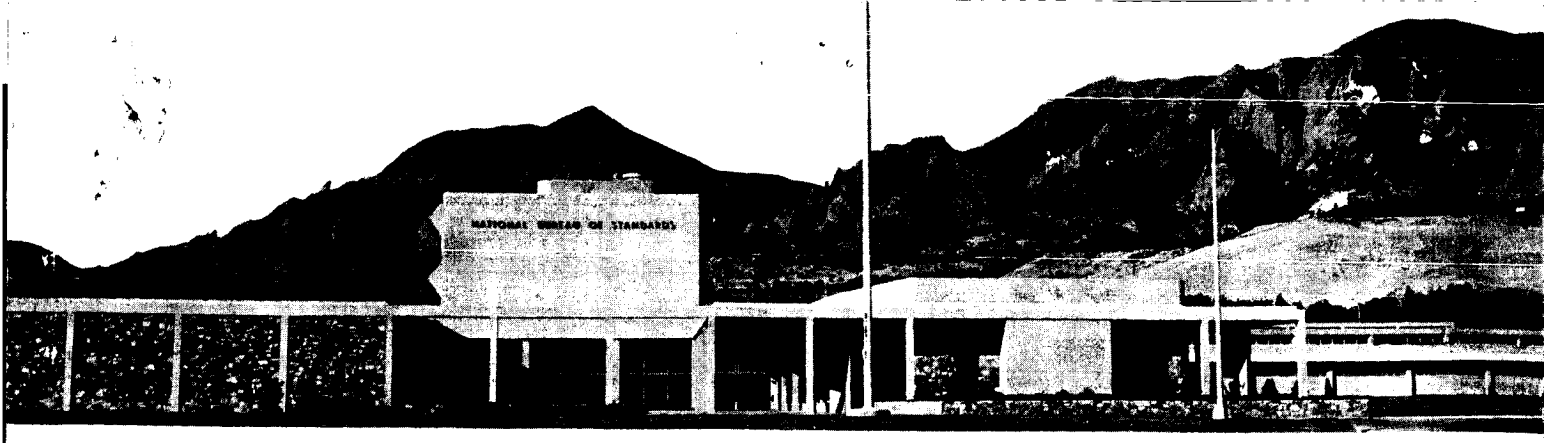

NBS REPORT

9249

FINAL REPORT

on

THERMOMETRY PROJECT

by

L. L. Sparks and R. L. Powell

to

National Aeronautics and Space Administration
George C. Marshall Space Flight Center
Huntsville, Alabama

U. S. DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS
BOULDER LABORATORIES
Boulder, Colorado

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NATIONAL BUREAU OF STANDARDS REPORT

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Contract H-92152

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ABSTRACT

Commercially available low temperature thermocouple wire from all major manufacturers has been exhaustively tested to determine the inhomogeneity and interchangeability characteristics of the wire. The results of special tests to determine the effect of straining or kinking thermocouple wire are also given. Previously printed low temperature thermocouple tables have been smoothed in the first and second differences and are included as an appendix to the report. Spot calibrations between liquid helium and liquid nitrogen temperatures and between liquid nitrogen and ice temperatures show that these tables are sufficient for most engineering requirements. Preliminary work on several gold-iron alloys indicates that these alloys will allow more accurate thermoelectric temperature measurement in the liquid helium - liquid hydrogen temperature range.

INTRODUCTION

The overall objectives of the thermometry work being done in the Cryogenics Division may be divided into three phases: 1) Establishment of thermocouple calibration tables for cryogenic use, 2) Development of new thermocouple materials for the temperature range from 4° to 90°K, and 3) State-of-the-art resistance thermometer evaluation. Phases 1 and 2 are being done entirely by the Properties of Solids Section while phase 3 is being done primarily in the Cryogenic Metrology Section.

The primary purpose of the thermocouple project is to characterize the commercially available thermocouple materials which are commonly used at cryogenic temperatures. This characterization includes: 1) producing an acceptable calibration table for each of these materials, 2) determining the degree of inhomogeneity to be found in each type of wire from each manufacturer, 3) determining the degree of interchangeability of commercially produced wires, and 4) determining the sensitivity of various types of wires to physical abuse such as straining and kinking. An undetermined but probably incredibly large amount of time and money has been wasted because this information has not been available in the past. The increasing use of cryogenic fluids in our aerospace, military, and research industries demand reliable information concerning today's thermocouple materials.

Newly generated calibration tables for the common materials are given in Appendix A. These tables are smoothed versions of previously distributed tables. Extensive spot checking has shown that these tables are acceptable for engineering work with presently available thermocouple material. In order to make the tables as useful as possible, a

thermocouple data service has been established and is operated by the Cryogenic Data Center, NBS, Boulder. This service has been used by virtually all of the major aerospace companies and many universities and research centers. A detailed description of this service is given in Appendix B of this report. The computer program used in the thermocouple service has been written using three principle computer languages - Fortran II, Fortran IV, and Fortran 36. The existence of these three forms makes the program compatible for use in most large computer installations. Appendix C contains listings of the programs in each of the above forms.

An extensive experimental program to determine the homogeneity and interchangeability characteristics of commercial low temperature thermocouple materials has been completed. The information made available by these tests will be valuable to both the manufacturers and users of thermocouples. Manufacturers will now have definite guidelines to check their wires against with respect to homogeneity and batch to batch reproducibility. The inhomogeneity and interchangeability data give the user another useful criteria to follow when choosing a thermocouple system. Special tests on the effect of kinking or straining thermocouple wires may be used to more effectively determine when a particular thermocouple system has been damaged to the extent that the uncertainty in the output exceeds tolerances.

An important secondary aim of the project was to study new thermocouple materials which would extend the usefulness of this method of temperature measurement. Extension of accurate temperature measurement with thermocouples at and below liquid hydrogen temperature is of particular interest. There is also a growing need for a material for use as a standard reference material for temperatures below liquid nitrogen temperature.

In the course of our work we have found it necessary to develop or expand several techniques which are necessary for precision thermometry. Some of the problems studied are: 1) consistent methods for characterizing the inhomogeneities of thermocouple wires, 2) spot calibration of capsule type platinum resistance thermometers at the triple point of water, 3) Mueller bridge calibration and use, and 4) statistical methods of data acquisition.

COMMERCIAL THERMOCOUPLES

The materials commonly used at cryogenic temperatures and which are referred to as commercially available are copper, constantan, Chromel, Alumel, normal silver (Ag 0.37 at.% Au), and Au 2.1 at.% Co. Our test inventory of these materials was made up of several spools of each material from each major manufacturer.

The dip test program performed with these materials was designed to give inhomogeneity data for short range, medium range, and long range wire samples. In addition to the homogeneity tests an additional dip test was done to allow comparison of this wire with wire used in previous work. Since a different probe configuration was required to examine each of the properties mentioned above, four different sample probes were made for each spool of thermocouple wire. The make-up and purpose of these four probe types are as follows:

Type 1: Probe type 1 is made from a single continuous wire. Approximately 15 feet of this wire is coiled on a bakelite tube and the two free ends are connected across a potentiometer. The probe is lowered into a cryogenic bath, and the magnitude of the emf output is observed. The emf is due to

inhomogeneities in the wire for the given temperature gradients. The short range (approximately 15 feet) inhomogeneities are thus determined.

The data from this type of probe will be valuable to users since, for instance, this will be the effect they can expect as the liquid level changes along their thermocouple wires.

Type 2: Probe type 2 is a single leg thermocouple with one wire from the front of a roll and the other wire from the back of the same roll. This probe allows us to see any differences in the wire that might exist after many feet of wire have been used. The output from this type of probe is due to medium range inhomogeneities (100 to 500 feet). The results of the probe type 2 data will be helpful to a user in that he will know how much difference to expect in the first and the nth thermocouple from the same roll of material.

Type 3: Probe type 3 is again a single leg T C. In this case, however, the two legs are taken from different rolls of the same material. The data from the test will provide the user with an indication of what to expect when he makes two thermocouples from different rolls of the same material. These results are termed the long range inhomogeneities.

Type 4: Probe type 4 is a common differential T C. It is used to compare the emf from our sample wires to the emf's given in Circular 561 and previous low temperature calibrations. The wires finally chosen for calibration should allow a smooth fit with the existing standard T C tables.

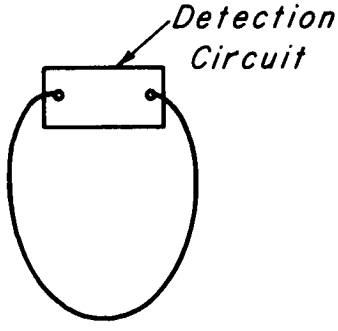
Schematic representations of the probe types are given in figure 1.

Probe types I, II, and III were tested at liquid nitrogen and liquid helium temperatures. Condensed results of these tests are tabulated in Table I. The type IV differential thermocouple was tested from liquid helium temperature to liquid nitrogen temperature and from liquid nitrogen temperature to ice temperature. Table III gives the results of the differential thermocouple tests. In general the agreement with the interim low temperature tables is quite good. As a result of these industry-wide sampling tests, it has been shown that the calibration tables distributed in the summer of 1965 amply fill most engineering needs for thermocouple tables.

A number of samples of each material were given special tests to determine the effect of accidental kinking or straining. The test samples for these tests were made by deliberately kinking one leg of the thermocouple in the "kink" case and by elongating one leg by 2% in the strain case. The results of the kink and strain tests are compared to the undamaged tests in Table II. This was not an exhaustive test of each sample from each manufacturer, but the general effect of abusing a thermocouple wire is evident. In normal assemblies, the additional voltages caused by accidental hard-working of the alloys should be equal to or less than those given in Table II.

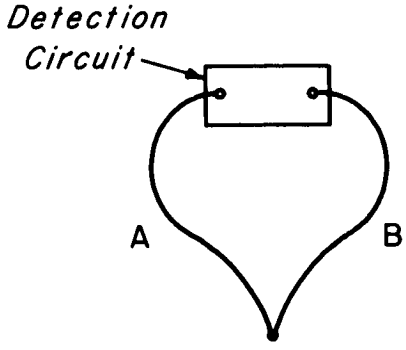
SCHEMATIC OF THERMOCOUPLE DIP TEST PROBES

TYPE I



SINGLE CONTINUOUS WIRE.

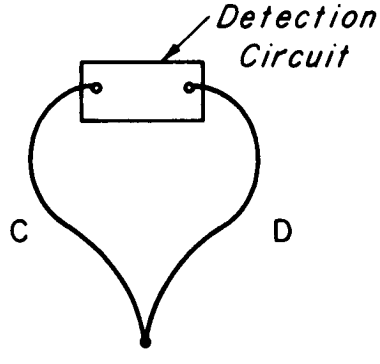
TYPE II



A - FROM FRONT OF SPOOL

B - FROM BACK OF SPOOL

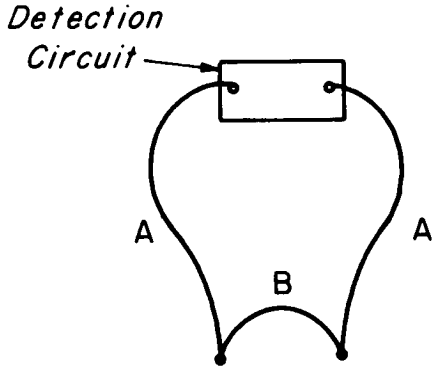
TYPE III



C - FROM SPOOL ONE.

D - FROM SPOOL TWO OF SAME NOMINAL MATERIAL.

TYPE IV



COMMON TWO MATERIAL THERMOCOUPLE CIRCUIT

Figure 1

TABLE I

THERMOCOUPLE WIRE INHOMOGENEITY DATA*

Material	Company	Short length[1]			Medium length[2]		Different spools[3]	
		Equilibrium		Dynamic	Equilibrium		Equilibrium	
		Liq N_2	Liq He	Liq N_2	Liq N_2	Liq He	Liq N_2	Liq He
Chromel	A	0.5μv	0.9μv	5.5μv	2.2μv	2.2μv	28.0μv	33.4μv
	B	1.0	1.2	6.9	1.0	1.0	38.0	39.1
	C	2.6	2.6	8.2	4.5	4.5	4.4	6.1
Iron	D	7.5	8.1	10.1	20.0	20.0	55.0	57.3
	E	2.2	2.2	8.1	1.6	1.6	15.0	15.0
Copper	F	0.4	0.4	1.0	0.4	0.7	0.5	0.5
	G	0.2	1.4	1.1	1.9	7.6	4.1	37.9
Alumel	H	0.7	0.7	13.7	3.8	4.9	42.0	45.4
	I	1.9	2.4	14.1	2.2	2.2	1.7	2.8
	J	2.0	2.0	21.4	2.6	2.6	4.6	4.6
Constantan	K	0.9	1.2	1.3	1.6	1.7	6.6	6.6
	L	3.0	3.0	5.1	2.4	2.5	26.0	27.7
	M	2.8	2.8	8.3	10.8	12.5	36.0	44.4
	N	1.6	2.1	6.8	5.8	5.8		
Ag 0.37 Au	O	0.5	0.6	2.0				
	P	0.2	0.2	2.7				
Au 0.03 Fe	Q	2.4	14.7	16.3				
Au 0.07 Fe	R	6.3	16.0	18.0				

* Reported data are maximums

[1] Continuous length of wire - approximately 15 feet

[2] Compares front and back ends of a single roll - 100 to 500 feet

[3] Widely separated lengths of wires from different spools

TABLE II

KINK OR STRAIN EFFECT ON THERMOCOUPLE WIRE

Material	Company	Kink[1]			Strain[2]			Undamaged[3]		
		Equilibrium		Dynamic	Equilibrium		Dynamic	Equilibrium		Dynamic
		Liq He	Liq N_2	Liq N_2	Liq He	Liq N_2	Liq N_2	Liq He	Liq N_2	Liq N_2
Chromel	A	6.0μv	6.0μv	10.5μv	8.5μv	7.2μv	9.0μv	0.4μv	0.4μv	4.2μv
	B	1.6	1.6	5.8	5.7	4.4	4.3	1.2	1.0	6.9
	C	2.2	2.2	17.1				0.1	0.1	5.5
Alumel	D	1.2	0.8	7.4	4.0	2.8	7.3	1.0	1.0	7.6
	E	1.0	1.0	6.6	1.3	1.3	9.8	0.7	0.7	10.0
	F	3.3	3.3	9.7				1.4	1.4	12.3
Constantan	G	1.3	1.3	5.4	4.7	4.7	6.9	3.0	3.0	4.0
	H	1.4	1.4	5.9				0.4	0.3	0.8
	I	4.8	3.8	8.0				2.1	2.1	6.8
Ag 0.37 Au	J	0.6	0.6	2.7	1.1	1.1	2.2	0.2	0.2	1.1
Au 0.03 Fe	K	1.4	1.4	16.3				14.7	2.4	11.6
Au 0.07 Fe	L	20.6	6.2	18.0				16.0	6.3	13.0

[1] Kinks were formed by forming a loop in the wire and applying tension; 6 kinks were made on each wire.

[2] The wires were strained by a 2% elongation.

[3] The "undamaged" results given here are for one particular sample from each company while the corresponding "short length" tests in Table I represent the maximum values from several spools from each company.

TABLE III

DIFFERENTIAL THERMOCOUPLE TEST DATA

COMPARED TO NBS TABLE 561 AND INTERIM VALUES

Material	PERCENTAGE DEVIATIONS[1]		
	Ice Temperature to Liq. N_2		Liq N_2 to Liq He
	Interim Tables[3]	NBS CIR. 561[2]	Interim Tables[3]
Cu vs Au Co	+ 0.01% to + 3.93%	- - - - - - -	- 0.13% to + 3.80%
Cu vs Constantan	- 0.11 to + 0.31	+ 0.89% to + 1.31%	- 2.07 to - 1.70
Fe vs Constantan	- 1.41 to + 12.88	- - - - - - -	- 2.49 to - 1.67
Chromel vs Alumel	- 0.45 to + 0.23	+ 2.14 to + 2.27	- 0.54 to + 2.3
Chromel vs Au Co	+ 1.13 to + 3.75	- - - - - - -	+ 0.47 to + 4.35
Chromel vs Constantan	- 0.19 to + 0.72	+ 0.38 to + 1.29	- 1.68 to + 1.07

[1] In comparing the experimental data to existing data a positive percentage indicates the experimental data was higher than the existing data. The values used here are the maximums found in testing several thermocouples of each type.

[2] National Bureau of Standards Circular 561 "Reference Tables for Thermocouples." The emf's corresponding to Liq N_2 temperature had to be extrapolated. No values are available for the He to N_2 range.

[3] Interim values are from low temperature thermocouple tables by Powell, et al., of Cryogenics Division, National Bureau of Standards, Boulder, Colorado, distributed Summer, 1965, as reported in NBS Report 8750.

DEVELOPMENT THERMOCOUPLES

At the present time no commercial thermocouple material is sensitive enough to allow good absolute temperature determination below liquid hydrogen temperatures. At liquid hydrogen temperature Chromel vs. Au 2.1 at.% Co is sufficiently sensitive, but Au 2.1 at.% Co is a supersaturated solid solution at room temperature and is unstable. 5% shifts from calibration have been observed over a 2-year period in this laboratory. There is, therefore,an urgent need in the aerospace and scientific industries for a stable, sensitive thermocouple material to be used in the very low temperature range.

Several "exotic" materials have been evaluated by dip tests similar to those discussed previously. The new materials tested have been: 1) Au 0.02 at.% Fe, 2) Au 0.03 at.% Fe, 3) Au 0.07 at.% Fe, 4) Rh 0.5 at.% Fe, 5) Au 10% Ni, and 6) Au 18% Ni. The gold-iron alloys are the most promising of the new materials tested. Figure 2 gives the sensitivity vs. temperature relationship for the gold-iron alloys when paired with Chromel or normal silver wire as the passive element. These curves illustrate the high sensitivity of the gold-iron alloys as compared to the gold-cobalt alloy in the 1 to 15°K range. The Chromel vs. Au 0.07 at.% Fe appears to be sufficiently sensitive to use over the entire cryogenic range. The curves shown in figure 2 have been calculated using data from several different sources and should be considered for their general form only.[3, 4, 5]

The standard reference material for the thermocouple industry is platinum. For thermocouple specifications at liquid nitrogen temperatures and above platinum fills the reference material requirements quite well. At liquid hydrogen and liquid helium temperatures platinum

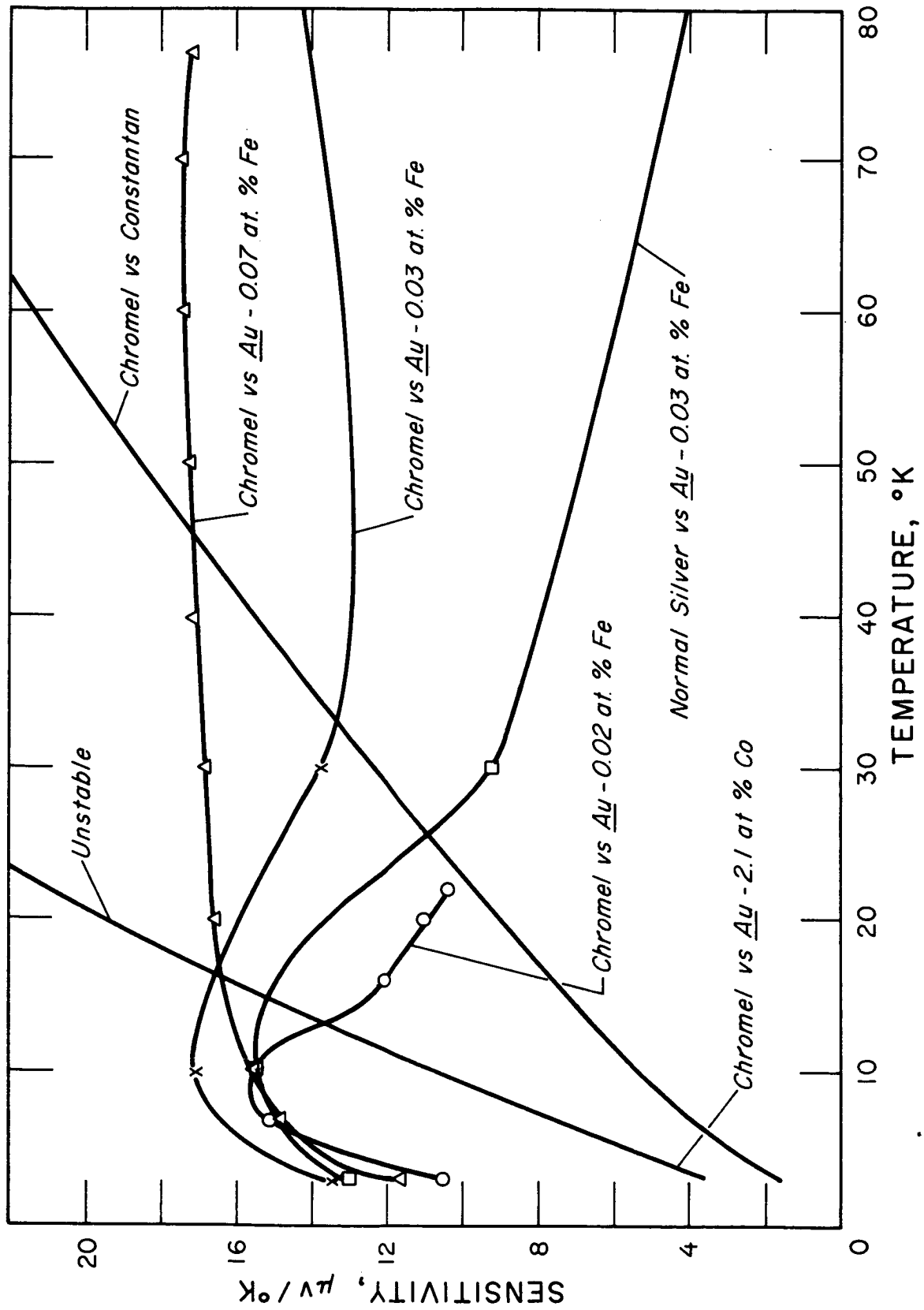


Figure 2. Sensitivity of gold-iron alloys when paired with Chromel or Normal Silver.

has the same deficiency as all pure metals - extreme thermoelectric sensitivity to trace impurities. A new reference material is therefore needed which will allow manufacturers to reliably specify the characteristics of their wires in the very low temperature range.

Work done in this laboratory indicates that Ag ~ 28 at. % Au meets the requirements of a low temperature thermoelectric standard. A plot of sensitivity vs. atomic percentage of gold in silver shows that the sensitivity of this alloy varies by only 0.01μv/°K between nominally 26 - 30 at. % gold. Other criteria considered in the selection of this particular alloy are stability after repeated thermal cycling, low thermal conductivity, ease of handling, and availability in quantities needed.

RESISTANCE THERMOMETRY

The reference thermometers to be used in the thermocouple calibrations were a calibrated platinum resistance thermometer from 20°K to 300°K and a calibrated germanium resistance thermometer in the 4°K to 20°K range. In order to maintain strict statistical control three thermometers of each type were required. One germanium thermometer was calibrated by NBS, Washington. No further preliminary work was required on the germanium thermometers.

Several of the L & N capsule type thermometers with NBS calibrations were available; however, the calibrations were several years old. This, coupled with the fact that each thermometer had been used repeatedly since being calibrated, required us to spot check the available thermometers. If they were acceptably close to the original calibration at the triple point of water temperature, only minor corrections to the original calibration would be required. The corrected calibration could be accurately checked in the liquid hydrogen and nitrogen temperature range with a vapor-pressure bulb especially designed for calibration of resistance thermometers.

Very little could be found in the literature regarding the type of tests we were attempting on the capsule type thermometers. Our technique, therefore, developed by trial until our results were as consistent and precise as our instrumentation would allow. A few of the refinements that developed in the course of our triple point of water experiment are listed below:

1. The capsule type thermometer must be fitted in a mandrel of Cu or Al to insure a good and consistent heat path to the triple point temperature.
2. The triple point cell itself must be allowed to age for at least one day after freezing the mantle.
3. In order to keep a particular ice mantle for an extended period the cell must be insulated in slush ice at all times.
4. The lead in wires must be tempered in both the cell insulating slush and the inner well liquid.
5. Octoil is better for inner well liquid than is alcohol since the alcohol absorbs water and causes high resistance shorts between leads.
6. Enamel or formvar coated wires cannot be used in contact with the slush due to high resistance shorting.

Figure 3 shows the triple point cell and platinum resistance thermometer in their final arrangement.

A relatively large difference in our precision and accuracy led us to an investigation of the commonly used calibration procedure for the Mueller bridge. Our work prompted the 1965 revision of "Calibration of Mueller Bridges" by Paul P. B. Brooks. A description of the "calibrator" which we developed is included in this revision. This calibrator

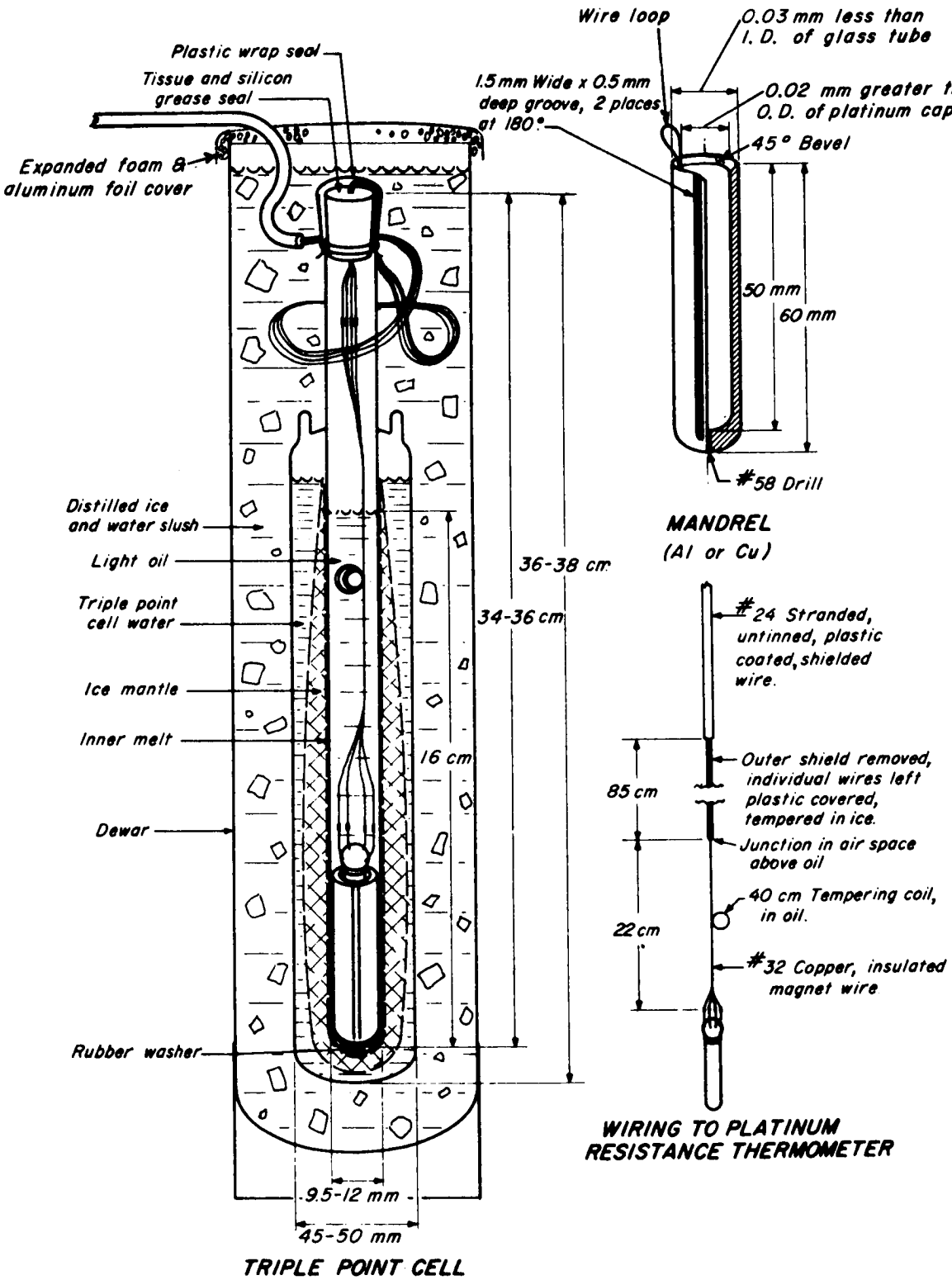


Figure 3. Test arrangement for checking capsule type platinum resistance thermometer at triple point of water temperature.

eliminates the need for an expensive direct reading ratio set which was previously called for. The cost of equipment needed for a precise calibration is reduced by more than half, thus allowing more laboratories to use better calibration procedures.

We also found that the Mueller bridge resistance readings are critically dependent on the bridge warm-up time. As may be seen in figure 4, approximately 10 hours must be allowed for 100μΩ accuracy and about 40 hours for 10μΩ accuracy. Zero time in figure 4 is taken as the time at which the temperature controller begins regulation.

We did a rather brief evaluation of several GaAs diodes. Our data indicated a bend in the voltage near liquid hydrogen temperature, thus making analytical representation very difficult. For our purposes the GaAs diodes offered no special advantages over other available types of thermometers.

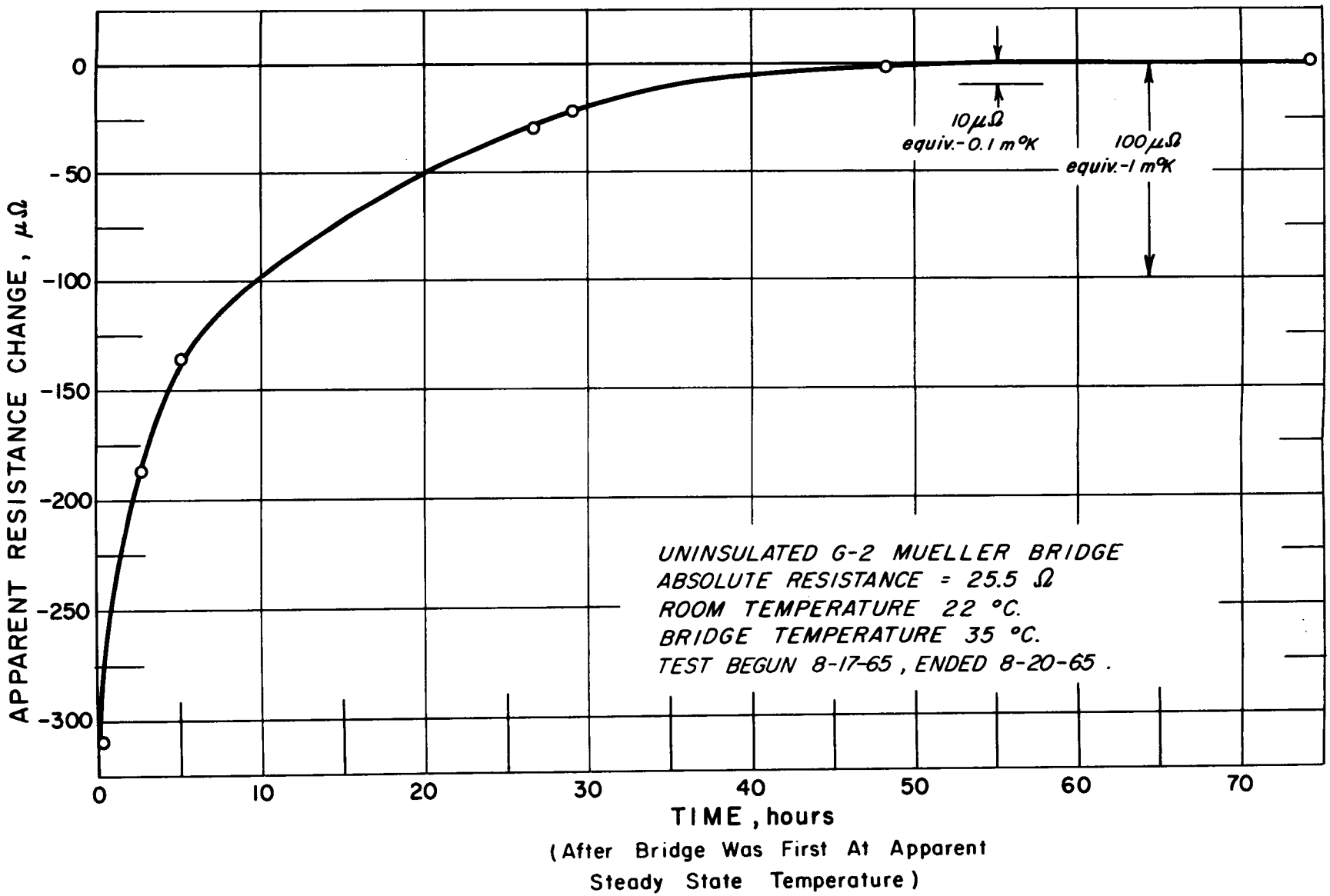


Figure 4. Mueller Bridge warm-up time.

A-6062

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3. Berman, R., Brock, J. C. F., and Huntley, D. J. Cryogenics 4, (1964).
4. Finnemore, D. K., Ostenson, J. E., and Stromberg, T. F., "Secondary Thermometer for the 4 to 20°K Range" Institute for Atomic Research and Department of Physics, Iowa State University, Ames, Iowa.
5. National Bureau of Standards interium low temperature thermocouple calibration tables.

APPENDIX A

Thermocouple tables in degrees Kelvin (0°K reference) or degrees Celsius (0°C reference) for the following materials:

1) Copper vs. Constantan
2) Copper vs. Gold-cobalt
3) Copper vs. "normal" silver
4) Chromel vs. Alumel
5) Chromel vs. Constantan
6) Chromel vs. Gold-cobalt
7) Iron (J) vs. Constantan
8) Iron (Y) vs. Constantan
9) "Normal" silver vs. Constantan
10) "Normal" silver vs. Gold-cobalt

THERMOCOUPLE TABLE FOR COPPER VS CONST., ISA TYPE TP-TN , BASED ON NAT. BUR. OF STANDARDS PUB. R-188 WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
1	0.17	0.17	0.331	41	233.3	10.4	10.505
2	0.66	0.49	0.657	42	243.9	10.6	10.703
3	1.48	0.82	0.978	43	254.7	10.8	10.898
4	2.62	1.14	1.295	44	265.7	11.0	11.091
5	4.07	1.45	1.607	45	276.8	11.1	11.282
6	5.83	1.76	1.914	46	288.2	11.4	11.470
7	7.90	2.07	2.217	47	299.8	11.6	11.656
8	10.27	2.37	2.515	48	311.6	11.8	11.840
9	12.93	2.66	2.808	49	323.5	11.9	12.022
10	15.88	2.95	3.096	50	335.6	12.1	12.202
11	19.12	3.24	3.380	51	347.9	12.3	12.380
12	22.64	3.52	3.659	52	360.4	12.5	12.555
13	26.43	3.79	3.933	53	373.0	12.6	12.728
14	30.50	4.07	4.203	54	385.8	12.8	12.899
15	34.83	4.33	4.468	55	398.8	13.0	13.068
16	39.43	4.60	4.731	56	411.9	13.1	13.236
17	44.29	4.86	4.992	57	425.2	13.3	13.402
18	49.41	5.12	5.251	58	438.7	13.5	13.565
19	54.78	5.37	5.509	59	452.4	13.7	13.726
20	60.41	5.63	5.765	60	466.2	13.8	13.885
21	66.29	5.88	6.018	61	480.1	13.9	14.043
22	72.42	6.13	6.268	62	494.2	14.1	14.199
23	78.80	6.38	6.516	63	508.5	14.3	14.353
24	85.43	6.63	6.761	64	522.9	14.4	14.505
25	92.31	6.88	7.003	65	537.5	14.6	14.655
26	99.43	7.12	7.242	66	552.3	14.8	14.804
27	106.8	7.4	7.478	67	567.2	14.9	14.951
28	114.4	7.6	7.711	68	582.2	15.0	15.096
29	122.2	7.8	7.942	69	597.3	15.1	15.239
30	130.3	8.1	8.170	70	612.6	15.3	15.380
31	138.6	8.3	8.395	71	628.1	15.5	15.518
32	147.1	8.5	8.617	72	643.7	15.6	15.653
33	155.8	8.7	8.837	73	659.4	15.7	15.786
34	164.7	8.9	9.054	74	675.2	15.8	15.918
35	173.9	9.2	9.269	75	691.2	16.0	16.050
36	183.3	9.4	9.481	76	707.3	16.1	16.182
37	192.9	9.6	9.691	77	723.5	16.2	16.314
38	202.7	9.8	9.898	78	739.9	16.4	16.447
39	212.7	10.0	10.103	79	756.4	16.5	16.580
40	222.9	10.2	10.305	80	773.0	16.6	16.713

THERMOCOUPLE TABLE FOR COPPER VS CONST., ISA TYPE TP-TN , BASED ON
NAT. BUR. OF STANDARDS PUB. R-188 WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
81	789.7	16.7	16.846	121	1568.4	22.0	22.027
82	806.6	16.9	16.979	122	1590.5	22.1	22.153
83	823.6	17.0	17.112	123	1612.7	22.2	22.279
84	840.8	17.2	17.245	124	1635.0	22.3	22.405
85	858.1	17.3	17.378	125	1657.5	22.5	22.530
86	875.5	17.4	17.511	126	1680.1	22.6	22.655
87	893.1	17.6	17.644	127	1702.8	22.7	22.780
88	910.8	17.7	17.777	128	1725.6	22.8	22.905
89	928.7	17.9	17.910	129	1748.6	23.0	23.030
90	946.7	18.0	18.043	130	1771.7	23.1	23.155
91	964.8	18.1	18.176	131	1794.9	23.2	23.281
92	983.0	18.2	18.309	132	1818.3	23.4	23.407
93	1001.4	18.4	18.441	133	1841.8	23.5	23.533
94	1019.9	18.5	18.573	134	1865.4	23.6	23.659
95	1038.5	18.6	18.705	135	1889.1	23.7	23.784
96	1057.3	18.8	18.836	136	1912.9	23.8	23.910
97	1076.2	18.9	18.967	137	1936.9	24.0	24.036
98	1095.2	19.0	19.097	138	1961.0	24.1	24.162
99	1114.4	19.2	19.227	139	1985.2	24.2	24.288
100	1133.7	19.3	19.357	140	2009.5	24.3	24.414
101	1153.1	19.4	19.486	141	2034.0	24.5	24.540
102	1172.7	19.6	19.615	142	2058.6	24.6	24.666
103	1192.4	19.7	19.744	143	2083.3	24.7	24.793
104	1212.2	19.8	19.873	144	2108.2	24.9	24.919
105	1232.1	19.9	20.001	145	2133.2	25.0	25.045
106	1252.2	20.1	20.129	146	2158.3	25.1	25.170
107	1272.4	20.2	20.257	147	2183.5	25.2	25.294
108	1292.7	20.3	20.384	148	2208.9	25.4	25.417
109	1313.1	20.4	20.511	149	2234.4	25.5	25.540
110	1333.7	20.6	20.638	150	2260.0	25.6	25.663
111	1354.4	20.7	20.765	151	2285.7	25.7	25.785
112	1375.2	20.8	20.892	152	2311.6	25.9	25.907
113	1396.2	21.0	21.019	153	2337.6	26.0	26.028
114	1417.3	21.1	21.146	154	2363.7	26.1	26.148
115	1438.5	21.2	21.272	155	2389.9	26.2	26.268
116	1459.8	21.3	21.398	156	2416.2	26.3	26.388
117	1481.3	21.5	21.524	157	2442.6	26.4	26.507
118	1502.9	21.6	21.650	158	2469.2	26.6	26.625
119	1524.6	21.7	21.775	159	2495.9	26.7	26.743
120	1546.4	21.8	21.901	160	2522.7	26.8	26.860

THERMOCOUPLE TABLE FOR COPPER VS CONST., ISA TYPE TP-TN , BASED ON NAT. BUR. OF STANDARDS PUB. R-188 WITH CALC. MULT. FACTOR OF 1.000. GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
161	2549.6	26.9	26.977	201	3720.0	31.4	31.481
162	2576.6	27.0	27.094	202	3751.5	31.5	31.589
163	2603.8	27.2	27.211	203	3783.1	31.6	31.697
164	2631.1	27.3	27.327	204	3814.9	31.8	31.805
165	2658.5	27.4	27.443	205	3846.8	31.9	31.912
166	2686.0	27.5	27.559	206	3878.8	32.0	32.019
167	2713.6	27.6	27.675	207	3910.8	32.0	32.126
168	2741.3	27.7	27.791	208	3943.0	32.2	32.233
169	2769.1	27.8	27.907	209	3975.3	32.3	32.339
170	2797.1	28.0	28.022	210	4007.7	32.4	32.445
171	2825.2	28.1	28.137	211	4040.2	32.5	32.551
172	2853.4	28.2	28.252	212	4072.8	32.6	32.657
173	2881.7	28.3	28.366	213	4105.5	32.7	32.763
174	2910.1	28.4	28.480	214	4138.3	32.8	32.868
175	2938.6	28.5	28.594	215	4171.2	32.9	32.973
176	2967.3	28.7	28.708	216	4204.3	33.1	33.078
177	2996.1	28.8	28.822	217	4237.4	33.1	33.183
178	3025.0	28.9	28.935	218	4270.6	33.2	33.287
179	3054.0	29.0	29.048	219	4303.9	33.3	33.391
180	3083.1	29.1	29.161	220	4337.3	33.4	33.495
181	3112.3	29.2	29.274	221	4370.8	33.5	33.599
182	3141.6	29.3	29.387	222	4404.4	33.6	33.703
183	3171.0	29.4	29.499	223	4438.2	33.8	33.806
184	3200.6	29.6	29.611	224	4472.1	33.9	33.909
185	3230.3	29.7	29.723	225	4506.1	34.0	34.012
186	3260.1	29.8	29.835	226	4540.2	34.1	34.115
187	3290.0	29.9	29.946	227	4574.4	34.2	34.217
188	3320.0	30.0	30.057	228	4608.7	34.3	34.319
189	3350.1	30.1	30.168	229	4643.0	34.3	34.421
190	3380.3	30.2	30.279	230	4677.5	34.5	34.523
191	3410.6	30.3	30.389	231	4712.1	34.6	34.624
192	3441.0	30.4	30.499	232	4746.8	34.7	34.725
193	3471.6	30.6	30.609	233	4781.5	34.7	34.826
194	3502.3	30.7	30.719	234	4816.4	34.9	34.927
195	3533.1	30.8	30.829	235	4851.4	35.0	35.028
196	3564.0	30.9	30.938	236	4886.5	35.1	35.128
197	3595.0	31.0	31.047	237	4921.6	35.1	35.228
198	3626.1	31.1	31.156	238	4956.9	35.3	35.328
199	3657.3	31.2	31.265	239	4992.3	35.4	35.428
200	3688.6	31.3	31.373	240	5027.8	35.5	35.528

THERMOCOUPLE TABLE FOR COPPER VS CONST., ISA TYPE TP-TN , BASED ON NAT. BUR. OF STANDARDS PUB. R-188 WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
241	5063.4	35.6	35.627	281	6565.4	39.4	39.413
242	5099.0	35.6	35.726	282	6604.9	39.5	39.503
243	5134.8	35.8	35.825	283	6644.4	39.5	39.593
244	5170.7	35.9	35.923	284	6684.0	39.6	39.682
245	5206.7	36.0	36.021	285	6723.7	39.7	39.771
246	5242.7	36.0	36.119	286	6763.5	39.8	39.860
247	5278.9	36.2	36.217	287	6803.4	39.9	39.949
248	5315.2	36.3	36.315	288	6843.4	40.0	40.038
249	5351.6	36.4	36.413	289	6883.5	40.1	40.127
250	5388.1	36.5	36.510	290	6923.7	40.2	40.215
251	5424.7	36.6	36.607	291	6964.0	40.3	40.303
252	5461.4	36.7	36.704	292	7004.3	40.3	40.391
253	5498.2	36.8	36.800	293	7044.7	40.4	40.479
254	5535.0	36.8	36.896	294	7085.2	40.5	40.566
255	5571.9	36.9	36.992	295	7125.8	40.6	40.653
256	5608.9	37.0	37.088	296	7166.5	40.7	40.740
257	5646.0	37.1	37.184	297	7207.3	40.8	40.827
258	5683.2	37.2	37.280	298	7248.2	40.9	40.913
259	5720.5	37.3	37.375	299	7289.2	41.0	40.999
260	5757.9	37.4	37.470	300	7330.2	41.0	41.085
261	5795.4	37.5	37.565				
262	5833.0	37.6	37.659				
263	5870.7	37.7	37.753				
264	5908.5	37.8	37.847				
265	5946.4	37.9	37.941				
266	5984.4	38.0	38.035				
267	6022.5	38.1	38.129				
268	6060.7	38.2	38.222				
269	6099.0	38.3	38.315				
270	6137.4	38.4	38.408				
271	6175.9	38.5	38.500				
272	6214.4	38.5	38.592				
273	6253.0	38.6	38.684				
274	6291.7	38.7	38.776				
275	6330.5	38.8	38.868				
276	6369.4	38.9	38.959				
277	6408.4	39.0	39.050				
278	6447.5	39.1	39.141				
279	6486.7	39.2	39.232				
280	6526.0	39.3	39.323				

THERMOCOUPLE TABLE FOR COPPER VS CONST., ISA TYPE TP-TN , BASED ON NAT. BUR. OF STANDARDS PUB. R-188 WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-272	-6258.58	0.22	0.380	-232	-6023.9	10.5	10.535
-271	-6258.04	0.54	0.705	-231	-6013.3	10.6	10.732
-270	-6257.17	0.87	1.026	-230	-6002.5	10.8	10.927
-269	-6255.98	1.19	1.342	-229	-5991.5	11.0	11.120
-268	-6254.48	1.50	1.653	-228	-5980.3	11.2	11.310
-267	-6252.68	1.80	1.960	-227	-5968.9	11.4	11.498
-266	-6250.56	2.12	2.262	-226	-5957.2	11.7	11.684
-265	-6248.15	2.41	2.559	-225	-5945.4	11.8	11.867
-264	-6245.44	2.71	2.851	-224	-5933.5	11.9	12.049
-263	-6242.45	2.99	3.139	-223	-5921.4	12.1	12.229
-262	-6239.17	3.28	3.422	-222	-5909.0	12.4	12.406
-261	-6235.61	3.56	3.700	-221	-5896.5	12.5	12.581
-260	-6231.77	3.84	3.974	-220	-5883.9	12.6	12.754
-259	-6227.67	4.10	4.243	-219	-5871.1	12.8	12.924
-258	-6223.30	4.37	4.508	-218	-5858.0	13.1	13.093
-257	-6218.66	4.64	4.770	-217	-5844.9	13.1	13.261
-256	-6213.76	4.90	5.031	-216	-5831.6	13.3	13.427
-255	-6208.60	5.16	5.290	-215	-5818.0	13.6	13.589
-254	-6203.19	5.41	5.548	-214	-5804.3	13.7	13.750
-253	-6197.52	5.67	5.803	-213	-5790.5	13.8	13.909
-252	-6191.60	5.91	6.056	-212	-5776.6	13.9	14.067
-251	-6185.44	6.17	6.305	-211	-5762.5	14.1	14.222
-250	-6179.02	6.42	6.553	-210	-5748.2	14.3	14.376
-249	-6172.35	6.67	6.797	-209	-5733.7	14.5	14.528
-248	-6165.44	6.91	7.039	-208	-5719.1	14.6	14.677
-247	-6158.28	7.16	7.278	-207	-5704.3	14.8	14.826
-246	-6150.9	7.4	7.513	-206	-5689.4	14.9	14.973
-245	-6143.2	7.7	7.746	-205	-5674.3	15.1	15.118
-244	-6135.4	7.8	7.976	-204	-5659.2	15.1	15.260
-243	-6127.3	8.1	8.204	-203	-5643.9	15.3	15.401
-242	-6118.9	8.4	8.428	-202	-5628.4	15.5	15.538
-241	-6110.4	8.5	8.650	-201	-5612.7	15.7	15.673
-240	-6101.7	8.7	8.870	-200	-5597.0	15.7	15.806
-239	-6092.7	9.0	9.086	-199	-5581.2	15.8	15.938
-238	-6083.5	9.2	9.301	-198	-5565.2	16.0	16.070
-237	-6074.1	9.4	9.513	-197	-5549.1	16.1	16.202
-236	-6064.4	9.7	9.722	-196	-5532.8	16.3	16.334
-235	-6054.6	9.8	9.929	-195	-5516.4	16.4	16.467
-234	-6044.6	10.0	10.133	-194	-5499.9	16.5	16.600
-233	-6034.4	10.2	10.335	-193	-5483.3	16.6	16.733

THERMOCOUPLE TABLE FOR COPPER VS CONST., ISA TYPE TP-TN , BASED ON NAT. BUR. OF STANDARDS PUB. R-188 WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-192	-5466.6	16.7	16.866	-152	-4687.1	22.0	22.046
-191	-5449.7	16.9	16.999	-151	-4665.0	22.1	22.172
-190	-5432.6	17.1	17.132	-150	-4642.8	22.2	22.298
-189	-5415.4	17.2	17.265	-149	-4620.4	22.4	22.424
-188	-5398.1	17.3	17.398	-148	-4597.9	22.5	22.549
-187	-5380.7	17.4	17.531	-147	-4575.3	22.6	22.674
-186	-5363.1	17.6	17.664	-146	-4552.6	22.7	22.799
-185	-5345.3	17.8	17.797	-145	-4529.8	22.8	22.924
-184	-5327.4	17.9	17.930	-144	-4506.7	23.1	23.049
-183	-5309.4	18.0	18.063	-143	-4483.6	23.1	23.174
-182	-5291.3	18.1	18.196	-142	-4460.4	23.2	23.300
-181	-5273.0	18.3	18.329	-141	-4437.0	23.4	23.426
-180	-5254.6	18.4	18.461	-140	-4413.5	23.5	23.552
-179	-5236.1	18.5	18.593	-139	-4389.8	23.7	23.678
-178	-5217.5	18.6	18.725	-138	-4366.1	23.7	23.803
-177	-5198.7	18.8	18.856	-137	-4342.3	23.8	23.929
-176	-5179.8	18.9	18.986	-136	-4318.3	24.0	24.055
-175	-5160.7	19.1	19.117	-135	-4294.2	24.1	24.181
-174	-5141.5	19.2	19.247	-134	-4270.0	24.2	24.307
-173	-5122.2	19.3	19.376	-133	-4245.6	24.4	24.433
-172	-5102.8	19.4	19.505	-132	-4221.1	24.5	24.559
-171	-5083.1	19.7	19.634	-131	-4196.5	24.6	24.685
-170	-5063.4	19.7	19.763	-130	-4171.8	24.7	24.812
-169	-5043.6	19.8	19.892	-129	-4146.9	24.9	24.938
-168	-5023.7	19.9	20.020	-128	-4121.8	25.1	25.064
-167	-5003.6	20.1	20.148	-127	-4096.7	25.1	25.189
-166	-4983.4	20.2	20.276	-126	-4071.5	25.2	25.312
-165	-4963.1	20.3	20.403	-125	-4046.1	25.4	25.435
-164	-4942.6	20.5	20.530	-124	-4020.6	25.5	25.559
-163	-4922.0	20.6	20.657	-123	-3995.0	25.6	25.681
-162	-4901.3	20.7	20.784	-122	-3969.2	25.8	25.803
-161	-4880.5	20.8	20.911	-121	-3943.3	25.9	25.925
-160	-4859.4	21.1	21.038	-120	-3917.3	26.0	26.046
-159	-4838.3	21.1	21.165	-119	-3891.2	26.1	26.166
-158	-4817.1	21.2	21.291	-118	-3865.0	26.2	26.286
-157	-4795.8	21.3	21.417	-117	-3838.7	26.3	26.406
-156	-4774.3	21.5	21.543	-116	-3812.2	26.5	26.525
-155	-4752.6	21.7	21.669	-115	-3785.6	26.6	26.643
-154	-4730.9	21.7	21.794	-114	-3758.9	26.7	26.761
-153	-4709.1	21.8	21.920	-113	-3732.1	26.8	26.878

THERMOCOUPLE TABLE FOR COPPER VS CONST., ISA TYPE TP-TN , BASED ON
NAT. BUR. OF STANDARDS PUB. R-188 WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-112	-3705.2	26.9	26.995	-72	-2534.1	31.4	31.497
-111	-3678.1	27.1	27.112	-71	-2502.6	31.5	31.605
-110	-3650.9	27.2	27.228	-70	-2470.9	31.7	31.713
-109	-3623.6	27.3	27.344	-69	-2439.1	31.8	31.821
-108	-3596.2	27.4	27.460	-68	-2407.2	31.9	31.928
-107	-3568.7	27.5	27.576	-67	-2375.2	32.0	32.035
-106	-3541.0	27.7	27.692	-66	-2343.2	32.0	32.142
-105	-3513.3	27.7	27.808	-65	-2311.0	32.2	32.249
-104	-3485.5	27.8	27.924	-64	-2278.6	32.4	32.355
-103	-3457.5	28.0	28.039	-63	-2246.2	32.4	32.461
-102	-3429.4	28.1	28.154	-62	-2213.7	32.5	32.567
-101	-3401.2	28.2	28.269	-61	-2181.1	32.6	32.673
-100	-3372.8	28.4	28.383	-60	-2148.4	32.7	32.779
-99	-3344.4	28.4	28.497	-59	-2115.6	32.8	32.884
-98	-3315.9	28.5	28.611	-58	-2082.6	33.0	32.989
-97	-3287.2	28.7	28.725	-57	-2049.5	33.1	33.094
-96	-3258.4	28.8	28.839	-56	-2016.4	33.1	33.199
-95	-3229.5	28.9	28.952	-55	-1983.2	33.2	33.303
-94	-3200.4	29.1	29.065	-54	-1949.9	33.3	33.407
-93	-3171.3	29.1	29.178	-53	-1916.5	33.4	33.511
-92	-3142.1	29.2	29.291	-52	-1883.0	33.5	33.615
-91	-3112.8	29.3	29.404	-51	-1849.3	33.7	33.718
-90	-3083.4	29.4	29.516	-50	-1815.5	33.8	33.821
-89	-3053.7	29.7	29.628	-49	-1781.6	33.9	33.924
-88	-3024.0	29.7	29.740	-48	-1747.6	34.0	34.028
-87	-2994.2	29.8	29.852	-47	-1713.5	34.1	34.130
-86	-2964.3	29.9	29.963	-46	-1679.3	34.2	34.232
-85	-2934.3	30.0	30.074	-45	-1645.0	34.3	34.334
-84	-2904.2	30.1	30.185	-44	-1610.6	34.4	34.436
-83	-2874.0	30.2	30.295	-43	-1576.1	34.5	34.538
-82	-2843.7	30.3	30.405	-42	-1541.5	34.6	34.639
-81	-2813.2	30.5	30.515	-41	-1506.8	34.7	34.740
-80	-2782.6	30.6	30.625	-40	-1472.1	34.7	34.841
-79	-2751.9	30.7	30.736	-39	-1437.2	34.9	34.942
-78	-2721.1	30.8	30.845	-38	-1402.1	35.1	35.043
-77	-2690.2	30.9	30.954	-37	-1367.0	35.1	35.143
-76	-2659.1	31.1	31.063	-36	-1331.9	35.1	35.243
-75	-2628.0	31.1	31.172	-35	-1296.6	35.3	35.343
-74	-2596.8	31.2	31.281	-34	-1261.2	35.4	35.443
-73	-2565.5	31.3	31.389	-33	-1225.7	35.5	35.543

THERMOCOUPLE TABLE FOR COPPER VS CONST., ISA TYPE TP-TN , BASED ON NAT. BUR. OF STANDARDS PUB. R-188 WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-32	-1190.1	35.6	35.642	8	312.5	39.4	39.426
-31	-1154.4	35.7	35.741	9	352.0	39.5	39.517
-30	-1118.6	35.8	35.840	10	391.5	39.5	39.606
-29	-1082.7	35.9	35.938	11	431.2	39.7	39.695
-28	-1046.7	36.0	36.036	12	470.9	39.7	39.784
-27	-1010.7	36.0	36.134	13	510.7	39.8	39.873
-26	-974.5	36.2	36.232	14	550.6	39.9	39.962
-25	-938.1	36.4	36.330	15	590.6	40.0	40.051
-24	-901.7	36.4	36.428	16	630.7	40.1	40.140
-23	-865.2	36.5	36.525	17	670.9	40.2	40.228
-22	-828.6	36.6	36.622	18	711.2	40.3	40.316
-21	-791.9	36.7	36.718	19	751.6	40.4	40.404
-20	-755.1	36.8	36.814	20	792.0	40.4	40.492
-19	-718.3	36.8	36.910	21	832.5	40.5	40.579
-18	-681.4	36.9	37.006	22	873.1	40.6	40.666
-17	-644.3	37.1	37.102	23	913.8	40.7	40.753
-16	-607.2	37.1	37.198	24	954.6	40.8	40.840
-15	-570.0	37.2	37.294	25	995.6	41.0	40.926
-14	-532.7	37.3	37.389	26	1036.6	41.0	41.012
-13	-495.3	37.4	37.484				
-12	-457.8	37.5	37.579				
-11	-420.1	37.7	37.673				
-10	-382.4	37.7	37.767				
-9	-344.6	37.8	37.861				
-8	-306.7	37.9	37.955				
-7	-268.7	38.0	38.049				
-6	-230.6	38.1	38.143				
-5	-192.4	38.2	38.236				
-4	-154.0	38.4	38.329				
-3	-115.6	38.4	38.422				
-2	-77.1	38.5	38.514				
-1	-38.6	38.5	38.606				
-0	0.0	38.5	38.698				
1	38.7	38.7	38.790				
2	77.5	38.8	38.882				
3	116.4	38.9	38.973				
4	155.5	39.1	39.064				
5	194.6	39.1	39.155				
6	233.8	39.2	39.246				
7	273.1	39.3	39.337				

THERMOCOUPLE TABLE FOR COPPER VS AUCO , ISA TYPE UNDESIG.. BASED ON NAT. BUR. OF STANDARDS PUB. R-188 WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0.000 DEG. K
TEST DATE SEPTEMBER 1.60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
1	0.53	0.53	1.047	41	640.6	26.4	26.600
2	2.09	1.56	2.070	42	667.4	26.8	26.963
3	4.66	2.57	3.069	43	694.6	27.2	27.317
4	8.22	3.56	4.044	44	722.1	27.5	27.662
5	12.74	4.52	4.994	45	749.9	27.8	27.998
6	18.20	5.46	5.920	46	778.1	28.2	28.326
7	24.57	6.37	6.822	47	806.6	28.5	28.646
8	31.83	7.26	7.700	48	835.4	28.8	28.958
9	39.96	8.13	8.554	49	864.5	29.1	29.262
10	48.93	8.97	9.383	50	893.9	29.4	29.558
11	58.72	9.79	10.188	51	923.6	29.7	29.846
12	69.30	10.58	10.969	52	953.6	30.0	30.127
13	80.65	11.35	11.726	53	983.9	30.3	30.402
14	92.75	12.10	12.458	54	1014.4	30.5	30.669
15	105.6	12.8	13.165	55	1045.2	30.8	30.929
16	119.1	13.5	13.848	56	1076.2	31.0	31.183
17	133.2	14.1	14.513	57	1107.5	31.3	31.430
18	148.0	14.8	15.165	58	1139.1	31.6	31.671
19	163.5	15.5	15.803	59	1170.9	31.8	31.906
20	179.6	16.1	16.427	60	1202.9	32.0	32.134
21	196.4	16.8	17.038	61	1235.1	32.2	32.356
22	213.7	17.3	17.635	62	1267.5	32.4	32.573
23	231.6	17.9	18.219	63	1300.2	32.7	32.784
24	250.1	18.5	18.791	64	1333.1	32.9	32.989
25	269.2	19.1	19.349	65	1366.2	33.1	33.189
26	288.8	19.6	19.893	66	1399.5	33.3	33.384
27	308.9	20.1	20.424	67	1433.0	33.5	33.574
28	329.6	20.7	20.941	68	1466.7	33.7	33.759
29	350.8	21.2	21.446	69	1500.5	33.8	33.938
30	372.5	21.7	21.938	70	1534.5	34.0	34.112
31	394.7	22.2	22.417	71	1568.7	34.2	34.280
32	417.3	22.6	22.884	72	1603.1	34.4	34.442
33	440.4	23.1	23.340	73	1637.6	34.5	34.599
34	464.0	23.6	23.785	74	1672.3	34.7	34.753
35	488.0	24.0	24.218	75	1707.1	34.8	34.905
36	512.4	24.4	24.640	76	1742.1	35.0	35.056
37	537.3	24.9	25.052	77	1777.2	35.1	35.205
38	562.6	25.3	25.454	78	1812.5	35.3	35.352
39	588.2	25.6	25.846	79	1847.9	35.4	35.497
40	614.2	26.0	26.228	80	1883.5	35.6	35.641

THERMOCOUPLE TABLE FOR COPPER VS AUCO . ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. R-188 WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL . LOT ANY . USERS REFERENCE TEMPERATURE 0.000 DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
81	1919.2	35.7	35.785	121	3442.6	39.8	39.873
82	1955.0	35.8	35.929	122	3482.5	39.9	39.941
83	1991.0	36.0	36.071	123	3522.5	40.0	40.008
84	2027.2	36.2	36.211	124	3562.5	40.0	40.073
85	2063.5	36.3	36.348	125	3602.6	40.1	40.137
86	2099.9	36.4	36.483	126	3642.8	40.2	40.200
87	2136.4	36.5	36.615	127	3683.0	40.2	40.262
88	2173.1	36.7	36.744	128	3723.3	40.3	40.322
89	2209.9	36.8	36.871	129	3763.7	40.4	40.381
90	2246.8	36.9	36.995	130	3804.1	40.4	40.440
91	2283.9	37.1	37.117	131	3844.6	40.5	40.498
92	2321.1	37.2	37.236	132	3885.1	40.5	40.554
93	2358.4	37.3	37.353	133	3925.7	40.6	40.609
94	2395.8	37.4	37.468	134	3966.3	40.6	40.664
95	2433.3	37.5	37.581	135	4007.0	40.7	40.718
96	2470.9	37.6	37.692	136	4047.7	40.7	40.770
97	2508.6	37.7	37.801	137	4088.5	40.8	40.821
98	2546.5	37.9	37.907	138	4129.4	40.9	40.871
99	2584.5	38.0	38.011	139	4170.3	40.9	40.920
100	2622.6	38.1	38.113	140	4211.2	40.9	40.969
101	2660.7	38.1	38.213	141	4252.2	41.0	41.017
102	2698.9	38.2	38.312	142	4293.2	41.0	41.064
103	2737.3	38.4	38.409	143	4334.3	41.1	41.110
104	2775.8	38.5	38.504	144	4375.5	41.2	41.155
105	2814.4	38.6	38.597	145	4416.7	41.2	41.199
106	2853.0	38.6	38.688	146	4457.9	41.2	41.242
107	2891.7	38.7	38.778	147	4499.1	41.2	41.285
108	2930.6	38.9	38.866	148	4540.4	41.3	41.327
109	2969.5	38.9	38.953	149	4581.8	41.4	41.368
110	3008.5	39.0	39.038	150	4623.2	41.4	41.408
111	3047.6	39.1	39.121	151	4664.6	41.4	41.448
112	3086.8	39.2	39.202	152	4706.1	41.5	41.487
113	3126.0	39.2	39.282	153	4747.6	41.5	41.525
114	3165.3	39.3	39.361	154	4789.1	41.5	41.562
115	3204.7	39.4	39.439	155	4830.7	41.6	41.599
116	3244.2	39.5	39.515	156	4872.3	41.6	41.635
117	3283.7	39.5	39.589	157	4914.0	41.7	41.670
118	3323.3	39.6	39.662	158	4955.7	41.7	41.705
119	3363.0	39.7	39.734	159	4997.4	41.7	41.739
120	3402.8	39.8	39.804	160	5039.1	41.7	41.772

THERMOCOUPLE TABLE FOR COPPER VS AUCO , ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. R-188 WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL . LOT ANY . USERS REFERENCE TEMPERATURE 0.000 DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
161	5080.9	41.8	41.805	201	6773.3	42.7	42.688
162	5122.7	41.8	41.837	202	6816.0	42.7	42.701
163	5164.6	41.9	41.868	203	6858.7	42.7	42.714
164	5206.5	41.9	41.899	204	6901.4	42.7	42.727
165	5248.4	41.9	41.929	205	6944.1	42.7	42.740
166	5290.3	41.9	41.959	206	6986.8	42.7	42.752
167	5332.3	42.0	41.988	207	7029.6	42.8	42.764
168	5374.3	42.0	42.016	208	7072.4	42.8	42.775
169	5416.3	42.0	42.044	209	7115.2	42.8	42.786
170	5458.4	42.1	42.072	210	7158.0	42.8	42.797
171	5500.5	42.1	42.099	211	7200.8	42.8	42.808
172	5542.6	42.1	42.125	212	7243.6	42.8	42.818
173	5584.7	42.1	42.151	213	7286.4	42.8	42.828
174	5626.9	42.2	42.176	214	7329.2	42.8	42.838
175	5669.1	42.2	42.201	215	7372.0	42.8	42.848
176	5711.3	42.2	42.225	216	7414.9	42.9	42.857
177	5753.5	42.2	42.249	217	7457.8	42.9	42.866
178	5795.8	42.3	42.272	218	7500.7	42.9	42.875
179	5838.1	42.3	42.295	219	7543.5	42.8	42.883
180	5880.4	42.3	42.317	220	7586.4	42.9	42.891
181	5922.7	42.3	42.339	221	7629.3	42.9	42.899
182	5965.0	42.3	42.360	222	7672.2	42.9	42.906
183	6007.4	42.4	42.381	223	7715.1	42.9	42.913
184	6049.8	42.4	42.402	224	7758.0	42.9	42.920
185	6092.2	42.4	42.422	225	7801.0	43.0	42.927
186	6134.6	42.4	42.441	226	7843.9	42.9	42.934
187	6177.1	42.5	42.460	227	7886.8	42.9	42.940
188	6219.6	42.5	42.479	228	7929.7	42.9	42.946
189	6262.1	42.5	42.497	229	7972.6	42.9	42.952
190	6304.6	42.5	42.515	230	8015.6	43.0	42.958
191	6347.1	42.5	42.533	231	8058.6	43.0	42.963
192	6389.6	42.5	42.550	232	8101.6	43.0	42.968
193	6432.2	42.6	42.567	233	8144.6	43.0	42.973
194	6474.8	42.6	42.583	234	8187.6	43.0	42.978
195	6517.4	42.6	42.599	235	8230.5	42.9	42.983
196	6560.0	42.6	42.615	236	8273.5	43.0	42.987
197	6602.6	42.6	42.630	237	8316.5	43.0	42.991
198	6645.2	42.6	42.645	238	8359.5	43.0	42.995
199	6687.9	42.7	42.660	239	8402.5	43.0	42.999
200	6730.6	42.7	42.674	240	8445.5	43.0	43.002

THERMOCOUPLE TABLE FOR COPPER VS AUCO , ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. R-188 WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0.000 DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
241	8488.5	43.0	43.005	281	10209.3	43.0	42.995
242	8531.5	43.0	43.008	282	10252.3	43.0	42.992
243	8574.5	43.0	43.011	283	10295.3	43.0	42.989
244	8617.5	43.0	43.014	284	10338.3	43.0	42.986
245	8660.5	43.0	43.016	285	10381.3	43.0	42.982
246	8703.6	43.1	43.018	286	10424.3	43.0	42.978
247	8746.6	43.0	43.020	287	10467.2	42.9	42.974
248	8789.6	43.0	43.022	288	10510.2	43.0	42.970
249	8832.6	43.0	43.024	289	10553.2	43.0	42.966
250	8875.6	43.0	43.026	290	10596.1	42.9	42.962
251	8918.7	43.1	43.027	291	10639.1	43.0	42.958
252	8961.7	43.0	43.028	292	10682.1	43.0	42.953
253	9004.7	43.0	43.029	293	10725.1	43.0	42.949
254	9047.8	43.1	43.030	294	10768.0	42.9	42.945
255	9090.8	43.0	43.031	295	10810.9	42.9	42.940
256	9133.8	43.0	43.031	296	10853.8	42.9	42.935
257	9176.9	43.1	43.031	297	10896.8	43.0	42.930
258	9219.9	43.0	43.031	298	10939.7	42.9	42.925
259	9262.9	43.0	43.031	299	10982.6	42.9	42.920
260	9305.9	43.0	43.031	300	11025.5	42.9	42.915
261	9349.0	43.1	43.031				
262	9392.0	43.0	43.031				
263	9435.0	43.0	43.030				
264	9478.1	43.1	43.029				
265	9521.1	43.0	43.028				
266	9564.1	43.0	43.027				
267	9607.2	43.1	43.026				
268	9650.2	43.0	43.025				
269	9693.2	43.0	43.024				
270	9736.2	43.0	43.022				
271	9779.2	43.0	43.020				
272	9822.3	43.1	43.018				
273	9865.3	43.0	43.016				
274	9908.3	43.0	43.014				
275	9951.3	43.0	43.012				
276	9994.3	43.0	43.010				
277	10037.3	43.0	43.007				
278	10080.3	43.0	43.004				
279	10123.3	43.0	43.001				
280	10166.3	43.0	42.998				

THERMOCOUPLE TABLE FOR COPPER VS AUCO . ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. R-188 WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL . LOT ANY . USERS REFERENCE TEMPERATURE 0.000 DEG. C
TEST DATE SEPTEMBER 1.68 BY POWELL,RUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-272	-9871.05	0.7u	1.202	-232	-9227.2	26.4	26.655
-271	-9869.34	1.71	2.221	-231	-9200.3	26.9	27.017
-270	-9866.62	2.72	3.217	-230	-9173.0	27.3	27.369
-269	-9862.91	3.71	4.188	-229	-9145.5	27.5	27.713
-268	-9858.25	4.66	5.134	-228	-9117.6	27.9	28.048
-267	-9852.65	5.60	6.057	-227	-9089.4	28.2	28.375
-266	-9846.15	6.50	6.955	-226	-9060.8	28.6	28.693
-265	-9838.75	7.40	7.830	-225	-9032.0	28.8	29.004
-264	-9830.50	8.25	8.680	-224	-9002.9	29.1	29.307
-263	-9821.40	9.10	9.505	-223	-8973.4	29.5	29.602
-262	-9811.49	9.91	10.307	-222	-8943.7	29.7	29.889
-261	-9800.80	10.69	11.084	-221	-8913.6	30.1	30.169
-260	-9789.33	11.47	11.837	-220	-8883.3	30.3	30.442
-259	-9777.11	12.22	12.566	-219	-8852.7	30.6	30.708
-258	-9764.2	12.9	13.269	-218	-8821.9	30.8	30.968
-257	-9750.6	13.6	13.949	-217	-8790.9	31.0	31.220
-256	-9736.4	14.2	14.612	-216	-8759.5	31.4	31.467
-255	-9721.5	14.9	15.262	-215	-8727.9	31.6	31.707
-254	-9705.9	15.6	15.897	-214	-8696.1	31.8	31.941
-253	-9689.7	16.2	16.520	-213	-8664.0	32.1	32.168
-252	-9672.8	16.9	17.128	-212	-8631.8	32.2	32.389
-251	-9655.4	17.4	17.723	-211	-8599.4	32.4	32.605
-250	-9637.4	18.0	18.306	-210	-8566.6	32.8	32.815
-249	-9618.9	18.6	18.876	-209	-8533.7	32.9	33.019
-248	-9599.6	19.2	19.431	-208	-8500.6	33.1	33.219
-247	-9580.0	19.6	19.974	-207	-8467.2	33.4	33.413
-246	-9559.8	20.2	20.502	-206	-8433.7	33.5	33.602
-245	-9539.0	20.8	21.018	-205	-8400.0	33.7	33.786
-244	-9517.7	21.3	21.521	-204	-8366.2	33.8	33.964
-243	-9495.9	21.8	22.011	-203	-8332.1	34.1	34.138
-242	-9473.7	22.2	22.488	-202	-8297.9	34.2	34.305
-241	-9451.0	22.7	22.953	-201	-8263.5	34.4	34.466
-240	-9427.9	23.2	23.408	-200	-8229.0	34.5	34.622
-239	-9404.2	23.6	23.851	-199	-8194.2	34.8	34.776
-238	-9380.1	24.1	24.282	-198	-8159.4	34.8	34.928
-237	-9355.6	24.5	24.702	-197	-8124.4	35.0	35.078
-236	-9330.7	24.9	25.113	-196	-8089.3	35.1	35.227
-235	-9305.3	25.4	25.513	-195	-8054.0	35.3	35.374
-234	-9279.7	25.6	25.904	-194	-8018.5	35.5	35.519
-233	-9253.6	26.1	26.284	-193	-7982.9	35.6	35.663

THERMOCOUPLE TABLE FOR COPPER VS AUCO . ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. R-188 WITH CALC. MULT. FACTOR OF 1.00000. GENERAL . LOT ANY . USERS REFERENCE TEMPERATURE 0.000 DEG. C
TEST DATE SEPTEMBER 1.60 BY POWELL.BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-192	-7947.2	35.7	35.807	-152	-6423.2	39.8	39.883
-191	-7911.4	35.8	35.950	-151	-6383.3	39.9	39.951
-190	-7875.3	36.1	36.092	-150	-6343.3	40.0	40.018
-189	-7839.1	36.2	36.232	-149	-6303.2	40.1	40.083
-188	-7802.8	36.3	36.368	-148	-6263.1	40.1	40.147
-187	-7766.4	36.4	36.503	-147	-6222.9	40.2	40.209
-186	-7729.9	36.5	36.634	-146	-6182.7	40.2	40.271
-185	-7693.1	36.8	36.763	-145	-6142.4	40.3	40.331
-184	-7656.3	36.8	36.890	-144	-6102.0	40.4	40.390
-183	-7619.4	36.9	37.013	-143	-6061.6	40.4	40.449
-182	-7582.3	37.1	37.135	-142	-6021.1	40.5	40.506
-181	-7545.1	37.2	37.254	-141	-5980.6	40.5	40.562
-180	-7507.7	37.4	37.370	-140	-5940.0	40.6	40.617
-179	-7470.3	37.4	37.485	-139	-5899.3	40.7	40.672
-178	-7432.8	37.5	37.598	-138	-5858.7	40.6	40.726
-177	-7395.2	37.6	37.709	-137	-5817.9	40.8	40.778
-176	-7357.5	37.7	37.817	-136	-5777.1	40.8	40.829
-175	-7319.6	37.9	37.923	-135	-5736.2	40.9	40.878
-174	-7281.5	38.1	38.026	-134	-5695.3	40.9	40.927
-173	-7243.4	38.1	38.128	-133	-5654.4	40.9	40.976
-172	-7205.3	38.1	38.228	-132	-5613.4	41.0	41.024
-171	-7167.1	38.2	38.327	-131	-5572.4	41.0	41.071
-170	-7128.7	38.4	38.423	-130	-5531.3	41.1	41.117
-169	-7090.2	38.5	38.518	-129	-5490.1	41.2	41.162
-168	-7051.6	38.6	38.611	-128	-5448.9	41.2	41.205
-167	-7013.0	38.6	38.702	-127	-5407.7	41.2	41.249
-166	-6974.2	38.8	38.791	-126	-5366.5	41.2	41.291
-165	-6935.3	38.9	38.879	-125	-5325.1	41.4	41.333
-164	-6896.4	38.9	38.966	-124	-5283.7	41.4	41.374
-163	-6857.4	39.0	39.051	-123	-5242.3	41.4	41.414
-162	-6818.3	39.1	39.133	-122	-5200.9	41.4	41.454
-161	-6779.1	39.2	39.214	-121	-5159.4	41.5	41.493
-160	-6739.9	39.2	39.294	-120	-5117.9	41.5	41.531
-159	-6700.5	39.4	39.373	-119	-5076.4	41.5	41.568
-158	-6661.1	39.4	39.451	-118	-5034.8	41.6	41.604
-157	-6621.6	39.5	39.526	-117	-4993.2	41.6	41.640
-156	-6582.1	39.5	39.600	-116	-4951.5	41.7	41.675
-155	-6542.5	39.6	39.673	-115	-4909.8	41.7	41.710
-154	-6502.8	39.7	39.745	-114	-4868.1	41.7	41.744
-153	-6463.0	39.8	39.814	-113	-4826.4	41.7	41.777

THERMOCOUPLE TABLE FOR COPPER VS AUCO . ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. R-188 WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL . LOT ANY . USERS REFERENCE TEMPERATURE 0.000 DEG. C
TEST DATE SEPTEMBER 1.60 BY POWELL.BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-112	-4784.6	41.8	41.810	-72	-3092.0	42.7	42.690
-111	-4742.8	41.8	41.842	-71	-3049.3	42.7	42.703
-110	-4700.9	41.9	41.873	-70	-3006.6	42.7	42.716
-109	-4659.0	41.9	41.904	-69	-2963.9	42.7	42.729
-108	-4617.1	41.9	41.934	-68	-2921.3	42.6	42.742
-107	-4575.1	42.0	41.963	-67	-2878.5	42.8	42.754
-106	-4533.1	42.0	41.992	-66	-2835.7	42.8	42.766
-105	-4491.2	41.9	42.020	-65	-2792.9	42.8	42.777
-104	-4449.1	42.1	42.048	-64	-2750.1	42.8	42.788
-103	-4407.0	42.1	42.076	-63	-2707.3	42.8	42.799
-102	-4364.9	42.1	42.103	-62	-2664.5	42.8	42.810
-101	-4322.8	42.1	42.129	-61	-2621.7	42.8	42.820
-100	-4280.7	42.1	42.155	-60	-2578.9	42.8	42.830
-99	-4238.5	42.2	42.180	-59	-2536.1	42.8	42.840
-98	-4196.3	42.2	42.205	-58	-2493.3	42.8	42.849
-97	-4154.1	42.2	42.229	-57	-2450.4	42.9	42.858
-96	-4111.9	42.2	42.252	-56	-2407.5	42.9	42.867
-95	-4069.6	42.3	42.276	-55	-2364.6	42.9	42.876
-94	-4027.3	42.3	42.298	-54	-2321.8	42.8	42.884
-93	-3985.0	42.3	42.320	-53	-2278.9	42.9	42.892
-92	-3942.7	42.3	42.342	-52	-2236.0	42.9	42.900
-91	-3900.4	42.3	42.363	-51	-2193.1	42.9	42.907
-90	-3858.0	42.4	42.384	-50	-2150.2	42.9	42.914
-89	-3815.6	42.4	42.405	-49	-2107.3	42.9	42.921
-88	-3773.2	42.4	42.425	-48	-2064.3	43.0	42.928
-87	-3730.8	42.4	42.444	-47	-2021.4	42.9	42.935
-86	-3688.3	42.5	42.463	-46	-1978.5	42.9	42.941
-85	-3645.8	42.5	42.482	-45	-1935.6	42.9	42.947
-84	-3603.3	42.5	42.500	-44	-1892.7	42.9	42.953
-83	-3560.8	42.5	42.518	-43	-1849.7	43.0	42.959
-82	-3518.3	42.5	42.536	-42	-1806.7	43.0	42.964
-81	-3475.8	42.5	42.553	-41	-1763.7	43.0	42.969
-80	-3433.2	42.6	42.569	-40	-1720.7	43.0	42.974
-79	-3390.6	42.6	42.585	-39	-1677.7	43.0	42.979
-78	-3348.0	42.6	42.601	-38	-1634.8	42.9	42.984
-77	-3305.4	42.6	42.617	-37	-1591.8	43.0	42.988
-76	-3262.8	42.6	42.632	-36	-1548.8	43.0	42.992
-75	-3220.1	42.7	42.647	-35	-1505.8	43.0	42.996
-74	-3177.4	42.7	42.662	-34	-1462.8	43.0	42.999
-73	-3134.7	42.7	42.676	-33	-1419.8	43.0	43.002

THERMOCOUPLE TABLE FOR COPPER VS AUCO . ISA TYPE UNDESIG.. BASED ON NAT. BUR. OF STANDARDS PUB. P-188 WITH CALC. MULT. FACTOR OF 1.00000. GENERAL . LOT ANY . USERS REFERENCE TEMPERATURE 0.000 DEG. C
TEST DATE SEPTEMBER 1.60 BY POWELL.BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-32	-1376.8	43.0	43.005	8	344.0	43.0	42.995
-31	-1333.8	43.0	43.008	9	387.0	43.0	42.992
-30	-1290.8	43.0	43.012	10	430.0	43.0	42.989
-29	-1247.8	43.0	43.014	11	473.0	43.0	42.985
-28	-1204.8	43.0	43.016	12	516.0	43.0	42.981
-27	-1161.7	43.1	43.018	13	559.0	43.0	42.977
-26	-1118.7	43.0	43.020	14	601.9	42.9	42.973
-25	-1075.7	43.0	43.022	15	644.9	43.0	42.969
-24	-1032.7	43.0	43.024	16	687.9	43.0	42.965
-23	-989.7	43.0	43.026	17	730.8	42.9	42.961
-22	-946.6	43.1	43.027	18	773.8	43.0	42.957
-21	-903.6	43.0	43.028	19	816.8	43.0	42.952
-20	-860.6	43.0	43.029	20	859.8	43.0	42.948
-19	-817.5	43.1	43.030	21	902.7	42.9	42.944
-18	-774.5	43.0	43.031	22	945.6	42.9	42.939
-17	-731.5	43.0	43.031	23	988.5	42.9	42.934
-16	-688.4	43.1	43.031	24	1031.5	43.0	42.929
-15	-645.4	43.0	43.031	25	1074.4	42.9	42.924
-14	-602.4	43.0	43.031	26	1117.3	42.9	42.919
-13	-559.4	43.0	43.031				
-12	-516.3	43.1	43.031				
-11	-473.3	43.0	43.031				
-10	-430.3	43.0	43.030				
-9	-387.2	43.1	43.029				
-8	-344.2	43.0	43.028				
-7	-301.2	43.0	43.027				
-6	-258.1	43.1	43.026				
-5	-215.1	43.0	43.025				
-4	-172.1	43.0	43.024				
-3	-129.1	43.0	43.022				
-2	-86.1	43.0	43.020				
-1	-43.0	43.1	43.018				
0	0.0	42.9	43.016				
1	43.0	43.0	43.014				
2	86.0	43.0	43.012				
3	129.0	43.0	43.010				
4	172.0	43.0	43.007				
5	215.0	43.0	43.004				
6	258.0	43.0	43.001				
7	301.0	43.0	42.998				

THERMOCOUPLE TABLE FOR CU VS N.AG , ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY , USERS REFERENCE TEMPERATURE 0.000 DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
1	0.00	0.00	0.000	41	8.0	0.7	0.720
2	0.00	0.00	0.000	42	8.7	0.7	0.740
3	0.00	0.00	0.000	43	9.4	0.7	0.760
4	0.00	0.00	0.000	44	10.2	0.8	0.780
5	0.00	0.00	0.000	45	11.0	0.8	0.800
6	0.00	0.00	0.000	46	11.8	0.8	0.820
7	0.00	0.00	0.000	47	12.6	0.8	0.830
8	0.00	0.00	0.000	48	13.4	0.8	0.840
9	0.00	0.00	0.000	49	14.3	0.9	0.850
10	0.01	0.01	0.000	50	15.2	0.9	0.860
11	0.02	0.01	0.000	51	16.1	0.9	0.870
12	0.03	0.01	0.000	52	16.9	0.8	0.880
13	0.04	0.01	0.000	53	17.8	0.9	0.880
14	0.05	0.01	0.000	54	18.7	0.9	0.880
15	0.06	0.01	0.010	55	19.6	0.9	0.880
16	0.08	0.02	0.020	56	20.5	0.9	0.880
17	0.10	0.02	0.030	57	21.3	0.8	0.880
18	0.13	0.03	0.040	58	22.2	0.9	0.880
19	0.16	0.03	0.050	59	23.1	0.9	0.880
20	0.20	0.04	0.060	60	24.0	0.9	0.880
21	0.27	0.07	0.070	61	24.9	0.9	0.880
22	0.37	0.10	0.090	62	25.7	0.8	0.880
23	0.50	0.13	0.110	63	26.6	0.9	0.880
24	0.66	0.16	0.130	64	27.5	0.9	0.880
25	0.85	0.19	0.160	65	28.4	0.9	0.880
26	1.07	0.22	0.200	66	29.3	0.9	0.880
27	1.32	0.25	0.240	67	30.1	0.8	0.880
28	1.60	0.28	0.280	68	31.0	0.9	0.890
29	1.91	0.31	0.320	69	31.9	0.9	0.890
30	2.25	0.34	0.360	70	32.8	0.9	0.890
31	2.6	0.4	0.400	71	33.7	0.9	0.890
32	3.0	0.4	0.440	72	34.5	0.8	0.890
33	3.4	0.4	0.480	73	35.4	0.9	0.890
34	3.9	0.5	0.510	74	36.3	0.9	0.890
35	4.4	0.5	0.540	75	37.2	0.9	0.890
36	4.9	0.5	0.570	76	38.0	0.8	0.890
37	5.5	0.6	0.600	77	38.9	0.9	0.890
38	6.1	0.6	0.630	78	39.7	0.8	0.890
39	6.7	0.6	0.660	79	40.6	0.9	0.880
40	7.3	0.6	0.690	80	41.4	0.8	0.870

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TEST DATE SEPTEMBER 1,60 BY POWELL.BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
81	42.2	0.8	0.860	121	71.9	0.7	0.670
82	43.1	0.9	0.850	122	72.5	0.6	0.670
83	43.9	0.8	0.840	123	73.2	0.7	0.670
84	44.8	0.9	0.830	124	73.8	0.6	0.670
85	45.6	0.8	0.820	125	74.5	0.7	0.670
86	46.4	0.8	0.810	126	75.1	0.6	0.670
87	47.2	0.8	0.800	127	75.8	0.7	0.670
88	48.0	0.8	0.790	128	76.4	0.6	0.670
89	48.8	0.8	0.780	129	77.1	0.7	0.670
90	49.6	0.8	0.770	130	77.7	0.6	0.670
91	50.4	0.8	0.760	131	78.4	0.7	0.670
92	51.2	0.8	0.750	132	79.0	0.6	0.670
93	52.0	0.8	0.740	133	79.6	0.6	0.670
94	52.7	0.7	0.730	134	80.3	0.7	0.660
95	53.5	0.8	0.720	135	80.9	0.6	0.650
96	54.2	0.7	0.710	136	81.6	0.7	0.640
97	55.0	0.8	0.700	137	82.2	0.6	0.630
98	55.7	0.7	0.690	138	82.8	0.6	0.620
99	56.5	0.8	0.680	139	83.5	0.7	0.620
100	57.2	0.7	0.670	140	84.1	0.6	0.620
101	57.9	0.7	0.670	141	84.7	0.6	0.620
102	58.6	0.7	0.670	142	85.3	0.6	0.620
103	59.4	0.8	0.670	143	86.0	0.7	0.620
104	60.1	0.7	0.670	144	86.6	0.6	0.620
105	60.8	0.7	0.670	145	87.2	0.6	0.620
106	61.5	0.7	0.670	146	87.8	0.6	0.620
107	62.2	0.7	0.670	147	88.4	0.6	0.620
108	62.9	0.7	0.670	148	89.1	0.7	0.620
109	63.6	0.7	0.670	149	89.7	0.6	0.620
110	64.3	0.7	0.670	150	90.3	0.6	0.620
111	65.0	0.7	0.670	151	90.9	0.6	0.620
112	65.7	0.7	0.670	152	91.5	0.6	0.620
113	66.4	0.7	0.670	153	92.2	0.7	0.620
114	67.1	0.7	0.670	154	92.8	0.6	0.620
115	67.8	0.7	0.670	155	93.4	0.6	0.620
116	68.5	0.7	0.670	156	94.0	0.6	0.620
117	69.2	0.7	0.670	157	94.6	0.6	0.620
118	69.8	0.6	0.670	158	95.3	0.7	0.620
119	70.5	0.7	0.670	159	95.9	0.6	0.620
120	71.2	0.7	0.670	160	96.5	0.6	0.620

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TEST DATE SEPTEMBER 1,60 BY POWELL,HUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
161	97.1	0.6	0.620	201	122.4	0.6	0.630
162	97.7	0.6	0.620	202	123.1	0.7	0.630
163	98.4	0.7	0.620	203	123.7	0.6	0.630
164	99.0	0.6	0.620	204	124.3	0.6	0.630
165	99.6	0.6	0.620	205	125.0	0.7	0.630
166	100.2	0.6	0.620	206	125.6	0.6	0.630
167	100.8	0.6	0.620	207	126.3	0.7	0.630
168	101.5	0.7	0.620	208	126.9	0.6	0.630
169	102.1	0.6	0.620	209	127.5	0.6	0.630
170	102.7	0.6	0.620	210	128.2	0.7	0.630
171	103.3	0.6	0.620	211	128.8	0.6	0.630
172	104.0	0.7	0.620	212	129.5	0.7	0.630
173	104.6	0.6	0.620	213	130.1	0.6	0.630
174	105.3	0.7	0.620	214	130.7	0.6	0.630
175	105.9	0.6	0.620	215	131.4	0.7	0.630
176	106.6	0.7	0.620	216	132.0	0.6	0.630
177	107.2	0.6	0.620	217	132.7	0.7	0.630
178	107.9	0.7	0.620	218	133.3	0.6	0.630
179	108.5	0.6	0.620	219	133.9	0.6	0.640
180	109.2	0.7	0.620	220	134.6	0.7	0.650
181	109.8	0.6	0.620	221	135.3	0.7	0.660
182	110.5	0.7	0.620	222	135.9	0.6	0.670
183	111.1	0.6	0.620	223	136.6	0.7	0.680
184	111.8	0.7	0.620	224	137.2	0.6	0.690
185	112.4	0.6	0.620	225	137.9	0.7	0.700
186	113.1	0.7	0.620	226	138.6	0.7	0.700
187	113.7	0.6	0.620	227	139.3	0.7	0.700
188	114.3	0.6	0.630	228	139.9	0.6	0.700
189	115.0	0.7	0.630	229	140.6	0.7	0.700
190	115.6	0.6	0.630	230	141.3	0.7	0.700
191	116.2	0.6	0.630	231	142.0	0.7	0.700
192	116.8	0.6	0.630	232	142.7	0.7	0.700
193	117.5	0.7	0.630	233	143.3	0.6	0.700
194	118.1	0.6	0.630	234	144.0	0.7	0.700
195	118.7	0.6	0.630	235	144.7	0.7	0.700
196	119.3	0.6	0.630	236	145.4	0.7	0.700
197	119.9	0.6	0.630	237	146.1	0.7	0.700
198	120.6	0.7	0.630	238	146.8	0.7	0.700
199	121.2	0.6	0.630	239	147.5	0.7	0.700
200	121.8	0.6	0.630	240	148.2	0.7	0.700

THERMOCOUPLE TABLE FOR CU VS N.AG , ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY , USERS REFERENCE TEMPERATURE 0.000 DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
241	148.9	0.7	0.700	281	177.6	0.7	0.730
242	149.6	0.7	0.700	282	178.4	0.8	0.730
243	150.3	0.7	0.700	283	179.1	0.7	0.730
244	151.0	0.7	0.700	284	179.9	0.8	0.740
245	151.7	0.7	0.700	285	180.6	0.7	0.750
246	152.4	0.7	0.700	286	181.4	0.8	0.760
247	153.1	0.7	0.700	287	182.1	0.7	0.770
248	153.8	0.7	0.700	288	182.9	0.8	0.770
249	154.5	0.7	0.700	289	183.6	0.7	0.770
250	155.2	0.7	0.700	290	184.4	0.8	0.770
251	155.9	0.7	0.700	291	185.2	0.8	0.770
252	156.6	0.7	0.700	292	185.9	0.7	0.770
253	157.3	0.7	0.710	293	186.7	0.8	0.770
254	158.0	0.7	0.720	294	187.5	0.8	0.770
255	158.7	0.7	0.730	295	188.3	0.8	0.770
256	159.4	0.7	0.730	296	189.1	0.8	0.770
257	160.1	0.7	0.730	297	189.9	0.8	0.770
258	160.9	0.8	0.730	298	190.7	0.8	0.770
259	161.6	0.7	0.730	299	191.5	0.8	0.770
260	162.3	0.7	0.730	300	192.3	0.8	0.770
261	163.0	0.7	0.730				
262	163.7	0.7	0.730				
263	164.5	0.8	0.730				
264	165.2	0.7	0.730				
265	165.9	0.7	0.730				
266	166.7	0.8	0.730				
267	167.4	0.7	0.730				
268	168.1	0.7	0.730				
269	168.9	0.8	0.730				
270	169.6	0.7	0.730				
271	170.3	0.7	0.730				
272	171.0	0.7	0.730				
273	171.8	0.8	0.730				
274	172.5	0.7	0.730				
275	173.2	0.7	0.730				
276	174.0	0.8	0.730				
277	174.7	0.7	0.730				
278	175.4	0.7	0.730				
279	176.2	0.8	0.730				
280	176.9	0.7	0.730				

THERMOCOUPLE TABLE FOR CU VS N.AG , ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.00000. GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0.000 DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-272	-171.89	0.00	0.000	-232	-163.8	0.7	0.723
-271	-171.89	0.00	0.000	-231	-163.1	0.7	0.743
-270	-171.89	0.00	0.000	-230	-162.4	0.7	0.763
-269	-171.89	0.00	0.000	-229	-161.6	0.8	0.783
-268	-171.89	0.00	0.000	-228	-160.8	0.8	0.804
-267	-171.89	0.00	0.000	-227	-160.0	0.8	0.821
-266	-171.89	0.00	0.000	-226	-159.2	0.8	0.831
-265	-171.89	0.00	0.000	-225	-158.3	0.9	0.841
-264	-171.89	0.00	0.000	-224	-157.4	0.9	0.852
-263	-171.88	0.01	0.000	-223	-156.6	0.8	0.861
-262	-171.87	0.01	0.000	-222	-155.7	0.9	0.872
-261	-171.86	0.01	0.000	-221	-154.8	0.9	0.880
-260	-171.85	0.01	-0.001	-220	-153.9	0.9	0.880
-259	-171.84	0.01	0.001	-219	-153.0	0.9	0.880
-258	-171.83	0.01	0.011	-218	-152.2	0.8	0.880
-257	-171.81	0.02	0.021	-217	-151.3	0.9	0.880
-256	-171.78	0.03	0.031	-216	-150.4	0.9	0.880
-255	-171.76	0.02	0.042	-215	-149.5	0.9	0.880
-254	-171.73	0.03	0.051	-214	-148.6	0.9	0.880
-253	-171.68	0.05	0.061	-213	-147.8	0.8	0.880
-252	-171.61	0.07	0.073	-212	-146.9	0.9	0.880
-251	-171.50	0.11	0.093	-211	-146.0	0.9	0.880
-250	-171.37	0.13	0.112	-210	-145.1	0.9	0.880
-249	-171.20	0.17	0.134	-209	-144.2	0.9	0.880
-248	-171.01	0.19	0.166	-208	-143.4	0.8	0.880
-247	-170.78	0.23	0.206	-207	-142.5	0.9	0.879
-246	-170.53	0.25	0.246	-206	-141.6	0.9	0.882
-245	-170.24	0.29	0.286	-205	-140.7	0.9	0.890
-244	-169.93	0.31	0.326	-204	-139.8	0.9	0.890
-243	-169.59	0.34	0.366	-203	-139.0	0.8	0.890
-242	-169.2	0.4	0.406	-202	-138.1	0.9	0.890
-241	-168.8	0.4	0.447	-201	-137.2	0.9	0.890
-240	-168.4	0.4	0.484	-200	-136.3	0.9	0.890
-239	-167.9	0.5	0.514	-199	-135.4	0.9	0.890
-238	-167.4	0.5	0.544	-198	-134.6	0.8	0.890
-237	-166.9	0.5	0.574	-197	-133.7	0.9	0.890
-236	-166.3	0.6	0.604	-196	-132.9	0.8	0.891
-235	-165.7	0.6	0.634	-195	-132.0	0.9	0.889
-234	-165.1	0.6	0.664	-194	-131.2	0.8	0.878
-233	-164.5	0.6	0.695	-193	-130.4	0.8	0.868

THERMOCOUPLE TABLE FOR CU VS N.AG , ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.00000. GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0.000 DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-192	-129.5	0.9	0.858	-152	-99.9	0.7	0.670
-191	-128.7	0.8	0.848	-151	-99.3	0.6	0.670
-190	-127.8	0.9	0.838	-150	-98.6	0.7	0.670
-189	-127.0	0.8	0.828	-149	-98.0	0.6	0.670
-188	-126.2	0.8	0.818	-148	-97.3	0.7	0.670
-187	-125.3	0.9	0.808	-147	-96.7	0.6	0.670
-186	-124.5	0.8	0.798	-146	-96.0	0.7	0.670
-185	-123.7	0.8	0.788	-145	-95.4	0.6	0.670
-184	-122.9	0.8	0.778	-144	-94.7	0.7	0.670
-183	-122.1	0.8	0.769	-143	-94.1	0.6	0.670
-182	-121.3	0.8	0.758	-142	-93.4	0.7	0.670
-181	-120.6	0.7	0.748	-141	-92.8	0.6	0.671
-180	-119.8	0.8	0.738	-140	-92.2	0.6	0.668
-179	-119.0	0.8	0.728	-139	-91.5	0.7	0.658
-178	-118.3	0.7	0.719	-138	-90.9	0.6	0.648
-177	-117.5	0.8	0.708	-137	-90.2	0.7	0.639
-176	-116.8	0.7	0.698	-136	-89.6	0.6	0.628
-175	-116.1	0.7	0.688	-135	-89.0	0.6	0.620
-174	-115.3	0.8	0.678	-134	-88.3	0.7	0.620
-173	-114.6	0.7	0.670	-133	-87.7	0.6	0.620
-172	-113.9	0.7	0.670	-132	-87.1	0.6	0.620
-171	-113.1	0.8	0.670	-131	-86.4	0.7	0.620
-170	-112.4	0.7	0.670	-130	-85.8	0.6	0.620
-169	-111.7	0.7	0.670	-129	-85.2	0.6	0.620
-168	-111.0	0.7	0.670	-128	-84.6	0.6	0.620
-167	-110.3	0.7	0.670	-127	-84.0	0.6	0.620
-166	-109.6	0.7	0.670	-126	-83.3	0.7	0.620
-165	-108.9	0.7	0.670	-125	-82.7	0.6	0.620
-164	-108.2	0.7	0.670	-124	-82.1	0.6	0.620
-163	-107.5	0.7	0.670	-123	-81.5	0.6	0.620
-162	-106.8	0.7	0.670	-122	-80.9	0.6	0.620
-161	-106.1	0.7	0.670	-121	-80.3	0.6	0.620
-160	-105.4	0.7	0.670	-120	-79.6	0.7	0.620
-159	-104.7	0.7	0.670	-119	-79.0	0.6	0.620
-158	-104.0	0.7	0.670	-118	-78.4	0.6	0.620
-157	-103.3	0.7	0.670	-117	-77.8	0.6	0.620
-156	-102.6	0.7	0.670	-116	-77.2	0.6	0.620
-155	-101.9	0.7	0.670	-115	-76.5	0.7	0.620
-154	-101.3	0.6	0.670	-114	-75.9	0.6	0.620
-153	-100.6	0.7	0.670	-113	-75.3	0.6	0.620

THERMOCOUPLE TABLE FOR CU VS N.AG . ISA TYPE UNDESIG.. BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.00000. GENERAL . LOT ANY . USERS REFERENCE TEMPERATURE 0.000 DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL.BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-112	-74.7	0.6	0.620	-72	-49.4	0.6	0.630
-111	-74.1	0.6	0.620	-71	-48.7	0.7	0.630
-110	-73.4	0.7	0.620	-70	-48.1	0.6	0.630
-109	-72.8	0.6	0.620	-69	-47.4	0.7	0.630
-108	-72.2	0.6	0.620	-68	-46.8	0.6	0.630
-107	-71.6	0.6	0.620	-67	-46.2	0.6	0.630
-106	-71.0	0.6	0.620	-66	-45.5	0.7	0.630
-105	-70.3	0.7	0.620	-65	-44.9	0.6	0.630
-104	-69.7	0.6	0.620	-64	-44.2	0.7	0.630
-103	-69.1	0.6	0.620	-63	-43.6	0.6	0.630
-102	-68.4	0.7	0.620	-62	-43.0	0.6	0.630
-101	-67.8	0.6	0.620	-61	-42.3	0.7	0.630
-100	-67.1	0.7	0.620	-60	-41.7	0.6	0.630
-99	-66.5	0.6	0.620	-59	-41.0	0.7	0.630
-98	-65.8	0.7	0.620	-58	-40.4	0.6	0.630
-97	-65.2	0.6	0.620	-57	-39.8	0.6	0.630
-96	-64.5	0.7	0.620	-56	-39.1	0.7	0.629
-95	-63.9	0.6	0.620	-55	-38.5	0.6	0.631
-94	-63.2	0.7	0.620	-54	-37.8	0.7	0.641
-93	-62.6	0.6	0.620	-53	-37.2	0.6	0.651
-92	-61.9	0.7	0.620	-52	-36.5	0.7	0.661
-91	-61.3	0.6	0.620	-51	-35.9	0.6	0.671
-90	-60.7	0.6	0.620	-50	-35.2	0.7	0.681
-89	-60.0	0.7	0.620	-49	-34.5	0.7	0.692
-88	-59.4	0.6	0.620	-48	-33.9	0.6	0.700
-87	-58.7	0.7	0.619	-47	-33.2	0.7	0.700
-86	-58.1	0.6	0.622	-46	-32.5	0.7	0.700
-85	-57.5	0.6	0.630	-45	-31.8	0.7	0.700
-84	-56.8	0.7	0.630	-44	-31.2	0.6	0.700
-83	-56.2	0.6	0.630	-43	-30.5	0.7	0.700
-82	-55.6	0.6	0.630	-42	-29.8	0.7	0.700
-81	-55.0	0.6	0.630	-41	-29.1	0.7	0.700
-80	-54.3	0.7	0.630	-40	-28.4	0.7	0.700
-79	-53.7	0.6	0.630	-39	-27.7	0.7	0.700
-78	-53.1	0.6	0.630	-38	-27.1	0.6	0.700
-77	-52.5	0.6	0.630	-37	-26.4	0.7	0.700
-76	-51.9	0.6	0.630	-36	-25.7	0.7	0.700
-75	-51.2	0.7	0.630	-35	-25.0	0.7	0.700
-74	-50.6	0.6	0.630	-34	-24.3	0.7	0.700
-73	-50.0	0.6	0.630	-33	-23.6	0.7	0.700

THERMOCOUPLE TABLE FOR CU VS N.AG , ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.00000. GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0.000 DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-32	-22.9	0.7	0.700	8	5.9	0.8	0.730
-31	-22.2	0.7	0.700	9	6.6	0.7	0.729
-30	-21.5	0.7	0.700	10	7.3	0.7	0.731
-29	-20.8	0.7	0.700	11	8.1	0.8	0.741
-28	-20.1	0.7	0.700	12	8.8	0.7	0.751
-27	-19.4	0.7	0.700	13	9.6	0.8	0.762
-26	-18.7	0.7	0.700	14	10.3	0.7	0.770
-25	-18.0	0.7	0.700	15	11.1	0.8	0.770
-24	-17.3	0.7	0.700	16	11.9	0.8	0.770
-23	-16.6	0.7	0.700	17	12.6	0.7	0.770
-22	-15.9	0.7	0.699	18	13.4	0.8	0.770
-21	-15.2	0.7	0.701	19	14.2	0.8	0.770
-20	-14.5	0.7	0.711	20	14.9	0.7	0.770
-19	-13.8	0.7	0.722	21	15.7	0.8	0.770
-18	-13.1	0.7	0.730	22	16.5	0.8	0.770
-17	-12.3	0.8	0.730	23	17.3	0.8	0.770
-16	-11.6	0.7	0.730	24	18.1	0.8	0.770
-15	-10.9	0.7	0.730	25	18.9	0.8	0.770
-14	-10.2	0.7	0.730	26	19.7	0.8	0.770
-13	-9.5	0.7	0.730				
-12	-8.8	0.7	0.730				
-11	-8.0	0.8	0.730				
-10	-7.3	0.7	0.730				
-9	-6.6	0.7	0.730				
-8	-5.8	0.8	0.730				
-7	-5.1	0.7	0.730				
-6	-4.4	0.7	0.730				
-5	-3.7	0.7	0.730				
-4	-2.9	0.8	0.730				
-3	-2.2	0.7	0.730				
-2	-1.5	0.7	0.730				
-1	-0.7	0.8	0.730				
0	0.0	0.6	0.730				
1	0.7	0.7	0.730				
2	1.5	0.8	0.730				
3	2.2	0.7	0.730				
4	2.9	0.7	0.730				
5	3.6	0.7	0.730				
6	4.4	0.8	0.730				
7	5.1	0.7	0.730				

THERMOCOUPLE TABLE FOR CHRML VS ALUMEL, ISA TYPE KP-KN , BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.000. GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
1	0.13	0.13	0.188	41	176.7	8.7	8.830
2	0.41	0.28	0.379	42	185.6	8.9	9.040
3	0.89	0.48	0.572	43	194.7	9.1	9.250
4	1.56	0.67	0.767	44	204.1	9.4	9.460
5	2.42	0.86	0.965	45	213.7	9.6	9.670
6	3.48	1.06	1.164	46	223.5	9.8	9.880
7	4.75	1.27	1.366	47	233.5	10.0	10.090
8	6.22	1.47	1.569	48	243.7	10.2	10.300
9	7.89	1.67	1.775	49	254.1	10.4	10.510
10	9.77	1.88	1.982	50	264.7	10.6	10.720
11	11.86	2.09	2.191	51	275.5	10.8	10.920
12	14.16	2.30	2.402	52	286.5	11.0	11.120
13	16.67	2.51	2.614	53	297.7	11.2	11.320
14	19.38	2.71	2.826	54	309.1	11.4	11.520
15	22.3	2.9	3.040	55	320.7	11.6	11.730
16	25.4	3.1	3.260	56	332.5	11.8	11.930
17	28.8	3.4	3.480	57	344.5	12.0	12.130
18	32.4	3.6	3.700	58	356.8	12.3	12.330
19	36.2	3.8	3.920	59	369.3	12.5	12.530
20	40.2	4.0	4.140	60	382.0	12.7	12.720
21	44.5	4.3	4.360	61	394.8	12.8	12.920
22	49.0	4.5	4.580	62	407.8	13.0	13.120
23	53.7	4.7	4.800	63	421.0	13.2	13.320
24	58.6	4.9	5.020	64	434.4	13.4	13.520
25	63.7	5.1	5.250	65	448.0	13.6	13.710
26	69.1	5.4	5.480	66	461.8	13.8	13.900
27	74.7	5.6	5.710	67	475.8	14.0	14.090
28	80.5	5.8	5.940	68	490.0	14.2	14.280
29	86.5	6.0	6.170	69	504.4	14.4	14.470
30	92.8	6.3	6.390	70	519.0	14.6	14.660
31	99.3	6.5	6.610	71	533.8	14.8	14.850
32	106.0	6.7	6.830	72	548.7	14.9	15.040
33	113.0	7.0	7.060	73	563.8	15.1	15.230
34	120.2	7.2	7.290	74	579.1	15.3	15.420
35	127.6	7.4	7.520	75	594.6	15.5	15.610
36	135.2	7.6	7.750	76	610.3	15.7	15.800
37	143.1	7.9	7.970	77	626.2	15.9	15.990
38	151.2	8.1	8.190	78	642.3	16.1	16.170
39	159.5	8.3	8.410	79	658.5	16.2	16.350
40	168.0	8.5	8.620	80	674.9	16.4	16.530

THERMOCOUPLE TABLE FOR CHRML VS ALUMEL, ISA TYPE KP-KN , BASED ON
NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
81	691.5	16.6	16.710	121	1498.1	23.4	23.450
82	708.3	16.8	16.890	122	1521.6	23.5	23.600
83	725.3	17.0	17.070	123	1545.3	23.7	23.750
84	742.5	17.2	17.250	124	1569.1	23.8	23.900
85	759.8	17.3	17.430	125	1593.1	24.0	24.050
86	777.3	17.5	17.610	126	1617.2	24.1	24.200
87	795.0	17.7	17.790	127	1641.5	24.3	24.350
88	812.9	17.9	17.960	128	1665.9	24.4	24.500
89	831.0	18.1	18.140	129	1690.5	24.6	24.650
90	849.2	18.2	18.320	130	1715.2	24.7	24.800
91	867.6	18.4	18.500	131	1740.1	24.9	24.950
92	886.2	18.6	18.680	132	1765.1	25.0	25.100
93	905.0	18.8	18.850	133	1790.3	25.2	25.250
94	923.9	18.9	19.020	134	1815.6	25.3	25.400
95	943.0	19.1	19.190	135	1841.1	25.5	25.550
96	962.3	19.3	19.360	136	1866.7	25.6	25.700
97	981.7	19.4	19.530	137	1892.4	25.7	25.840
98	1001.3	19.6	19.700	138	1918.3	25.9	25.980
99	1021.1	19.8	19.870	139	1944.4	26.1	26.120
100	1041.1	20.0	20.040	140	1970.6	26.2	26.260
101	1061.2	20.1	20.210	141	1996.9	26.3	26.400
102	1081.5	20.3	20.380	142	2023.4	26.5	26.540
103	1101.9	20.4	20.550	143	2050.0	26.6	26.680
104	1122.5	20.6	20.720	144	2076.7	26.7	26.820
105	1143.3	20.8	20.890	145	2103.6	26.9	26.960
106	1164.3	21.0	21.060	146	2130.6	27.0	27.100
107	1185.4	21.1	21.220	147	2157.8	27.2	27.240
108	1206.7	21.3	21.380	148	2185.1	27.3	27.380
109	1228.2	21.5	21.540	149	2212.6	27.5	27.520
110	1249.8	21.6	21.700	150	2240.2	27.6	27.650
111	1271.6	21.8	21.860	151	2267.9	27.7	27.780
112	1293.5	21.9	22.020	152	2295.7	27.8	27.920
113	1315.6	22.1	22.180	153	2323.7	28.0	28.060
114	1337.8	22.2	22.340	154	2351.8	28.1	28.200
115	1360.2	22.4	22.500	155	2380.1	28.3	28.330
116	1382.8	22.6	22.660	156	2408.5	28.4	28.460
117	1405.6	22.8	22.820	157	2437.0	28.5	28.590
118	1428.5	22.9	22.980	158	2465.7	28.7	28.720
119	1451.5	23.0	23.140	159	2494.5	28.8	28.850
120	1474.7	23.2	23.300	160	2523.4	28.9	28.980

THERMOCOUPLE TABLE FOR CHRML VS ALUMEL, ISA TYPE KP-KN , BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
161	2552.4	29.0	29.110	201	3812.9	33.7	33.740
162	2581.6	29.2	29.240	202	3846.7	33.8	33.840
163	2610.9	29.3	29.360	203	3880.5	33.8	33.950
164	2640.3	29.4	29.490	204	3914.5	34.0	34.050
165	2669.9	29.6	29.620	205	3948.6	34.1	34.150
166	2699.6	29.7	29.750	206	3982.8	34.2	34.250
167	2729.4	29.8	29.880	207	4017.1	34.3	34.350
168	2759.3	29.9	30.000	208	4051.5	34.4	34.440
169	2789.3	30.0	30.120	209	4086.0	34.5	34.540
170	2819.5	30.2	30.240	210	4120.6	34.6	34.640
171	2849.8	30.3	30.360	211	4155.3	34.7	34.740
172	2880.2	30.4	30.480	212	4190.1	34.8	34.840
173	2910.8	30.6	30.610	213	4225.0	34.9	34.940
174	2941.5	30.7	30.730	214	4259.9	34.9	35.030
175	2972.3	30.8	30.850	215	4295.0	35.1	35.120
176	3003.2	30.9	30.970	216	4330.2	35.2	35.210
177	3034.2	31.0	31.090	217	4365.5	35.3	35.300
178	3065.3	31.1	31.210	218	4400.9	35.4	35.390
179	3096.6	31.3	31.330	219	4436.3	35.4	35.480
180	3128.0	31.4	31.440	220	4471.8	35.5	35.570
181	3159.5	31.5	31.550	221	4507.4	35.6	35.660
182	3191.1	31.6	31.660	222	4543.1	35.7	35.750
183	3222.8	31.7	31.780	223	4578.9	35.8	35.840
184	3254.6	31.8	31.900	224	4614.8	35.9	35.930
185	3286.6	32.0	32.020	225	4650.8	36.0	36.020
186	3318.7	32.1	32.130	226	4686.9	36.1	36.110
187	3350.9	32.2	32.240	227	4723.0	36.1	36.200
188	3383.2	32.3	32.350	228	4759.2	36.2	36.290
189	3415.6	32.4	32.460	229	4795.5	36.3	36.370
190	3448.1	32.5	32.570	230	4831.9	36.4	36.450
191	3480.7	32.6	32.680	231	4868.4	36.5	36.530
192	3513.4	32.7	32.790	232	4905.0	36.6	36.610
193	3546.2	32.8	32.900	233	4941.7	36.7	36.690
194	3579.1	32.9	33.010	234	4978.4	36.7	36.770
195	3612.2	33.1	33.120	235	5015.2	36.8	36.850
196	3645.4	33.2	33.230	236	5052.1	36.9	36.930
197	3678.7	33.3	33.340	237	5089.1	37.0	37.010
198	3712.1	33.4	33.440	238	5126.1	37.0	37.090
199	3745.6	33.5	33.540	239	5163.2	37.1	37.170
200	3779.2	33.6	33.640	240	5200.4	37.2	37.250

THERMOCOUPLE TABLE FOR CHRML VS ALUMEL, ISA TYPE KP-KN , BASED ON
NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
241	5237.7	37.3	37.330				
242	5275.1	37.4	37.410				
243	5312.5	37.4	37.490				
244	5350.0	37.5	37.560				
245	5387.6	37.6	37.630				
246	5425.3	37.7	37.700				
247	5463.0	37.7	37.770				
248	5500.8	37.8	37.840				
249	5538.7	37.9	37.910				
250	5576.7	38.0	37.980				
251	5614.7	38.0	38.050				
252	5652.8	38.1	38.120				
253	5691.0	38.2	38.190				
254	5729.2	38.2	38.260				
255	5767.5	38.3	38.330				
256	5805.9	38.4	38.400				
257	5844.3	38.4	38.470				
258	5882.8	38.5	38.540				
259	5921.3	38.5	38.600				
260	5959.9	38.6	38.660				
261	5998.6	38.7	38.720				
262	6037.4	38.8	38.780				
263	6076.2	38.8	38.840				
264	6115.1	38.9	38.900				
265	6154.0	38.9	38.960				
266	6193.0	39.0	39.020				
267	6232.1	39.1	39.080				
268	6271.2	39.1	39.140				
269	6310.4	39.2	39.200				
270	6349.6	39.2	39.260				
271	6388.9	39.3	39.320				
272	6428.2	39.3	39.380				
273	6467.6	39.4	39.440				
274	6507.1	39.5	39.490				
275	6546.6	39.5	39.540				
276	6586.1	39.5	39.590				
277	6625.7	39.6	39.640				
278	6665.4	39.7	39.690				
279	6705.1	39.7	39.740				
280	6744.9	39.8	39.790				

THERMOCOUPLE TABLE FOR CHRML VS ALUMEL, ISA TYPE KP-KN , BASED ON
NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-272	-6473.37	0.16	C.217	-232	-6295.5	8.7	8.862
-271	-6473.06	0.31	0.408	-231	-6286.6	8.9	9.072
-270	-6472.55	0.51	0.601	-230	-6277.4	9.2	9.282
-269	-6471.85	0.70	0.797	-229	-6268.0	9.4	9.492
-268	-6470.96	0.89	0.995	-228	-6258.4	9.6	9.702
-267	-6469.87	1.09	1.194	-227	-6248.5	9.9	9.912
-266	-6468.57	1.30	1.396	-226	-6238.5	10.0	10.122
-265	-6467.07	1.50	1.600	-225	-6228.3	10.2	10.332
-264	-6465.37	1.70	1.806	-224	-6217.8	10.5	10.542
-263	-6463.45	1.92	2.013	-223	-6207.2	10.6	10.750
-262	-6461.33	2.12	2.223	-222	-6196.4	10.8	10.950
-261	-6459.00	2.33	2.434	-221	-6185.4	11.0	11.150
-260	-6456.46	2.54	2.646	-220	-6174.1	11.3	11.349
-259	-6453.72	2.74	2.858	-219	-6162.7	11.4	11.552
-258	-6450.8	2.9	3.073	-218	-6151.1	11.6	11.760
-257	-6447.6	3.2	3.293	-217	-6139.2	11.9	11.960
-256	-6444.2	3.4	3.513	-216	-6127.2	12.0	12.160
-255	-6440.6	3.6	3.733	-215	-6114.9	12.3	12.361
-254	-6436.7	3.9	3.953	-214	-6102.3	12.6	12.558
-253	-6432.7	4.0	4.173	-213	-6089.6	12.7	12.750
-252	-6428.4	4.3	4.393	-212	-6076.8	12.8	12.950
-251	-6423.8	4.6	4.613	-211	-6063.8	13.0	13.150
-250	-6419.1	4.7	4.832	-210	-6050.5	13.3	13.351
-249	-6414.2	4.9	5.055	-209	-6037.1	13.4	13.549
-248	-6409.0	5.2	5.285	-208	-6023.5	13.6	13.739
-247	-6403.6	5.4	5.515	-207	-6009.6	13.9	13.929
-246	-6398.0	5.6	5.745	-206	-5995.6	14.0	14.119
-245	-6392.1	5.9	5.975	-205	-5981.4	14.2	14.309
-244	-6386.1	6.0	6.203	-204	-5966.9	14.5	14.499
-243	-6379.8	6.3	6.423	-203	-5952.3	14.6	14.689
-242	-6373.2	6.6	6.642	-202	-5937.5	14.8	14.879
-241	-6366.5	6.7	6.865	-201	-5922.6	14.9	15.069
-240	-6359.5	7.0	7.095	-200	-5907.4	15.2	15.259
-239	-6352.2	7.3	7.325	-199	-5892.1	15.3	15.449
-238	-6344.8	7.4	7.555	-198	-5876.6	15.5	15.639
-237	-6337.2	7.6	7.783	-197	-5860.9	15.7	15.829
-236	-6329.2	8.0	8.003	-196	-5844.9	16.0	16.017
-235	-6321.1	8.1	8.224	-195	-5828.8	16.1	16.197
-234	-6312.8	8.3	8.442	-194	-5812.6	16.2	16.377
-233	-6304.2	8.6	8.652	-193	-5796.1	16.5	16.557

THERMOCOUPLE TABLE FOR CHRML VS ALUMEL, ISA TYPE KP-KN , BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-192	-5779.5	16.6	16.737	-152	-4971.9	23.4	23.473
-191	-5762.7	16.8	16.917	-151	-4948.4	23.5	23.623
-190	-5745.7	17.0	17.097	-150	-4924.7	23.7	23.773
-189	-5728.4	17.3	17.277	-149	-4900.8	23.9	23.923
-188	-5711.1	17.3	17.457	-148	-4876.8	24.0	24.073
-187	-5693.6	17.5	17.638	-147	-4852.7	24.1	24.223
-186	-5675.9	17.7	17.815	-146	-4828.4	24.3	24.373
-185	-5657.9	18.0	17.987	-145	-4803.9	24.5	24.523
-184	-5639.8	18.1	18.167	-144	-4779.3	24.6	24.673
-183	-5621.6	18.2	18.347	-143	-4754.6	24.7	24.823
-182	-5603.1	18.5	18.528	-142	-4729.7	24.9	24.973
-181	-5584.5	18.6	18.706	-141	-4704.7	25.0	25.123
-180	-5565.7	18.8	18.876	-140	-4679.4	25.3	25.273
-179	-5546.8	18.9	19.046	-139	-4654.1	25.3	25.423
-178	-5527.6	19.2	19.216	-138	-4628.6	25.5	25.573
-177	-5508.3	19.3	19.386	-137	-4603.0	25.6	25.721
-176	-5488.9	19.4	19.556	-136	-4577.3	25.7	25.861
-175	-5469.3	19.6	19.726	-135	-4551.3	26.0	26.001
-174	-5449.4	19.9	19.896	-134	-4525.2	26.1	26.141
-173	-5429.4	20.0	20.066	-133	-4499.0	26.2	26.281
-172	-5409.3	20.1	20.236	-132	-4472.7	26.3	26.421
-171	-5389.0	20.3	20.405	-131	-4446.1	26.6	26.561
-170	-5368.5	20.5	20.576	-130	-4419.5	26.6	26.701
-169	-5347.9	20.6	20.746	-129	-4392.8	26.7	26.841
-168	-5327.1	20.8	20.916	-128	-4365.9	26.9	26.981
-167	-5306.1	21.0	21.084	-127	-4338.9	27.0	27.121
-166	-5284.9	21.2	21.244	-126	-4311.6	27.3	27.261
-165	-5263.6	21.3	21.404	-125	-4284.3	27.3	27.402
-164	-5242.1	21.5	21.564	-124	-4256.8	27.5	27.540
-163	-5220.5	21.6	21.724	-123	-4229.2	27.6	27.669
-162	-5198.7	21.8	21.884	-122	-4201.5	27.7	27.801
-161	-5176.7	22.0	22.044	-121	-4173.6	27.9	27.941
-160	-5154.6	22.1	22.204	-120	-4145.6	28.0	28.082
-159	-5132.4	22.2	22.364	-119	-4117.5	28.1	28.220
-158	-5109.9	22.5	22.524	-118	-4089.2	28.3	28.350
-157	-5087.3	22.6	22.684	-117	-4060.8	28.4	28.480
-156	-5064.5	22.8	22.844	-116	-4032.2	28.6	28.610
-155	-5041.6	22.9	23.004	-115	-4003.5	28.7	28.740
-154	-5018.6	23.0	23.165	-114	-3974.7	28.8	28.870
-153	-4995.3	23.3	23.323	-113	-3945.8	28.9	29.000

THERMOCOUPLE TABLE FOR CHRML VS ALUMEL, ISA TYPE KP-KN , BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-112	-3916.8	29.0	29.130	-72	-2655.6	33.7	33.754
-111	-3887.5	29.3	29.257	-71	-2621.8	33.8	33.857
-110	-3858.2	29.3	29.380	-70	-2587.9	33.9	33.965
-109	-3828.8	29.4	29.510	-69	-2553.9	34.0	34.065
-108	-3799.2	29.6	29.640	-68	-2519.8	34.1	34.165
-107	-3769.5	29.7	29.770	-67	-2485.6	34.2	34.266
-106	-3739.6	29.9	29.898	-66	-2451.3	34.3	34.363
-105	-3709.7	29.9	30.018	-65	-2416.9	34.4	34.455
-104	-3679.7	30.0	30.138	-64	-2382.3	34.6	34.555
-103	-3649.5	30.2	30.258	-63	-2347.7	34.6	34.655
-102	-3619.2	30.3	30.377	-62	-2313.0	34.7	34.755
-101	-3588.7	30.5	30.500	-61	-2278.2	34.8	34.856
-100	-3558.1	30.6	30.628	-60	-2243.3	34.9	34.954
-99	-3527.4	30.7	30.748	-59	-2208.4	34.9	35.044
-98	-3496.6	30.8	30.868	-58	-2173.3	35.1	35.134
-97	-3465.7	30.9	30.988	-57	-2138.0	35.3	35.224
-96	-3434.7	31.0	31.108	-56	-2102.7	35.3	35.314
-95	-3403.5	31.2	31.229	-55	-2067.3	35.4	35.404
-94	-3372.2	31.3	31.347	-54	-2031.9	35.4	35.494
-93	-3340.8	31.4	31.457	-53	-1996.4	35.5	35.584
-92	-3309.3	31.5	31.566	-52	-1960.8	35.6	35.674
-91	-3277.7	31.6	31.678	-51	-1925.1	35.7	35.764
-90	-3246.0	31.7	31.798	-50	-1889.2	35.9	35.854
-89	-3214.1	31.9	31.919	-49	-1853.3	35.9	35.944
-88	-3182.1	32.0	32.037	-48	-1817.3	36.0	36.034
-87	-3150.0	32.1	32.147	-47	-1781.2	36.1	36.124
-86	-3117.8	32.2	32.257	-46	-1745.1	36.1	36.214
-85	-3085.5	32.3	32.367	-45	-1708.9	36.2	36.302
-84	-3053.1	32.4	32.477	-44	-1672.6	36.3	36.382
-83	-3020.5	32.6	32.587	-43	-1636.2	36.4	36.462
-82	-2987.9	32.6	32.697	-42	-1599.6	36.6	36.542
-81	-2955.2	32.7	32.807	-41	-1563.0	36.6	36.622
-80	-2922.4	32.8	32.917	-40	-1526.3	36.7	36.702
-79	-2889.5	32.9	33.027	-39	-1489.6	36.7	36.782
-78	-2856.4	33.1	33.137	-38	-1452.8	36.8	36.862
-77	-2823.1	33.3	33.247	-37	-1415.9	36.9	36.942
-76	-2789.8	33.3	33.355	-36	-1378.9	37.0	37.022
-75	-2756.4	33.4	33.455	-35	-1341.9	37.0	37.102
-74	-2722.9	33.5	33.555	-34	-1304.8	37.1	37.182
-73	-2689.3	33.6	33.655	-33	-1267.5	37.3	37.262

THERMOCOUPLE TABLE FOR CHRML VS ALUMEL, ISA TYPE KP-KN , BASED ON
NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-32	-1230.2	37.3	37.342				
-31	-1192.8	37.4	37.423				
-30	-1155.4	37.4	37.501				
-29	-1117.9	37.5	37.571				
-28	-1080.3	37.6	37.641				
-27	-1042.6	37.7	37.711				
-26	-1004.9	37.7	37.781				
-25	-967.0	37.9	37.851				
-24	-929.1	37.9	37.921				
-23	-891.1	38.0	37.991				
-22	-853.1	38.0	38.061				
-21	-815.0	38.1	38.131				
-20	-776.8	38.2	38.201				
-19	-738.6	38.2	38.271				
-18	-700.3	38.3	38.341				
-17	-661.9	38.4	38.411				
-16	-623.4	38.5	38.481				
-15	-585.0	38.4	38.549				
-14	-546.4	38.6	38.609				
-13	-507.8	38.6	38.669				
-12	-469.1	38.7	38.729				
-11	-430.3	38.8	38.789				
-10	-391.5	38.8	38.849				
-9	-352.6	38.9	38.909				
-8	-313.7	38.9	38.969				
-7	-274.7	39.0	39.029				
-6	-235.6	39.1	39.089				
-5	-196.4	39.2	39.149				
-4	-157.3	39.1	39.209				
-3	-118.0	39.3	39.269				
-2	-78.7	39.3	39.329				
-1	-39.4	39.3	39.390				
-0	0.0	39.3	39.448				
1	39.5	39.5	39.498				
2	79.0	39.5	39.548				
3	118.5	39.5	39.598				
4	158.1	39.6	39.648				
5	197.8	39.7	39.698				
6	237.5	39.7	39.748				

THERMOCOUPLE TABLE FOR CHRML VS CON , ISA TYPE EP-EN , BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
1	0.3	0.3	0.490	41	351.1	15.7	15.830
2	1.0	0.7	0.980	42	367.1	16.0	16.140
3	2.2	1.2	1.460	43	383.4	16.3	16.450
4	3.9	1.7	1.930	44	400.0	16.6	16.750
5	6.1	2.2	2.400	45	416.9	16.9	17.050
6	8.7	2.6	2.860	46	434.1	17.2	17.360
7	11.8	3.1	3.310	47	451.6	17.5	17.670
8	15.4	3.6	3.760	48	469.4	17.8	17.980
9	19.4	4.0	4.200	49	487.5	18.1	18.280
10	23.8	4.4	4.630	50	505.9	18.4	18.580
11	28.7	4.9	5.050	51	524.6	18.7	18.880
12	34.0	5.3	5.470	52	543.6	19.0	19.180
13	39.7	5.7	5.880	53	562.9	19.3	19.480
14	45.8	6.1	6.280	54	582.5	19.6	19.780
15	52.3	6.5	6.680	55	602.4	19.9	20.070
16	59.2	6.9	7.080	56	622.6	20.2	20.360
17	66.5	7.3	7.470	57	643.1	20.5	20.650
18	74.2	7.7	7.860	58	663.9	20.8	20.940
19	82.3	8.1	8.250	59	685.0	21.1	21.230
20	90.8	8.5	8.640	60	706.3	21.3	21.510
21	99.7	8.9	9.020	61	727.9	21.6	21.790
22	109.0	9.3	9.400	62	749.8	21.9	22.070
23	118.7	9.7	9.780	63	772.0	22.2	22.340
24	128.7	10.0	10.150	64	794.5	22.5	22.610
25	139.1	10.4	10.510	65	817.3	22.8	22.880
26	149.8	10.7	10.860	66	840.4	23.1	23.140
27	160.9	11.1	11.210	67	863.7	23.3	23.400
28	172.3	11.4	11.550	68	887.3	23.6	23.650
29	184.1	11.8	11.890	69	911.1	23.8	23.900
30	196.2	12.1	12.230	70	935.2	24.1	24.150
31	208.6	12.4	12.570	71	959.5	24.3	24.400
32	221.4	12.8	12.910	72	984.0	24.5	24.650
33	234.5	13.1	13.240	73	1008.7	24.7	24.890
34	247.9	13.4	13.570	74	1033.7	25.0	25.130
35	261.7	13.8	13.900	75	1058.9	25.2	25.370
36	275.8	14.1	14.230	76	1084.4	25.5	25.610
37	290.2	14.4	14.560	77	1110.1	25.7	25.850
38	304.9	14.7	14.880	78	1136.1	26.0	26.090
39	320.0	15.1	15.200	79	1162.3	26.2	26.330
40	335.4	15.4	15.520	80	1188.7	26.4	26.570

THERMOCOUPLE TABLE FOR CHRML VS CON , ISA TYPE EP-EN , BASED ON
NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
81	1215.4	26.7	26.810	121	2468.7	35.4	35.530
82	1242.3	26.9	27.050	122	2504.3	35.6	35.730
83	1269.5	27.2	27.290	123	2540.1	35.8	35.920
84	1296.9	27.4	27.540	124	2576.1	36.0	36.110
85	1324.5	27.6	27.780	125	2612.3	36.2	36.300
86	1352.4	27.9	28.020	126	2648.7	36.4	36.490
87	1380.5	28.1	28.260	127	2685.3	36.6	36.680
88	1408.9	28.4	28.500	128	2722.1	36.8	36.880
89	1437.5	28.6	28.740	129	2759.1	37.0	37.070
90	1466.4	28.9	28.980	130	2796.3	37.2	37.260
91	1495.5	29.1	29.210	131	2833.7	37.4	37.450
92	1524.8	29.3	29.440	132	2871.3	37.6	37.640
93	1554.4	29.6	29.670	133	2909.1	37.8	37.830
94	1584.2	29.8	29.900	134	2947.0	37.9	38.020
95	1614.2	30.0	30.120	135	2985.1	38.1	38.210
96	1644.4	30.2	30.340	136	3023.4	38.3	38.400
97	1674.8	30.4	30.560	137	3061.9	38.5	38.580
98	1705.4	30.6	30.780	138	3100.6	38.7	38.770
99	1736.3	30.9	31.000	139	3139.5	38.9	38.960
100	1767.4	31.1	31.220	140	3178.6	39.1	39.150
101	1798.7	31.3	31.430	141	3217.9	39.3	39.340
102	1830.3	31.6	31.640	142	3257.3	39.4	39.530
103	1862.1	31.8	31.850	143	3296.9	39.6	39.710
104	1894.1	32.0	32.060	144	3336.7	39.8	39.890
105	1926.3	32.2	32.270	145	3376.7	40.0	40.070
106	1958.7	32.4	32.480	146	3416.9	40.2	40.250
107	1991.3	32.6	32.690	147	3457.2	40.3	40.430
108	2024.1	32.8	32.900	148	3497.7	40.5	40.610
109	2057.1	33.0	33.110	149	3538.4	40.7	40.780
110	2090.3	33.2	33.320	150	3579.3	40.9	40.960
111	2123.7	33.4	33.530	151	3620.4	41.1	41.140
112	2157.3	33.6	33.730	152	3661.6	41.2	41.320
113	2191.1	33.8	33.930	153	3703.0	41.4	41.490
114	2225.1	34.0	34.130	154	3744.6	41.6	41.660
115	2259.3	34.2	34.330	155	3786.4	41.8	41.830
116	2293.7	34.4	34.530	156	3828.3	41.9	42.000
117	2328.3	34.6	34.730	157	3870.4	42.1	42.170
118	2363.1	34.8	34.930	158	3912.7	42.3	42.340
119	2398.1	35.0	35.130	159	3955.1	42.4	42.510
120	2433.3	35.2	35.330	160	3997.7	42.6	42.680

THERMOCOUPLE TABLE FOR CHRML VS CON , ISA TYPE EP-EN , BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
161	4040.5	42.8	42.850	201	5882.1	49.0	49.120
162	4083.4	42.9	43.010	202	5931.3	49.2	49.270
163	4126.5	43.1	43.170	203	5980.6	49.3	49.420
164	4169.8	43.3	43.330	204	6030.1	49.5	49.570
165	4213.2	43.4	43.500	205	6079.7	49.6	49.710
166	4256.8	43.6	43.660	206	6129.5	49.8	49.850
167	4300.5	43.7	43.820	207	6179.4	49.9	49.990
168	4344.4	43.9	43.980	208	6229.5	50.1	50.130
169	4388.5	44.1	44.140	209	6279.7	50.2	50.280
170	4432.7	44.2	44.300	210	6330.0	50.3	50.420
171	4477.1	44.4	44.460	211	6380.5	50.5	50.560
172	4521.6	44.5	44.620	212	6431.1	50.6	50.700
173	4566.3	44.7	44.780	213	6481.9	50.8	50.840
174	4611.2	44.9	44.940	214	6532.8	50.9	50.980
175	4656.2	45.0	45.100	215	6583.9	51.1	51.120
176	4701.4	45.2	45.260	216	6635.1	51.2	51.260
177	4746.7	45.3	45.420	217	6686.4	51.3	51.400
178	4792.2	45.5	45.580	218	6737.9	51.5	51.540
179	4837.9	45.7	45.740	219	6789.5	51.6	51.670
180	4883.7	45.8	45.900	220	6841.2	51.7	51.800
181	4929.7	46.0	46.060	221	6893.1	51.9	51.940
182	4975.8	46.1	46.210	222	6945.1	52.0	52.080
183	5022.1	46.3	46.370	223	6997.2	52.1	52.220
184	5068.6	46.5	46.530	224	7049.5	52.3	52.350
185	5115.2	46.6	46.690	225	7101.9	52.4	52.480
186	5162.0	46.8	46.840	226	7154.5	52.6	52.610
187	5208.9	46.9	47.000	227	7207.2	52.7	52.740
188	5256.0	47.1	47.160	228	7260.0	52.8	52.870
189	5303.2	47.2	47.320	229	7313.0	53.0	53.000
190	5350.6	47.4	47.470	230	7366.1	53.1	53.130
191	5398.2	47.6	47.620	231	7419.3	53.2	53.260
192	5445.9	47.7	47.770	232	7472.6	53.3	53.390
193	5493.8	47.9	47.930	233	7526.1	53.5	53.520
194	5541.8	48.0	48.080	234	7579.7	53.6	53.650
195	5590.0	48.2	48.230	235	7633.4	53.7	53.780
196	5638.3	48.3	48.380	236	7687.2	53.8	53.910
197	5686.8	48.5	48.530	237	7741.2	54.0	54.040
198	5735.4	48.6	48.680	238	7795.3	54.1	54.170
199	5784.2	48.8	48.830	239	7849.5	54.2	54.300
200	5833.1	48.9	48.970	240	7903.8	54.3	54.420

THERMOCOUPLE TABLE FOR CHRML VS CON , ISA TYPE EP-EN , BASED ON
NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
241	7958.3	54.5	54.540				
242	8012.9	54.6	54.660				
243	8067.6	54.7	54.780				
244	8122.4	54.8	54.900				
245	8177.3	54.9	55.020				
246	8232.4	55.1	55.140				
247	8287.6	55.2	55.260				
248	8342.9	55.3	55.380				
249	8398.3	55.4	55.500				
250	8453.9	55.6	55.620				
251	8509.6	55.7	55.740				
252	8565.4	55.8	55.860				
253	8621.3	55.9	55.980				
254	8677.3	56.0	56.090				
255	8733.5	56.2	56.200				
256	8789.8	56.3	56.310				
257	8846.2	56.4	56.420				
258	8902.7	56.5	56.540				
259	8959.3	56.6	56.650				
260	9016.0	56.7	56.760				
261	9072.8	56.8	56.870				
262	9129.7	56.9	56.980				
263	9186.7	57.0	57.090				
264	9243.8	57.1	57.200				
265	9301.0	57.2	57.310				
266	9358.3	57.3	57.410				
267	9415.8	57.5	57.510				
268	9473.4	57.6	57.610				
269	9531.1	57.7	57.710				
270	9588.9	57.8	57.810				
271	9646.8	57.9	57.910				
272	9704.8	58.0	58.010				
273	9762.9	58.1	58.110				
274	9821.1	58.2	58.210				
275	9879.4	58.3	58.310				
276	9937.7	58.3	58.410				
277	9996.1	58.4	58.510				
278	10054.6	58.5	58.600				
279	10113.2	58.6	58.690				
280	10171.9	58.7	58.780				

THERMOCOUPLE TABLE FOR CHRML VS CON , ISA TYPE EP-EN , BASED ON
NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-272	-9771.3	0.4	0.564	-232	-9418.1	15.8	15.876
-271	-9770.5	0.8	1.053	-231	-9402.1	16.0	16.187
-270	-9769.2	1.3	1.530	-230	-9385.8	16.3	16.495
-269	-9767.4	1.8	2.001	-229	-9369.1	16.7	16.794
-268	-9765.2	2.2	2.470	-228	-9352.2	16.9	17.096
-267	-9762.5	2.7	2.927	-227	-9334.9	17.3	17.406
-266	-9759.3	3.2	3.378	-226	-9317.4	17.5	17.717
-265	-9755.6	3.7	3.827	-225	-9299.5	17.9	18.025
-264	-9751.6	4.0	4.265	-224	-9281.4	18.1	18.325
-263	-9747.1	4.5	4.693	-223	-9262.9	18.5	18.625
-262	-9742.2	4.9	5.114	-222	-9244.2	18.7	18.925
-261	-9736.8	5.4	5.532	-221	-9225.1	19.1	19.225
-260	-9731.0	5.8	5.940	-220	-9205.8	19.3	19.526
-259	-9724.9	6.1	6.340	-219	-9186.2	19.6	19.823
-258	-9718.3	6.6	6.741	-218	-9166.2	20.0	20.113
-257	-9711.4	6.9	7.138	-217	-9146.0	20.2	20.403
-256	-9704.0	7.4	7.528	-216	-9125.4	20.6	20.693
-255	-9696.2	7.8	7.918	-215	-9104.6	20.8	20.984
-254	-9688.1	8.1	8.309	-214	-9083.4	21.2	21.272
-253	-9679.5	8.6	8.697	-213	-9062.1	21.3	21.552
-252	-9670.6	8.9	9.077	-212	-9040.5	21.6	21.833
-251	-9661.2	9.4	9.458	-211	-9018.5	22.0	22.110
-250	-9651.4	9.8	9.836	-210	-8996.3	22.2	22.380
-249	-9641.4	10.0	10.205	-209	-8973.7	22.6	22.651
-248	-9630.9	10.5	10.562	-208	-8950.9	22.8	22.919
-247	-9620.2	10.7	10.913	-207	-8927.7	23.2	23.180
-246	-9609.0	11.2	11.261	-206	-8904.4	23.3	23.437
-245	-9597.6	11.4	11.601	-205	-8880.8	23.6	23.687
-244	-9585.7	11.9	11.941	-204	-8856.9	23.9	23.937
-243	-9573.6	12.1	12.281	-203	-8832.8	24.1	24.187
-242	-9561.1	12.5	12.622	-202	-8808.5	24.3	24.438
-241	-9548.3	12.8	12.959	-201	-8783.9	24.6	24.686
-240	-9535.1	13.2	13.289	-200	-8759.2	24.7	24.926
-239	-9521.7	13.4	13.619	-199	-8734.2	25.0	25.166
-238	-9507.8	13.9	13.949	-198	-8708.9	25.3	25.406
-237	-9493.7	14.1	14.280	-197	-8683.4	25.5	25.646
-236	-9479.2	14.5	14.608	-196	-8657.6	25.8	25.886
-235	-9464.5	14.7	14.928	-195	-8631.6	26.0	26.126
-234	-9449.3	15.2	15.249	-194	-8605.4	26.2	26.366
-233	-9433.9	15.4	15.566	-193	-8578.9	26.5	26.606

THERMOCOUPLE TABLE FOR CHRML VS CON , ISA TYPE EP-EN , BASED ON
NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-192	-8552.2	26.7	26.846	-152	-7297.6	35.4	35.561
-191	-8525.3	26.9	27.085	-151	-7262.0	35.6	35.758
-190	-8498.0	27.3	27.328	-150	-7226.1	35.9	35.948
-189	-8470.6	27.4	27.576	-149	-7190.1	36.0	36.138
-188	-8443.0	27.6	27.816	-148	-7153.9	36.2	36.328
-187	-8415.0	28.0	28.056	-147	-7117.4	36.5	36.518
-186	-8386.9	28.1	28.296	-146	-7080.8	36.6	36.711
-185	-8358.5	28.4	28.536	-145	-7044.0	36.8	36.908
-184	-8329.8	28.7	28.777	-144	-7007.0	37.0	37.098
-183	-8300.9	28.9	29.014	-143	-6969.7	37.3	37.288
-182	-8271.7	29.2	29.244	-142	-6932.3	37.4	37.478
-181	-8242.4	29.3	29.474	-141	-6894.7	37.6	37.668
-180	-8212.8	29.6	29.705	-140	-6856.9	37.8	37.858
-179	-8182.9	29.9	29.933	-139	-6818.9	38.0	38.048
-178	-8152.9	30.0	30.153	-138	-6780.8	38.1	38.239
-177	-8122.7	30.2	30.373	-137	-6742.5	38.3	38.426
-176	-8092.3	30.4	30.593	-136	-6703.9	38.6	38.608
-175	-8061.6	30.7	30.813	-135	-6665.2	38.7	38.798
-174	-8030.7	30.9	31.034	-134	-6626.3	38.9	38.988
-173	-7999.5	31.2	31.251	-133	-6587.1	39.2	39.178
-172	-7968.2	31.3	31.461	-132	-6547.8	39.3	39.369
-171	-7936.6	31.6	31.671	-131	-6508.4	39.4	39.557
-170	-7904.7	31.9	31.881	-130	-6468.8	39.6	39.737
-169	-7872.7	32.0	32.091	-129	-6428.9	39.9	39.917
-168	-7840.5	32.2	32.301	-128	-6388.9	40.0	40.097
-167	-7808.0	32.5	32.511	-127	-6348.7	40.2	40.277
-166	-7775.4	32.6	32.721	-126	-6308.4	40.3	40.458
-165	-7742.6	32.8	32.931	-125	-6267.8	40.6	40.635
-164	-7709.6	33.0	33.141	-124	-6227.1	40.7	40.807
-163	-7676.3	33.3	33.352	-123	-6186.2	40.9	40.987
-162	-7642.9	33.4	33.560	-122	-6145.1	41.1	41.168
-161	-7609.3	33.6	33.760	-121	-6103.8	41.3	41.345
-160	-7575.4	33.9	33.960	-120	-6062.4	41.4	41.515
-159	-7541.4	34.0	34.160	-119	-6020.8	41.6	41.685
-158	-7507.2	34.2	34.360	-118	-5979.0	41.8	41.855
-157	-7472.7	34.5	34.560	-117	-5937.0	42.0	42.025
-156	-7438.1	34.6	34.760	-116	-5894.9	42.1	42.195
-155	-7403.3	34.8	34.960	-115	-5852.6	42.3	42.365
-154	-7368.3	35.0	35.160	-114	-5810.1	42.5	42.535
-153	-7333.0	35.3	35.360	-113	-5767.5	42.6	42.706

THERMOCOUPLE TABLE FOR CHRML VS CON , ISA TYPE EP-EN , BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-112	-5724.7	42.8	42.874	-72	-3882.1	49.1	49.142
-111	-5681.8	42.9	43.034	-71	-3832.9	49.2	49.292
-110	-5638.6	43.2	43.193	-70	-3783.6	49.3	49.443
-109	-5595.3	43.3	43.356	-69	-3734.1	49.5	49.591
-108	-5551.9	43.4	43.524	-68	-3684.5	49.6	49.731
-107	-5508.3	43.6	43.684	-67	-3634.7	49.8	49.871
-106	-5464.6	43.7	43.844	-66	-3584.7	50.0	50.010
-105	-5420.6	44.0	44.004	-65	-3534.6	50.1	50.153
-104	-5376.5	44.1	44.164	-64	-3484.4	50.2	50.301
-103	-5332.3	44.2	44.324	-63	-3434.1	50.3	50.441
-102	-5287.9	44.4	44.484	-62	-3383.5	50.6	50.581
-101	-5243.3	44.6	44.644	-61	-3332.9	50.6	50.721
-100	-5198.6	44.7	44.804	-60	-3282.1	50.8	50.861
-99	-5153.7	44.9	44.964	-59	-3231.2	50.9	51.001
-98	-5108.6	45.1	45.124	-58	-3180.0	51.2	51.141
-97	-5063.4	45.2	45.284	-57	-3128.8	51.2	51.281
-96	-5018.1	45.3	45.444	-56	-3077.5	51.3	51.422
-95	-4972.6	45.5	45.604	-55	-3026.0	51.5	51.559
-94	-4926.9	45.7	45.764	-54	-2974.4	51.6	51.689
-93	-4881.0	45.9	45.925	-53	-2922.6	51.8	51.821
-92	-4835.0	46.0	46.082	-52	-2870.7	51.9	51.961
-91	-4788.9	46.1	46.234	-51	-2818.7	52.0	52.102
-90	-4742.6	46.3	46.394	-50	-2766.6	52.1	52.239
-89	-4696.0	46.6	46.555	-49	-2714.3	52.3	52.369
-88	-4649.4	46.6	46.712	-48	-2661.8	52.5	52.499
-87	-4602.6	46.8	46.864	-47	-2609.2	52.6	52.629
-86	-4555.7	46.9	47.024	-46	-2556.5	52.7	52.759
-85	-4508.6	47.1	47.185	-45	-2503.7	52.8	52.889
-84	-4461.3	47.3	47.342	-44	-2450.7	53.0	53.019
-83	-4413.9	47.4	47.492	-43	-2397.5	53.2	53.149
-82	-4366.3	47.6	47.642	-42	-2344.3	53.2	53.279
-81	-4318.5	47.8	47.795	-41	-2291.0	53.3	53.409
-80	-4270.6	47.9	47.952	-40	-2237.5	53.5	53.539
-79	-4222.6	48.0	48.102	-39	-2183.9	53.6	53.669
-78	-4174.4	48.2	48.252	-38	-2130.2	53.7	53.799
-77	-4126.1	48.3	48.402	-37	-2076.3	53.9	53.929
-76	-4077.5	48.6	48.552	-36	-2022.3	54.0	54.059
-75	-4028.9	48.6	48.703	-35	-1968.2	54.1	54.190
-74	-3980.1	48.8	48.850	-34	-1914.0	54.2	54.318
-73	-3931.2	48.9	48.992	-33	-1859.7	54.3	54.438

THERMOCOUPLE TABLE FOR CHRML VS CON , ISA TYPE EP-EN , BASED ON
NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-32	-1805.1	54.6	54.558				
-31	-1750.5	54.6	54.678				
-30	-1695.8	54.7	54.798				
-29	-1641.0	54.8	54.918				
-28	-1586.1	54.9	55.038				
-27	-1530.9	55.2	55.158				
-26	-1475.7	55.2	55.278				
-25	-1420.4	55.3	55.398				
-24	-1365.0	55.4	55.518				
-23	-1309.4	55.6	55.638				
-22	-1253.7	55.7	55.758				
-21	-1197.8	55.9	55.879				
-20	-1141.9	55.9	55.996				
-19	-1085.9	56.0	56.106				
-18	-1029.7	56.2	56.216				
-17	-973.4	56.3	56.326				
-16	-917.0	56.4	56.439				
-15	-860.4	56.6	56.556				
-14	-803.8	56.6	56.666				
-13	-747.1	56.7	56.776				
-12	-690.3	56.8	56.886				
-11	-633.4	56.9	56.996				
-10	-576.4	57.0	57.106				
-9	-519.2	57.2	57.217				
-8	-462.0	57.2	57.325				
-7	-404.7	57.3	57.425				
-6	-347.2	57.5	57.525				
-5	-289.6	57.6	57.625				
-4	-231.9	57.7	57.725				
-3	-174.0	57.9	57.825				
-2	-116.1	57.9	57.925				
-1	-58.1	58.0	58.025				
-0	0.	58.0	58.125				
1	58.2	58.2	58.225				
2	116.5	58.3	58.325				
3	174.8	58.3	58.426				
4	233.2	58.4	58.523				
5	291.8	58.6	58.613				
6	350.4	58.6	58.703				

THERMOCOUPLE TABLE FOR CHRML VS AUCO , ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
1	0.6	0.6	1.210	41	758.3	31.7	31.930
2	2.4	1.8	2.390	42	790.5	32.2	32.410
3	5.4	3.0	3.550	43	823.2	32.7	32.880
4	9.5	4.1	4.680	44	856.4	33.2	33.340
5	14.7	5.2	5.780	45	890.0	33.6	33.790
6	21.0	6.3	6.860	46	924.0	34.0	34.240
7	28.4	7.4	7.910	47	958.4	34.4	34.680
8	36.8	8.4	8.940	48	993.2	34.8	35.110
9	46.2	9.4	9.940	49	1028.5	35.3	35.530
10	56.6	10.4	10.910	50	1064.2	35.7	35.940
11	68.0	11.4	11.860	51	1100.3	36.1	36.350
12	80.4	12.4	12.780	52	1136.8	36.5	36.750
13	93.7	13.3	13.670	53	1173.7	36.9	37.150
14	107.9	14.2	14.540	54	1211.0	37.3	37.540
15	123.0	15.1	15.390	55	1248.7	37.7	37.930
16	138.9	15.9	16.210	56	1286.8	38.1	38.310
17	155.6	16.7	17.010	57	1325.3	38.5	38.680
18	173.1	17.5	17.790	58	1364.2	38.9	39.040
19	191.4	18.3	18.560	59	1403.5	39.3	39.400
20	210.4	19.0	19.320	60	1443.1	39.6	39.750
21	230.1	19.7	20.060	61	1483.1	40.0	40.090
22	250.5	20.4	20.780	62	1523.4	40.3	40.430
23	271.6	21.1	21.490	63	1564.0	40.6	40.760
24	293.4	21.8	22.180	64	1604.9	40.9	41.090
25	315.9	22.5	22.850	65	1646.1	41.2	41.410
26	339.1	23.2	23.510	66	1687.6	41.5	41.720
27	363.0	23.9	24.150	67	1729.4	41.8	42.020
28	387.6	24.6	24.780	68	1771.5	42.1	42.320
29	412.8	25.2	25.390	69	1813.9	42.4	42.610
30	438.6	25.8	25.990	70	1856.6	42.7	42.890
31	464.9	26.3	26.580	71	1899.6	43.0	43.170
32	491.8	26.9	27.160	72	1942.9	43.3	43.440
33	519.3	27.5	27.730	73	1986.5	43.6	43.710
34	547.3	28.0	28.290	74	2030.4	43.9	43.980
35	575.9	28.6	28.840	75	2074.6	44.2	44.240
36	605.0	29.1	29.380	76	2119.0	44.4	44.500
37	634.6	29.6	29.910	77	2163.7	44.7	44.760
38	664.7	30.1	30.430	78	2208.6	44.9	45.020
39	695.4	30.7	30.940	79	2253.8	45.2	45.270
40	726.6	31.2	31.440	80	2299.2	45.4	45.520

THERMOCOUPLE TABLE FOR CHRML VS AUCO , ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
81	2344.9	45.7	45.770	121	4343.2	53.3	53.370
82	2390.8	45.9	46.020	122	4396.6	53.4	53.510
83	2436.9	46.1	46.270	123	4450.2	53.6	53.650
84	2483.3	46.4	46.510	124	4503.9	53.7	53.780
85	2529.9	46.6	46.750	125	4557.8	53.9	53.910
86	2576.8	46.9	46.990	126	4611.8	54.0	54.040
87	2623.9	47.1	47.230	127	4665.9	54.1	54.170
88	2671.2	47.3	47.460	128	4720.2	54.3	54.300
89	2718.8	47.6	47.690	129	4774.6	54.4	54.420
90	2766.6	47.8	47.920	130	4829.1	54.5	54.540
91	2814.6	48.0	48.140	131	4883.7	54.6	54.660
92	2862.9	48.3	48.360	132	4938.4	54.7	54.780
93	2911.4	48.5	48.580	133	4993.3	54.9	54.900
94	2960.1	48.7	48.790	134	5048.3	55.0	55.020
95	3009.0	48.9	48.990	135	5103.4	55.1	55.140
96	3058.1	49.1	49.190	136	5158.6	55.2	55.260
97	3107.4	49.3	49.390	137	5213.9	55.3	55.370
98	3156.9	49.5	49.590	138	5269.3	55.4	55.480
99	3206.6	49.7	49.780	139	5324.8	55.5	55.590
100	3256.5	49.9	49.970	140	5380.4	55.6	55.700
101	3306.5	50.0	50.160	141	5436.2	55.8	55.810
102	3356.7	50.2	50.340	142	5492.1	55.9	55.920
103	3407.1	50.4	50.520	143	5548.1	56.0	56.020
104	3457.7	50.6	50.700	144	5604.2	56.1	56.120
105	3508.5	50.8	50.870	145	5660.4	56.2	56.220
106	3559.5	51.0	51.040	146	5716.7	56.3	56.320
107	3610.6	51.1	51.210	147	5773.1	56.4	56.420
108	3661.9	51.3	51.380	148	5829.6	56.5	56.520
109	3713.4	51.5	51.550	149	5886.2	56.6	56.620
110	3765.0	51.6	51.710	150	5942.8	56.6	56.710
111	3816.8	51.8	51.870	151	5999.5	56.7	56.800
112	3868.8	52.0	52.030	152	6056.3	56.8	56.890
113	3920.9	52.1	52.190	153	6113.2	56.9	56.980
114	3973.2	52.3	52.350	154	6170.2	57.0	57.070
115	4025.6	52.4	52.500	155	6227.3	57.1	57.160
116	4078.2	52.6	52.650	156	6284.5	57.2	57.250
117	4130.9	52.7	52.800	157	6341.8	57.3	57.340
118	4183.8	52.9	52.950	158	6399.2	57.4	57.430
119	4236.8	53.0	53.090	159	6456.7	57.5	57.510
120	4289.9	53.1	53.230	160	6514.2	57.5	57.590

THERMOCOUPLE TABLE FOR CHRML VS AUCO , ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
161	6571.8	57.6	57.670	201	8935.4	60.3	60.330
162	6629.5	57.7	57.750	202	8995.8	60.4	60.380
163	6687.3	57.8	57.830	203	9056.2	60.4	60.430
164	6745.2	57.9	57.910	204	9116.7	60.5	60.480
165	6803.1	57.9	57.990	205	9177.2	60.5	60.530
166	6861.1	58.0	58.070	206	9237.7	60.5	60.580
167	6919.2	58.1	58.150	207	9298.3	60.6	60.630
168	6977.4	58.2	58.220	208	9358.9	60.6	60.680
169	7035.7	58.3	58.290	209	9419.6	60.7	60.730
170	7094.0	58.3	58.360	210	9480.3	60.7	60.780
171	7152.4	58.4	58.430	211	9541.1	60.8	60.820
172	7210.9	58.5	58.500	212	9601.9	60.8	60.860
173	7269.4	58.5	58.570	213	9662.8	60.9	60.900
174	7328.0	58.6	58.640	214	9723.7	60.9	60.950
175	7386.7	58.7	58.710	215	9784.7	61.0	60.990
176	7445.4	58.7	58.780	216	9845.7	61.0	61.030
177	7504.2	58.8	58.850	217	9906.8	61.1	61.070
178	7563.1	58.9	58.920	218	9967.9	61.1	61.110
179	7622.0	58.9	58.990	219	10029.0	61.1	61.150
180	7681.0	59.0	59.060	220	10090.2	61.2	61.190
181	7740.1	59.1	59.130	221	10151.4	61.2	61.230
182	7799.3	59.2	59.200	222	10212.7	61.3	61.270
183	7858.5	59.2	59.270	223	10274.0	61.3	61.310
184	7917.8	59.3	59.340	224	10335.4	61.4	61.350
185	7977.2	59.4	59.410	225	10396.8	61.4	61.390
186	8036.6	59.4	59.470	226	10458.2	61.4	61.430
187	8096.1	59.5	59.530	227	10519.7	61.5	61.470
188	8155.7	59.6	59.590	228	10581.2	61.5	61.510
189	8215.3	59.6	59.650	229	10642.7	61.5	61.540
190	8275.0	59.7	59.710	230	10704.3	61.6	61.570
191	8334.7	59.7	59.770	231	10765.9	61.6	61.600
192	8394.5	59.8	59.830	232	10827.5	61.6	61.630
193	8454.4	59.9	59.890	233	10889.1	61.6	61.670
194	8514.3	59.9	59.950	234	10950.8	61.7	61.700
195	8574.3	60.0	60.010	235	11012.5	61.7	61.730
196	8634.3	60.0	60.070	236	11074.2	61.7	61.760
197	8694.4	60.1	60.130	237	11136.0	61.8	61.790
198	8754.6	60.2	60.180	238	11197.8	61.8	61.820
199	8814.8	60.2	60.230	239	11259.6	61.8	61.850
200	8875.1	60.3	60.280	240	11321.5	61.9	61.880

THERMOCOUPLE TABLE FOR CHRML VS AUCO , ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
241	11383.4	61.9	61.910				
242	11445.3	61.9	61.940				
243	11507.2	61.9	61.970				
244	11569.2	62.0	62.000				
245	11631.2	62.0	62.030				
246	11693.2	62.0	62.060				
247	11755.3	62.1	62.080				
248	11817.4	62.1	62.100				
249	11879.5	62.1	62.120				
250	11941.6	62.1	62.140				
251	12003.8	62.2	62.160				
252	12066.0	62.2	62.180				
253	12128.2	62.2	62.200				
254	12190.4	62.2	62.220				
255	12252.6	62.2	62.240				
256	12314.9	62.3	62.260				
257	12377.2	62.3	62.280				
258	12439.5	62.3	62.300				
259	12501.8	62.3	62.320				
260	12564.1	62.3	62.330				
261	12626.4	62.3	62.340				
262	12688.7	62.3	62.350				
263	12751.0	62.3	62.360				
264	12813.4	62.4	62.370				
265	12875.8	62.4	62.380				
266	12938.2	62.4	62.390				
267	13000.6	62.4	62.400				
268	13063.0	62.4	62.410				
269	13125.4	62.4	62.420				
270	13187.8	62.4	62.430				
271	13250.2	62.4	62.440				
272	13312.6	62.4	62.450				
273	13375.0	62.4	62.450				
274	13437.4	62.4	62.450				
275	13499.8	62.4	62.450				
276	13562.2	62.4	62.450				
277	13624.6	62.4	62.450				
278	13687.0	62.4	62.450				
279	13749.4	62.4	62.450				
280	13811.9	62.5	62.460				

THERMOCOUPLE TABLE FOR CHRML VS AUCO , ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-272	-13383.6	0.8	1.388	-232	-12621.3	31.7	32.003
-271	-13381.6	2.0	2.566	-231	-12589.0	32.3	32.481
-270	-13378.4	3.2	3.721	-230	-12556.2	32.8	32.950
-269	-13374.1	4.3	4.846	-229	-12522.9	33.3	33.407
-268	-13368.8	5.3	5.944	-228	-12489.3	33.6	33.858
-267	-13362.3	6.5	7.019	-227	-12455.2	34.1	34.307
-266	-13354.8	7.5	8.066	-226	-12420.8	34.4	34.745
-265	-13346.2	8.6	9.092	-225	-12385.9	34.9	35.174
-264	-13336.7	9.5	10.087	-224	-12350.5	35.4	35.591
-263	-13326.1	10.6	11.054	-223	-12314.8	35.7	36.002
-262	-13314.6	11.5	12.000	-222	-12278.6	36.2	36.410
-261	-13302.0	12.6	12.915	-221	-12242.1	36.5	36.811
-260	-13288.6	13.4	13.802	-220	-12205.1	37.0	37.208
-259	-13274.2	14.4	14.669	-219	-12167.7	37.4	37.599
-258	-13259.0	15.2	15.514	-218	-12130.0	37.7	37.988
-257	-13243.0	16.0	16.331	-217	-12091.8	38.2	38.366
-256	-13226.2	16.8	17.128	-216	-12053.3	38.5	38.734
-255	-13208.6	17.6	17.906	-215	-12014.3	39.0	39.095
-254	-13190.2	18.4	18.675	-214	-11974.9	39.4	39.453
-253	-13171.0	19.2	19.432	-213	-11935.3	39.6	39.801
-252	-13151.2	19.8	20.169	-212	-11895.2	40.1	40.142
-251	-13130.7	20.5	20.888	-211	-11854.9	40.3	40.479
-250	-13109.5	21.2	21.595	-210	-11814.2	40.7	40.810
-249	-13087.6	21.9	22.281	-209	-11773.3	40.9	41.139
-248	-13065.0	22.6	22.950	-208	-11732.1	41.2	41.457
-247	-13041.7	23.3	23.607	-207	-11690.5	41.6	41.765
-246	-13017.7	24.0	24.246	-206	-11648.7	41.8	42.066
-245	-12993.0	24.7	24.872	-205	-11606.5	42.2	42.364
-244	-12967.7	25.3	25.481	-204	-11564.1	42.4	42.652
-243	-12941.9	25.8	26.079	-203	-11521.3	42.8	42.933
-242	-12915.5	26.4	26.668	-202	-11478.3	43.0	43.210
-241	-12888.5	27.0	27.246	-201	-11434.9	43.4	43.480
-240	-12860.9	27.6	27.815	-200	-11391.3	43.6	43.751
-239	-12832.8	28.1	28.373	-199	-11347.3	44.0	44.019
-238	-12804.1	28.7	28.922	-198	-11303.1	44.2	44.279
-237	-12775.0	29.1	29.460	-197	-11258.7	44.4	44.539
-236	-12745.3	29.7	29.989	-196	-11213.9	44.8	44.800
-235	-12715.1	30.2	30.507	-195	-11169.0	44.9	45.057
-234	-12684.3	30.8	31.016	-194	-11123.8	45.2	45.307
-233	-12653.0	31.3	31.514	-193	-11078.3	45.5	45.557

THERMOCOUPLE TABLE FOR CHRML VS AUCO , ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-192	-11032.6	45.7	45.807	-152	-9033.2	53.3	53.391
-191	-10986.7	45.9	46.058	-151	-8979.7	53.5	53.532
-190	-10940.5	46.2	46.306	-150	-8926.1	53.6	53.669
-189	-10894.1	46.4	46.546	-149	-8872.4	53.7	53.799
-188	-10847.4	46.7	46.786	-148	-8818.5	53.9	53.929
-187	-10800.5	46.9	47.027	-147	-8764.5	54.0	54.059
-186	-10753.4	47.1	47.264	-146	-8710.3	54.2	54.190
-185	-10706.0	47.4	47.494	-145	-8656.0	54.3	54.318
-184	-10658.4	47.6	47.725	-144	-8601.6	54.4	54.438
-183	-10610.6	47.8	47.953	-143	-8547.1	54.5	54.558
-182	-10562.5	48.1	48.173	-142	-8492.5	54.6	54.678
-181	-10514.2	48.3	48.394	-141	-8437.7	54.8	54.798
-180	-10465.7	48.5	48.612	-140	-8382.8	54.9	54.918
-179	-10416.9	48.8	48.820	-139	-8327.8	55.0	55.038
-178	-10368.0	48.9	49.020	-138	-8272.7	55.1	55.159
-177	-10318.9	49.1	49.220	-137	-8217.5	55.2	55.276
-176	-10269.5	49.4	49.421	-136	-8162.2	55.3	55.386
-175	-10220.0	49.5	49.618	-135	-8106.7	55.5	55.496
-174	-10170.3	49.7	49.808	-134	-8051.2	55.5	55.606
-173	-10120.4	49.9	49.999	-133	-7995.6	55.6	55.716
-172	-10070.3	50.1	50.187	-132	-7939.8	55.8	55.827
-171	-10020.1	50.2	50.367	-131	-7883.9	55.9	55.935
-170	-9969.7	50.4	50.548	-130	-7827.9	56.0	56.035
-169	-9919.1	50.6	50.725	-129	-7771.7	56.2	56.135
-168	-9868.2	50.9	50.895	-128	-7715.5	56.2	56.235
-167	-9817.2	51.0	51.065	-127	-7659.2	56.3	56.335
-166	-9766.1	51.1	51.235	-126	-7602.8	56.4	56.435
-165	-9714.7	51.4	51.406	-125	-7546.3	56.5	56.536
-164	-9663.2	51.5	51.574	-124	-7489.7	56.6	56.633
-163	-9611.6	51.6	51.734	-123	-7433.1	56.6	56.723
-162	-9559.8	51.8	51.894	-122	-7376.3	56.8	56.813
-161	-9507.8	52.0	52.054	-121	-7319.5	56.8	56.903
-160	-9455.6	52.2	52.215	-120	-7262.6	56.9	56.993
-159	-9403.3	52.3	52.372	-119	-7205.6	57.0	57.083
-158	-9350.9	52.4	52.522	-118	-7148.5	57.1	57.173
-157	-9298.3	52.6	52.672	-117	-7091.3	57.2	57.263
-156	-9245.5	52.8	52.823	-116	-7034.0	57.3	57.354
-155	-9192.6	52.9	52.971	-115	-6976.5	57.5	57.442
-154	-9139.6	53.0	53.111	-114	-6919.0	57.5	57.522
-153	-9086.5	53.1	53.251	-113	-6861.5	57.5	57.602

THERMOCOUPLE TABLE FOR CHRML VS AUCO , ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-112	-6803.9	57.6	57.682	-72	-4439.9	60.3	60.337
-111	-6746.2	57.7	57.762	-71	-4379.5	60.4	60.387
-110	-6688.4	57.8	57.842	-70	-4319.1	60.4	60.437
-109	-6630.5	57.9	57.922	-69	-4258.6	60.5	60.487
-108	-6572.6	57.9	58.002	-68	-4198.1	60.5	60.537
-107	-6514.6	58.0	58.083	-67	-4137.6	60.5	60.587
-106	-6456.4	58.2	58.160	-66	-4077.0	60.6	60.637
-105	-6398.2	58.2	58.230	-65	-4016.4	60.6	60.687
-104	-6339.9	58.3	58.300	-64	-3955.7	60.7	60.738
-103	-6281.6	58.3	58.370	-63	-3894.9	60.8	60.786
-102	-6223.2	58.4	58.440	-62	-3834.1	60.8	60.826
-101	-6164.7	58.5	58.510	-61	-3773.3	60.8	60.865
-100	-6106.2	58.5	58.580	-60	-3712.4	60.9	60.908
-99	-6047.6	58.6	58.650	-59	-3651.5	60.9	60.956
-98	-5988.9	58.7	58.720	-58	-3590.5	61.0	60.996
-97	-5930.1	58.8	58.790	-57	-3529.5	61.0	61.036
-96	-5871.3	58.8	58.860	-56	-3468.4	61.1	61.076
-95	-5812.4	58.9	58.930	-55	-3407.3	61.1	61.116
-94	-5753.5	58.9	59.000	-54	-3346.2	61.1	61.156
-93	-5694.5	59.0	59.070	-53	-3285.0	61.2	61.196
-92	-5635.4	59.1	59.140	-52	-3223.8	61.2	61.236
-91	-5576.2	59.2	59.210	-51	-3162.5	61.3	61.276
-90	-5517.0	59.2	59.280	-50	-3101.1	61.4	61.316
-89	-5457.6	59.4	59.351	-49	-3039.7	61.4	61.356
-88	-5398.3	59.3	59.419	-48	-2978.4	61.3	61.396
-87	-5338.8	59.5	59.479	-47	-2916.9	61.5	61.436
-86	-5279.3	59.5	59.539	-46	-2855.4	61.5	61.477
-85	-5219.7	59.6	59.599	-45	-2793.9	61.5	61.514
-84	-5160.1	59.6	59.659	-44	-2732.4	61.5	61.544
-83	-5100.4	59.7	59.719	-43	-2670.8	61.6	61.574
-82	-5040.7	59.7	59.779	-42	-2609.2	61.6	61.604
-81	-4980.9	59.8	59.839	-41	-2547.6	61.6	61.637
-80	-4921.0	59.9	59.899	-40	-2486.0	61.6	61.674
-79	-4861.1	59.9	59.959	-39	-2424.3	61.7	61.704
-78	-4801.1	60.0	60.019	-38	-2362.6	61.7	61.734
-77	-4741.1	60.0	60.080	-37	-2300.9	61.7	61.764
-76	-4680.9	60.2	60.137	-36	-2239.1	61.8	61.794
-75	-4620.7	60.2	60.187	-35	-2177.3	61.8	61.824
-74	-4560.5	60.2	60.237	-34	-2115.5	61.8	61.854
-73	-4500.2	60.3	60.287	-33	-2053.6	61.9	61.884

THERMOCOUPLE TABLE FOR CHRML VS AUCO , ISA TYPE UNDESIG., BASED ON
NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-32	-1991.7	61.9	61.914				
-31	-1929.8	61.9	61.944				
-30	-1867.9	61.9	61.974				
-29	-1805.9	62.0	62.004				
-28	-1743.9	62.0	62.035				
-27	-1681.8	62.1	62.063				
-26	-1619.7	62.1	62.083				
-25	-1557.6	62.1	62.103				
-24	-1495.6	62.0	62.123				
-23	-1433.4	62.2	62.143				
-22	-1371.2	62.2	62.163				
-21	-1309.0	62.2	62.183				
-20	-1246.8	62.2	62.203				
-19	-1184.6	62.2	62.223				
-18	-1122.4	62.2	62.243				
-17	-1060.1	62.3	62.263				
-16	-997.8	62.3	62.283				
-15	-935.5	62.3	62.304				
-14	-873.2	62.3	62.321				
-13	-810.9	62.3	62.331				
-12	-748.6	62.3	62.341				
-11	-686.3	62.3	62.351				
-10	-624.0	62.3	62.361				
-9	-561.6	62.4	62.371				
-8	-499.2	62.4	62.381				
-7	-436.8	62.4	62.391				
-6	-374.4	62.4	62.401				
-5	-312.0	62.4	62.411				
-4	-249.6	62.4	62.421				
-3	-187.2	62.4	62.431				
-2	-124.8	62.4	62.442				
-1	-62.4	62.4	62.450				
-0	0.0	62.3	62.450				
1	62.4	62.4	62.450				
2	124.8	62.4	62.450				
3	187.2	62.4	62.450				
4	249.6	62.4	62.450				
5	312.0	62.4	62.449				
6	374.4	62.4	62.451				

THERMOCOUPLE TABLE FOR FE (J) VS CONST., ISA TYPE JP-JN , BASED ON NAT. BUR. OF STANDARDS PUB. R-258 WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
1	0.32	0.32	0.376	41	244.7	11.5	11.690
2	0.88	0.56	0.740	42	256.5	11.8	11.970
3	1.80	0.92	1.091	43	268.6	12.1	12.260
4	3.06	1.26	1.430	44	281.0	12.4	12.560
5	4.65	1.59	1.758	45	293.7	12.7	12.860
6	6.57	1.92	2.076	46	306.7	13.0	13.160
7	8.80	2.23	2.384	47	320.0	13.3	13.460
8	11.33	2.53	2.683	48	333.6	13.6	13.760
9	14.16	2.83	2.974	49	347.5	13.9	14.060
10	17.28	3.12	3.257	50	361.7	14.2	14.360
11	20.67	3.39	3.534	51	376.2	14.5	14.670
12	24.34	3.67	3.805	52	391.0	14.8	14.980
13	28.28	3.94	4.070	53	406.2	15.2	15.290
14	32.48	4.20	4.330	54	421.7	15.5	15.600
15	36.94	4.46	4.586	55	437.5	15.8	15.910
16	41.66	4.72	4.839	56	453.6	16.1	16.220
17	46.63	4.97	5.090	57	470.0	16.4	16.530
18	51.85	5.22	5.341	58	486.7	16.7	16.840
19	57.32	5.47	5.593	59	503.7	17.0	17.160
20	63.03	5.71	5.846	60	521.0	17.3	17.480
21	68.99	5.96	6.101	61	538.7	17.7	17.800
22	75.20	6.21	6.358	62	556.7	18.0	18.120
23	81.64	6.44	6.617	63	575.0	18.3	18.440
24	88.31	6.67	6.879	64	593.6	18.6	18.760
25	95.22	6.91	7.146	65	612.5	18.9	19.070
26	102.4	7.2	7.418	66	631.7	19.2	19.370
27	109.9	7.5	7.696	67	651.2	19.5	19.670
28	117.7	7.8	7.980	68	671.0	19.8	19.960
29	125.8	8.1	8.270	69	691.1	20.1	20.250
30	134.2	8.4	8.560	70	711.5	20.4	20.540
31	142.8	8.6	8.850	71	732.2	20.7	20.830
32	151.7	8.9	9.140	72	753.2	21.0	21.110
33	160.9	9.2	9.430	73	774.5	21.3	21.390
34	170.4	9.5	9.720	74	796.1	21.6	21.670
35	180.2	9.8	10.010	75	817.9	21.8	21.950
36	190.2	10.0	10.290	76	840.0	22.1	22.230
37	200.5	10.3	10.570	77	862.4	22.4	22.510
38	211.1	10.6	10.850	78	885.1	22.7	22.790
39	222.0	10.9	11.130	79	908.1	23.0	23.070
40	233.2	11.2	11.410	80	931.4	23.3	23.350

THERMOCOUPLE TABLE FOR FE (J) VS CONST., ISA TYPE JP-JN , BASED ON NAT. BUR. OF STANDARDS PUB. R-258 WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
81	954.9	23.5	23.630	121	2100.6	33.0	32.990
82	978.7	23.8	23.910	122	2133.8	33.2	33.190
83	1002.8	24.1	24.190	123	2167.2	33.4	33.390
84	1027.2	24.4	24.460	124	2200.8	33.6	33.590
85	1051.8	24.6	24.730	125	2234.6	33.8	33.790
86	1076.7	24.9	24.990	126	2268.6	34.0	33.990
87	1101.9	25.2	25.250	127	2302.8	34.2	34.190
88	1127.3	25.4	25.510	128	2337.2	34.4	34.390
89	1153.0	25.7	25.770	129	2371.8	34.6	34.590
90	1179.0	26.0	26.030	130	2406.5	34.7	34.790
91	1205.2	26.2	26.290	131	2441.4	34.9	34.990
92	1231.7	26.5	26.550	132	2476.5	35.1	35.190
93	1258.4	26.7	26.810	133	2511.8	35.3	35.390
94	1285.4	27.0	27.070	134	2547.3	35.5	35.580
95	1312.6	27.2	27.330	135	2582.9	35.6	35.770
96	1340.1	27.5	27.590	136	2618.7	35.8	35.960
97	1367.9	27.8	27.840	137	2654.7	36.0	36.140
98	1395.9	28.0	28.090	138	2690.9	36.2	36.310
99	1424.1	28.2	28.330	139	2727.3	36.4	36.470
100	1452.5	28.4	28.560	140	2763.8	36.5	36.630
101	1481.2	28.7	28.780	141	2800.5	36.7	36.790
102	1510.1	28.9	29.000	142	2837.3	36.8	36.950
103	1539.2	29.1	29.220	143	2874.3	37.0	37.110
104	1568.5	29.3	29.440	144	2911.5	37.2	37.270
105	1598.1	29.6	29.660	145	2948.8	37.3	37.430
106	1627.9	29.8	29.880	146	2986.3	37.5	37.590
107	1657.9	30.0	30.100	147	3024.0	37.7	37.750
108	1688.1	30.2	30.320	148	3061.8	37.8	37.910
109	1718.5	30.4	30.540	149	3099.8	38.0	38.070
110	1749.2	30.7	30.760	150	3137.9	38.1	38.230
111	1780.1	30.9	30.980	151	3176.2	38.3	38.380
112	1811.2	31.1	31.190	152	3214.7	38.5	38.530
113	1842.5	31.3	31.390	153	3253.3	38.6	38.680
114	1874.0	31.5	31.590	154	3292.0	38.7	38.830
115	1905.7	31.7	31.790	155	3330.9	38.9	38.980
116	1937.6	31.9	31.990	156	3370.0	39.1	39.130
117	1969.8	32.2	32.190	157	3409.2	39.2	39.280
118	2002.2	32.4	32.390	158	3448.5	39.3	39.430
119	2034.8	32.6	32.590	159	3488.0	39.5	39.570
120	2067.6	32.8	32.790	160	3527.6	39.6	39.710

THERMOCOUPLE TABLE FOR FE (J) VS CONST., ISA TYPE JP-JN , BASED ON NAT. BUR. OF STANDARDS PUB. R-258 WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BLNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
161	3567.3	39.7	39.840	201	5263.7	44.7	44.680
162	3607.2	39.9	39.970	202	5308.5	44.8	44.780
163	3647.2	40.0	40.100	203	5353.4	44.9	44.880
164	3687.4	40.2	40.230	204	5398.4	45.0	44.980
165	3727.7	40.3	40.360	205	5443.5	45.1	45.080
166	3768.1	40.4	40.490	206	5488.7	45.2	45.180
167	3808.7	40.6	40.620	207	5534.0	45.3	45.280
168	3849.4	40.7	40.750	208	5579.4	45.4	45.380
169	3890.2	40.8	40.880	209	5624.9	45.5	45.480
170	3931.2	41.0	41.010	210	5670.5	45.6	45.580
171	3972.3	41.1	41.140	211	5716.2	45.7	45.690
172	4013.6	41.3	41.270	212	5762.0	45.8	45.800
173	4055.0	41.4	41.400	213	5807.9	45.9	45.910
174	4096.5	41.5	41.530	214	5853.9	46.0	46.020
175	4138.2	41.7	41.660	215	5900.0	46.1	46.130
176	4180.0	41.8	41.790	216	5946.2	46.2	46.240
177	4222.0	42.0	41.920	217	5992.4	46.2	46.350
178	4264.1	42.1	42.050	218	6038.7	46.3	46.460
179	4306.3	42.2	42.180	219	6085.1	46.4	46.560
180	4348.6	42.3	42.310	220	6131.6	46.5	46.660
181	4391.0	42.4	42.440	221	6178.2	46.6	46.760
182	4433.6	42.6	42.560	222	6224.9	46.7	46.860
183	4476.3	42.7	42.680	223	6271.7	46.8	46.950
184	4519.1	42.8	42.800	224	6318.6	46.9	47.040
185	4562.0	42.9	42.920	225	6365.6	47.0	47.130
186	4605.0	43.0	43.040	226	6412.7	47.1	47.210
187	4648.2	43.2	43.160	227	6459.9	47.2	47.290
188	4691.5	43.3	43.280	228	6507.2	47.3	47.370
189	4734.9	43.4	43.400	229	6554.6	47.4	47.450
190	4778.4	43.5	43.520	230	6602.1	47.5	47.520
191	4822.0	43.6	43.630	231	6649.7	47.6	47.590
192	4865.7	43.7	43.740	232	6697.3	47.6	47.650
193	4909.5	43.8	43.850	233	6745.0	47.7	47.700
194	4953.4	43.9	43.960	234	6792.8	47.8	47.750
195	4997.4	44.0	44.070	235	6840.7	47.9	47.800
196	5041.5	44.1	44.180	236	6888.7	48.0	47.850
197	5085.7	44.2	44.280	237	6936.7	48.0	47.900
198	5130.0	44.3	44.380	238	6984.8	48.1	47.950
199	5174.4	44.4	44.480	239	7033.0	48.2	48.010
200	5219.0	44.6	44.580	240	7081.2	48.2	48.070

THERMOCOUPLE TABLE FOR FE (J) VS CONST., ISA TYPE JP-JN , BASED ON NAT. BUR. OF STANDARDS PUB. R-258 WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
241	7129.5	48.3	48.130				
242	7177.8	48.3	48.190				
243	7226.2	48.4	48.250				
244	7274.6	48.4	48.320				
245	7323.1	48.5	48.390				
246	7371.7	48.6	48.470				
247	7420.3	48.6	48.560				
248	7469.0	48.7	48.650				
249	7517.8	48.8	48.750				
250	7566.7	48.9	48.850				
251	7615.7	49.0	48.960				
252	7664.8	49.1	49.070				
253	7713.9	49.1	49.180				
254	7763.1	49.2	49.300				
255	7812.4	49.3	49.420				
256	7861.8	49.4	49.540				
257	7911.3	49.5	49.660				
258	7961.0	49.7	49.780				
259	8010.9	49.9	49.900				
260	8060.9	50.0	50.020				
261	8111.0	50.1	50.140				
262	8161.2	50.2	50.250				
263	8211.5	50.3	50.360				
264	8261.9	50.4	50.480				
265	8312.4	50.5	50.610				
266	8363.1	50.7	50.750				
267	8414.0	50.9	50.890				
268	8465.1	51.1	51.040				
269	8516.4	51.3	51.190				
270	8567.9	51.5	51.340				
271	8619.5	51.6	51.490				
272	8671.3	51.8	51.640				
273	8723.3	52.0	51.780				
274	8775.5	52.2	51.920				
275	8827.9	52.4	52.060				
276	8880.4	52.5	52.200				
277	8933.0	52.6	52.340				
278	8985.7	52.7	52.480				
279	9038.5	52.8	52.620				
280	9091.4	52.9	52.760				

THERMOCOUPLE TABLE FOR FE (J) VS CONST., ISA TYPE JP-JN , BASED ON NAT. BUR. OF STANDARDS PUB. R-258 WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BLNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-272	-8730.74	0.38	C.431	-232	-8484.7	11.5	11.731
-271	-8730.12	0.62	C.793	-231	-8472.8	11.9	12.013
-270	-8729.15	0.97	1.143	-230	-8460.7	12.1	12.305
-269	-8727.84	1.31	1.480	-229	-8448.2	12.5	12.605
-268	-8726.20	1.64	1.806	-228	-8435.5	12.7	12.905
-267	-8724.23	1.97	2.123	-227	-8422.4	13.1	13.205
-266	-8721.96	2.27	2.429	-226	-8409.1	13.3	13.505
-265	-8719.38	2.58	2.727	-225	-8395.5	13.6	13.805
-264	-8716.51	2.87	3.C17	-224	-8381.5	14.0	14.104
-263	-8713.35	3.16	3.299	-223	-8367.3	14.2	14.406
-262	-8709.91	3.44	3.575	-222	-8352.7	14.6	14.717
-261	-8706.20	3.71	3.845	-221	-8337.9	14.8	15.026
-260	-8702.22	3.98	4.109	-220	-8322.6	15.3	15.336
-259	-8697.98	4.24	4.369	-219	-8307.1	15.5	15.646
-258	-8693.49	4.49	4.624	-218	-8291.2	15.9	15.956
-257	-8688.73	4.76	4.877	-217	-8275.1	16.1	16.266
-256	-8683.72	5.01	5.128	-216	-8258.6	16.5	16.576
-255	-8678.46	5.26	5.379	-215	-8241.9	16.7	16.888
-254	-8672.96	5.50	5.631	-214	-8224.8	17.1	17.208
-253	-8667.21	5.75	5.884	-213	-8207.5	17.3	17.528
-252	-8661.21	6.00	6.139	-212	-8189.7	17.8	17.848
-251	-8654.97	6.24	6.397	-211	-8171.7	18.0	18.168
-250	-8648.49	6.48	6.656	-210	-8153.3	18.4	18.489
-249	-8641.79	6.70	6.919	-209	-8134.7	18.6	18.807
-248	-8634.84	6.95	7.186	-208	-8115.8	18.9	19.115
-247	-8627.6	7.2	7.459	-207	-8096.5	19.3	19.416
-246	-8620.1	7.5	7.738	-206	-8077.0	19.5	19.713
-245	-8612.2	7.9	8.023	-205	-8057.1	19.9	20.003
-244	-8604.1	8.1	8.314	-204	-8037.0	20.1	20.294
-243	-8595.6	8.5	8.603	-203	-8016.5	20.5	20.584
-242	-8587.0	8.6	8.893	-202	-7995.8	20.7	20.872
-241	-8578.1	8.9	9.184	-201	-7974.7	21.1	21.152
-240	-8568.8	9.3	9.474	-200	-7953.4	21.3	21.432
-239	-8559.3	9.5	9.764	-199	-7931.8	21.6	21.712
-238	-8549.4	9.9	10.052	-198	-7909.9	21.9	21.992
-237	-8539.4	10.0	10.332	-197	-7887.8	22.1	22.272
-236	-8529.0	10.4	10.612	-196	-7865.3	22.5	22.552
-235	-8518.4	10.6	10.892	-195	-7842.6	22.7	22.832
-234	-8507.5	10.9	11.172	-194	-7819.5	23.1	23.112
-233	-8496.2	11.3	11.452	-193	-7796.2	23.3	23.392

THERMOCOUPLE TABLE FOR FE (J) VS CONST., ISA TYPE JP-JN , BASED ON NAT. BUR. OF STANDARDS PUB. R-258 WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-192	-7772.7	23.5	23.672	-152	-6625.5	33.1	33.020
-191	-7748.8	23.9	23.953	-151	-6592.3	33.2	33.220
-190	-7724.7	24.1	24.230	-150	-6558.9	33.4	33.420
-189	-7700.2	24.5	24.501	-149	-6525.3	33.6	33.620
-188	-7675.6	24.6	24.769	-148	-6491.4	33.9	33.820
-187	-7650.6	25.0	25.029	-147	-6457.4	34.0	34.020
-186	-7625.4	25.2	25.289	-146	-6423.2	34.2	34.220
-185	-7600.0	25.4	25.549	-145	-6388.7	34.5	34.420
-184	-7574.2	25.8	25.809	-144	-6354.1	34.6	34.620
-183	-7548.2	26.0	26.069	-143	-6319.4	34.7	34.820
-182	-7522.0	26.2	26.329	-142	-6284.5	34.9	35.020
-181	-7495.4	26.6	26.589	-141	-6249.3	35.2	35.221
-180	-7468.7	26.7	26.849	-140	-6214.0	35.3	35.418
-179	-7441.7	27.0	27.109	-139	-6178.5	35.5	35.609
-178	-7414.4	27.3	27.370	-138	-6142.9	35.6	35.799
-177	-7386.9	27.5	27.628	-137	-6107.0	35.9	35.988
-176	-7359.0	27.9	27.878	-136	-6071.0	36.0	36.166
-175	-7331.0	28.0	28.127	-135	-6034.8	36.2	36.334
-174	-7302.8	28.2	28.365	-134	-5998.4	36.4	36.494
-173	-7274.3	28.5	28.593	-133	-5961.8	36.6	36.654
-172	-7245.6	28.7	28.813	-132	-5925.1	36.7	36.814
-171	-7216.7	28.9	29.033	-131	-5888.3	36.8	36.974
-170	-7187.5	29.2	29.253	-130	-5851.2	37.1	37.134
-169	-7158.2	29.3	29.473	-129	-5814.0	37.2	37.294
-168	-7128.6	29.6	29.693	-128	-5776.7	37.3	37.454
-167	-7098.7	29.9	29.913	-127	-5739.2	37.5	37.614
-166	-7068.7	30.0	30.133	-126	-5701.5	37.7	37.774
-165	-7038.5	30.2	30.353	-125	-5663.6	37.9	37.934
-164	-7008.0	30.5	30.573	-124	-5625.6	38.0	38.095
-163	-6977.3	30.7	30.794	-123	-5587.5	38.1	38.252
-162	-6946.4	30.9	31.012	-122	-5549.1	38.4	38.402
-161	-6915.2	31.2	31.220	-121	-5510.6	38.5	38.552
-160	-6883.9	31.3	31.420	-120	-5472.0	38.6	38.702
-159	-6852.4	31.5	31.620	-119	-5433.3	38.7	38.852
-158	-6820.7	31.7	31.820	-118	-5394.4	38.9	39.002
-157	-6788.7	32.0	32.020	-117	-5355.2	39.2	39.152
-156	-6756.5	32.2	32.220	-116	-5316.0	39.2	39.303
-155	-6724.0	32.5	32.420	-115	-5276.7	39.3	39.451
-154	-6691.4	32.6	32.620	-114	-5237.2	39.5	39.592
-153	-6658.6	32.8	32.820	-113	-5197.6	39.6	39.729

THERMOCOUPLE TABLE FOR FE (J) VS CONST., ISA TYPE JP-JN , BASED ON NAT. BUR. OF STANDARDS PUB. R-258 WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-112	-5157.8	39.8	39.859	-72	-3460.7	44.7	44.695
-111	-5117.9	39.9	39.990	-71	-3415.9	44.8	44.795
-110	-5077.9	40.0	40.119	-70	-3371.0	44.9	44.895
-109	-5037.7	40.2	40.249	-69	-3326.0	45.0	44.995
-108	-4997.4	40.3	40.379	-68	-3280.8	45.2	45.095
-107	-4956.9	40.5	40.510	-67	-3235.6	45.2	45.195
-106	-4916.3	40.6	40.640	-66	-3190.3	45.3	45.295
-105	-4875.6	40.7	40.770	-65	-3144.9	45.4	45.395
-104	-4834.8	40.8	40.899	-64	-3099.4	45.5	45.494
-103	-4793.8	41.0	41.030	-63	-3053.8	45.6	45.596
-102	-4752.6	41.2	41.159	-62	-3008.1	45.7	45.707
-101	-4711.3	41.3	41.289	-61	-2962.2	45.9	45.816
-100	-4669.9	41.4	41.419	-60	-2916.3	45.9	45.926
-99	-4628.4	41.5	41.549	-59	-2870.3	46.0	46.036
-98	-4586.7	41.7	41.680	-58	-2824.2	46.1	46.147
-97	-4544.8	41.9	41.809	-57	-2778.0	46.2	46.256
-96	-4502.8	42.0	41.939	-56	-2731.8	46.2	46.367
-95	-4460.7	42.1	42.069	-55	-2685.5	46.3	46.475
-94	-4418.5	42.2	42.200	-54	-2639.0	46.5	46.575
-93	-4376.2	42.3	42.330	-53	-2592.5	46.5	46.675
-92	-4333.7	42.5	42.458	-52	-2545.9	46.6	46.776
-91	-4291.1	42.6	42.578	-51	-2499.2	46.7	46.873
-90	-4248.4	42.7	42.698	-50	-2452.4	46.8	46.964
-89	-4205.6	42.8	42.818	-49	-2405.5	46.9	47.054
-88	-4162.7	42.9	42.938	-48	-2358.5	47.0	47.142
-87	-4119.6	43.1	43.058	-47	-2311.3	47.2	47.222
-86	-4076.4	43.2	43.178	-46	-2264.1	47.2	47.302
-85	-4033.1	43.3	43.298	-45	-2216.8	47.3	47.383
-84	-3989.7	43.4	43.419	-44	-2169.4	47.4	47.460
-83	-3946.2	43.5	43.536	-43	-2121.9	47.5	47.531
-82	-3902.6	43.6	43.646	-42	-2074.3	47.6	47.600
-81	-3858.9	43.7	43.756	-41	-2026.7	47.6	47.657
-80	-3815.0	43.9	43.866	-40	-1979.0	47.7	47.707
-79	-3771.1	43.9	43.976	-39	-1931.1	47.9	47.757
-78	-3727.1	44.0	44.087	-38	-1883.2	47.9	47.807
-77	-3683.0	44.1	44.195	-37	-1835.2	48.0	47.857
-76	-3638.8	44.2	44.295	-36	-1787.2	48.0	47.907
-75	-3594.5	44.3	44.395	-35	-1739.1	48.1	47.959
-74	-3550.0	44.5	44.495	-34	-1690.9	48.2	48.019
-73	-3505.4	44.6	44.595	-33	-1642.7	48.2	48.079

THERMOCOUPLE TABLE FOR FE (J) VS CONST., ISA TYPE JP-JN , BASED ON
NAT. BUR. OF STANDARDS PUB. R-258 WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-32	-1594.4	48.3	48.139				
-31	-1546.1	48.3	48.198				
-30	-1497.7	48.4	48.261				
-29	-1449.2	48.5	48.330				
-28	-1400.7	48.5	48.401				
-27	-1352.1	48.6	48.484				
-26	-1303.5	48.6	48.573				
-25	-1254.8	48.7	48.665				
-24	-1206.0	48.8	48.764				
-23	-1157.1	48.9	48.867				
-22	-1108.1	49.0	48.977				
-21	-1059.0	49.1	49.086				
-20	-1009.8	49.2	49.198				
-19	-960.6	49.2	49.318				
-18	-911.3	49.3	49.438				
-17	-861.9	49.4	49.558				
-16	-812.4	49.5	49.678				
-15	-762.6	49.8	49.798				
-14	-712.7	49.9	49.918				
-13	-662.7	50.0	50.039				
-12	-612.6	50.1	50.157				
-11	-562.4	50.2	50.266				
-10	-512.1	50.3	50.377				
-9	-461.7	50.4	50.499				
-8	-411.1	50.6	50.631				
-7	-360.4	50.7	50.770				
-6	-309.5	50.9	50.913				
-5	-258.3	51.2	51.062				
-4	-207.0	51.3	51.212				
-3	-155.5	51.5	51.362				
-2	-103.9	51.6	51.513				
-1	-52.0	51.9	51.661				
-0	0.0	51.9	51.801				
1	52.2	52.2	51.941				
2	104.7	52.5	52.081				
3	157.2	52.5	52.221				
4	209.8	52.6	52.361				
5	262.5	52.7	52.501				
6	315.3	52.8	52.641				

THERMOCOUPLE TABLE FOR FE (Y) VS CONST., ISA TYPE YP-YN , BASED ON NAT. BUR. OF STANDARDS PUB. R-258 WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
1	0.48	0.48	0.366	41	246.6	11.9	12.090
2	1.02	0.54	0.720	42	258.8	12.2	12.410
3	1.92	0.90	1.062	43	271.3	12.5	12.730
4	3.15	1.23	1.393	44	284.1	12.8	13.050
5	4.70	1.55	1.714	45	297.3	13.2	13.380
6	6.57	1.87	2.026	46	310.8	13.5	13.720
7	8.74	2.17	2.330	47	324.7	13.9	14.060
8	11.21	2.47	2.626	48	338.9	14.2	14.400
9	13.97	2.76	2.915	49	353.4	14.5	14.740
10	17.01	3.04	3.197	50	368.3	14.9	15.080
11	20.32	3.31	3.472	51	383.6	15.3	15.420
12	23.91	3.59	3.740	52	399.2	15.6	15.760
13	27.77	3.86	4.002	53	415.1	15.9	16.100
14	31.9	4.1	4.258	54	431.4	16.3	16.440
15	36.3	4.4	4.510	55	448.0	16.6	16.780
16	41.0	4.7	4.760	56	464.9	16.9	17.120
17	46.0	5.0	5.010	57	482.2	17.3	17.460
18	51.3	5.3	5.260	58	499.8	17.6	17.800
19	56.9	5.6	5.510	59	517.7	17.9	18.140
20	62.7	5.8	5.770	60	536.0	18.3	18.480
21	68.8	6.1	6.030	61	554.6	18.6	18.820
22	75.2	6.4	6.290	62	573.6	19.0	19.160
23	81.8	6.6	6.550	63	592.9	19.3	19.490
24	88.6	6.8	6.820	64	612.5	19.6	19.810
25	95.6	7.0	7.090	65	632.4	19.9	20.120
26	102.9	7.3	7.370	66	652.7	20.3	20.430
27	110.4	7.5	7.660	67	673.3	20.6	20.740
28	118.1	7.7	7.960	68	694.2	20.9	21.050
29	126.1	8.0	8.260	69	715.4	21.2	21.360
30	134.4	8.3	8.570	70	736.9	21.5	21.670
31	143.0	8.6	8.890	71	758.8	21.9	21.980
32	151.9	8.9	9.210	72	781.0	22.2	22.290
33	161.1	9.2	9.530	73	803.5	22.5	22.600
34	170.6	9.5	9.850	74	826.3	22.8	22.910
35	180.4	9.8	10.170	75	849.4	23.1	23.220
36	190.5	10.1	10.490	76	872.8	23.4	23.530
37	201.0	10.5	10.810	77	896.5	23.7	23.840
38	211.9	10.9	11.130	78	920.5	24.0	24.150
39	223.1	11.2	11.450	79	944.8	24.3	24.460
40	234.7	11.6	11.770	80	969.4	24.6	24.760

THERMOCOUPLE TABLE FOR FE (Y) VS CONST., ISA TYPE YP-YN , BASED ON NAT. BUR. OF STANDARDS PUB. R-258 WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
81	994.4	25.0	25.060	121	2208.4	34.9	34.900
82	1019.7	25.3	25.360	122	2243.5	35.1	35.110
83	1045.3	25.6	25.650	123	2278.8	35.3	35.320
84	1071.2	25.9	25.940	124	2314.3	35.5	35.530
85	1097.3	26.1	26.220	125	2350.0	35.7	35.740
86	1123.7	26.4	26.500	126	2385.9	35.9	35.950
87	1150.4	26.7	26.780	127	2422.0	36.1	36.160
88	1177.4	27.0	27.060	128	2458.3	36.3	36.370
89	1204.7	27.3	27.340	129	2494.8	36.5	36.580
90	1232.3	27.6	27.620	130	2531.5	36.7	36.780
91	1260.1	27.8	27.900	131	2568.4	36.9	36.970
92	1288.2	28.1	28.180	132	2605.5	37.1	37.150
93	1316.6	28.4	28.460	133	2642.8	37.3	37.330
94	1345.3	28.7	28.730	134	2680.2	37.4	37.510
95	1374.2	28.9	28.990	135	2717.8	37.6	37.690
96	1403.3	29.1	29.240	136	2755.6	37.8	37.870
97	1432.7	29.4	29.490	137	2793.6	38.0	38.050
98	1462.3	29.6	29.740	138	2831.7	38.1	38.230
99	1492.1	29.8	29.990	139	2870.0	38.3	38.410
100	1522.2	30.1	30.240	140	2908.5	38.5	38.590
101	1552.6	30.4	30.490	141	2947.2	38.7	38.770
102	1583.2	30.6	30.730	142	2986.1	38.9	38.950
103	1614.1	30.9	30.970	143	3025.1	39.0	39.130
104	1645.2	31.1	31.210	144	3064.3	39.2	39.310
105	1676.5	31.3	31.450	145	3103.7	39.4	39.490
106	1708.1	31.6	31.690	146	3143.2	39.5	39.670
107	1739.9	31.8	31.930	147	3182.9	39.7	39.850
108	1771.9	32.0	32.160	148	3222.7	39.8	40.030
109	1804.1	32.2	32.380	149	3262.6	39.9	40.210
110	1836.6	32.5	32.590	150	3302.7	40.1	40.380
111	1869.3	32.7	32.800	151	3343.0	40.3	40.540
112	1902.2	32.9	33.010	152	3383.5	40.5	40.690
113	1935.3	33.1	33.220	153	3424.1	40.6	40.830
114	1968.6	33.3	33.430	154	3464.8	40.7	40.960
115	2002.2	33.6	33.640	155	3505.7	40.9	41.090
116	2036.0	33.8	33.850	156	3546.7	41.0	41.220
117	2070.0	34.0	34.060	157	3587.9	41.2	41.350
118	2104.3	34.3	34.270	158	3629.2	41.3	41.480
119	2138.8	34.5	34.480	159	3670.6	41.4	41.610
120	2173.5	34.7	34.690	160	3712.2	41.6	41.740

THERMOCOUPLE TABLE FOR FE (Y) VS CONST., ISA TYPE YP-YN , BASED ON NAT. BUR. OF STANDARDS PUB. R-258 WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
161	3753.9	41.7	41.870	201	5529.5	46.5	46.590
162	3795.7	41.8	42.000	202	5576.1	46.6	46.690
163	3837.7	42.0	42.130	203	5622.8	46.7	46.790
164	3879.8	42.1	42.260	204	5669.6	46.8	46.890
165	3922.1	42.3	42.390	205	5716.5	46.9	46.990
166	3964.5	42.4	42.520	206	5763.5	47.0	47.090
167	4007.1	42.6	42.650	207	5810.6	47.1	47.190
168	4049.8	42.7	42.780	208	5857.8	47.2	47.290
169	4092.6	42.8	42.910	209	5905.1	47.3	47.390
170	4135.6	43.0	43.040	210	5952.5	47.4	47.490
171	4178.7	43.1	43.170	211	6000.0	47.5	47.580
172	4222.0	43.3	43.300	212	6047.6	47.6	47.670
173	4265.4	43.4	43.430	213	6095.3	47.7	47.760
174	4308.9	43.5	43.560	214	6143.1	47.8	47.850
175	4352.5	43.6	43.690	215	6191.0	47.9	47.940
176	4396.3	43.8	43.820	216	6239.0	48.0	48.030
177	4440.2	43.9	43.950	217	6287.1	48.1	48.120
178	4484.2	44.0	44.080	218	6335.2	48.1	48.210
179	4528.4	44.2	44.210	219	6383.4	48.2	48.300
180	4572.7	44.3	44.340	220	6431.7	48.3	48.390
181	4617.1	44.4	44.470	221	6480.1	48.4	48.480
182	4661.6	44.5	44.600	222	6528.6	48.5	48.570
183	4706.3	44.7	44.730	223	6577.2	48.6	48.660
184	4751.1	44.8	44.860	224	6625.9	48.7	48.750
185	4796.0	44.9	44.990	225	6674.7	48.8	48.840
186	4841.1	45.1	45.120	226	6723.6	48.9	48.930
187	4886.3	45.2	45.240	227	6772.6	49.0	49.020
188	4931.6	45.3	45.350	228	6821.7	49.1	49.110
189	4977.0	45.4	45.450	229	6870.9	49.2	49.200
190	5022.5	45.5	45.550	230	6920.2	49.3	49.290
191	5068.1	45.6	45.650	231	6969.5	49.3	49.370
192	5113.8	45.7	45.750	232	7018.9	49.4	49.450
193	5159.6	45.8	45.850	233	7068.4	49.5	49.530
194	5205.5	45.9	45.950	234	7118.0	49.6	49.610
195	5251.5	46.0	46.050	235	7167.7	49.7	49.690
196	5297.6	46.1	46.140	236	7217.5	49.8	49.770
197	5343.8	46.2	46.230	237	7267.4	49.9	49.850
198	5390.1	46.3	46.320	238	7317.4	50.0	49.930
199	5436.5	46.4	46.410	239	7367.4	50.0	50.010
200	5483.0	46.5	46.500	240	7417.5	50.1	50.090

THERMOCOUPLE TABLE FOR FE (Y) VS CONST., ISA TYPE YP-YN , BASED ON NAT. BUR. OF STANDARDS PUB. R-258 WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BLNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
241	7467.6	50.1	50.170				
242	7517.8	50.2	50.250				
243	7568.0	50.2	50.330				
244	7618.3	50.3	50.410				
245	7668.7	50.4	50.500				
246	7719.1	50.4	50.590				
247	7769.6	50.5	50.680				
248	7820.1	50.5	50.770				
249	7870.6	50.5	50.860				
250	7921.2	50.6	50.950				
251	7971.9	50.7	51.050				
252	8022.7	50.8	51.150				
253	8073.6	50.9	51.260				
254	8124.6	51.0	51.370				
255	8175.6	51.0	51.490				
256	8226.7	51.1	51.610				
257	8277.9	51.2	51.740				
258	8329.2	51.3	51.880				
259	8380.6	51.4	52.030				
260	8432.2	51.6	52.170				
261	8483.9	51.7	52.310				
262	8535.7	51.8	52.450				
263	8587.6	51.9	52.590				
264	8639.7	52.1	52.730				
265	8692.0	52.3	52.870				
266	8744.5	52.5	53.020				
267	8797.2	52.7	53.170				
268	8850.1	52.9	53.320				
269	8903.2	53.1	53.470				
270	8956.5	53.3	53.620				
271	9010.0	53.5	53.770				
272	9063.7	53.7	53.920				
273	9117.6	53.9	54.070				
274	9171.7	54.1	54.220				
275	9226.0	54.3	54.370				
276	9280.5	54.5	54.520				
277	9335.2	54.7	54.680				
278	9390.0	54.8	54.840				
279	9445.0	55.0	55.000				
280	9500.1	55.1	55.160				

THERMOCOUPLE TABLE FOR FE (Y) VS CONST., ISA TYPE YP-YN , BASED ON NAT. BUR. OF STANDARDS PUB. R-258 WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-272	-9125.16	0.54	0.420	-232	-8877.3	11.9	12.138
-271	-9124.57	0.59	0.772	-231	-8865.0	12.3	12.458
-270	-9123.62	0.95	1.112	-230	-8852.5	12.5	12.777
-269	-9122.34	1.28	1.442	-229	-8839.6	12.9	13.099
-268	-9120.74	1.60	1.761	-228	-8826.4	13.2	13.431
-267	-9118.83	1.91	2.072	-227	-8812.8	13.6	13.771
-266	-9116.61	2.22	2.375	-226	-8798.9	13.9	14.111
-265	-9114.10	2.51	2.670	-225	-8784.7	14.2	14.451
-264	-9111.29	2.81	2.958	-224	-8770.1	14.6	14.791
-263	-9108.21	3.08	3.239	-223	-8755.1	15.0	15.131
-262	-9104.86	3.35	3.513	-222	-8739.8	15.3	15.471
-261	-9101.23	3.63	3.780	-221	-8724.1	15.7	15.811
-260	-9097.33	3.90	4.041	-220	-8708.2	15.9	16.151
-259	-9093.2	4.1	4.296	-219	-8691.8	16.4	16.491
-258	-9088.7	4.5	4.548	-218	-8675.2	16.6	16.831
-257	-9084.0	4.7	4.797	-217	-8658.2	17.0	17.171
-256	-9078.9	5.1	5.047	-216	-8640.9	17.3	17.511
-255	-9073.6	5.3	5.297	-215	-8623.2	17.7	17.851
-254	-9068.0	5.6	5.549	-214	-8605.3	17.9	18.191
-253	-9062.1	5.9	5.809	-213	-8586.9	18.4	18.531
-252	-9056.0	6.1	6.069	-212	-8568.3	18.6	18.872
-251	-9049.5	6.5	6.328	-211	-8549.2	19.1	19.210
-250	-9042.9	6.6	6.590	-210	-8529.9	19.3	19.539
-249	-9036.1	6.8	6.860	-209	-8510.2	19.7	19.856
-248	-9029.0	7.1	7.131	-208	-8490.3	19.9	20.166
-247	-9021.7	7.3	7.413	-207	-8469.9	20.4	20.476
-246	-9014.2	7.5	7.705	-206	-8449.3	20.6	20.786
-245	-9006.4	7.8	8.004	-205	-8428.3	21.0	21.096
-244	-8998.4	8.0	8.306	-204	-8407.1	21.2	21.406
-243	-8990.0	8.4	8.618	-203	-8385.5	21.6	21.716
-242	-8981.4	8.6	8.938	-202	-8363.6	21.9	22.026
-241	-8972.4	9.0	9.258	-201	-8341.3	22.3	22.336
-240	-8963.2	9.2	9.578	-200	-8318.8	22.5	22.646
-239	-8953.7	9.5	9.898	-199	-8296.0	22.8	22.956
-238	-8943.8	9.9	10.218	-198	-8272.8	23.2	23.266
-237	-8933.7	10.1	10.538	-197	-8249.4	23.4	23.576
-236	-8923.1	10.6	10.858	-196	-8225.6	23.8	23.886
-235	-8912.1	11.0	11.178	-195	-8201.6	24.0	24.197
-234	-8900.9	11.2	11.498	-194	-8177.2	24.4	24.505
-233	-8889.2	11.7	11.818	-193	-8152.6	24.6	24.805

THERMOCOUPLE TABLE FOR FE (Y) VS CONST., ISA TYPE YP-YN , BASED ON NAT. BUR. OF STANDARDS PUB. R-258 WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-192	-8127.5	25.1	25.106	-152	-6912.0	35.0	34.931
-191	-8102.2	25.3	25.403	-151	-6876.9	35.1	35.141
-190	-8076.5	25.7	25.694	-150	-6841.6	35.3	35.351
-189	-8050.6	25.9	25.982	-149	-6806.1	35.5	35.561
-188	-8024.5	26.1	26.262	-148	-6770.3	35.8	35.771
-187	-7998.0	26.5	26.542	-147	-6734.4	35.9	35.981
-186	-7971.3	26.7	26.822	-146	-6698.3	36.1	36.191
-185	-7944.2	27.1	27.102	-145	-6661.9	36.4	36.402
-184	-7916.9	27.3	27.382	-144	-6625.4	36.5	36.611
-183	-7889.3	27.6	27.662	-143	-6588.7	36.7	36.809
-182	-7861.4	27.9	27.942	-142	-6551.7	37.0	36.997
-181	-7833.3	28.1	28.223	-141	-6514.6	37.1	37.177
-180	-7804.8	28.5	28.501	-140	-6477.3	37.3	37.357
-179	-7776.1	28.7	28.770	-139	-6439.9	37.4	37.537
-178	-7747.2	28.9	29.027	-138	-6402.2	37.7	37.717
-177	-7718.0	29.2	29.277	-137	-6364.4	37.8	37.897
-176	-7688.6	29.4	29.527	-136	-6326.4	38.0	38.077
-175	-7659.0	29.6	29.777	-135	-6288.3	38.1	38.257
-174	-7629.1	29.9	30.027	-134	-6249.9	38.4	38.437
-173	-7599.0	30.1	30.278	-133	-6211.4	38.5	38.617
-172	-7568.5	30.5	30.526	-132	-6172.7	38.7	38.797
-171	-7537.9	30.6	30.766	-131	-6133.8	38.9	38.977
-170	-7506.9	31.0	31.006	-130	-6094.7	39.1	39.157
-169	-7475.8	31.1	31.246	-129	-6055.5	39.2	39.337
-168	-7444.5	31.3	31.486	-128	-6016.1	39.4	39.517
-167	-7412.8	31.7	31.727	-127	-5976.6	39.5	39.697
-166	-7381.0	31.8	31.965	-126	-5936.8	39.8	39.877
-165	-7349.0	32.0	32.194	-125	-5897.0	39.8	40.058
-164	-7316.7	32.3	32.411	-124	-5857.1	39.9	40.236
-163	-7284.2	32.5	32.621	-123	-5817.0	40.1	40.405
-162	-7251.5	32.7	32.831	-122	-5776.6	40.4	40.563
-161	-7218.5	33.0	33.041	-121	-5736.1	40.5	40.712
-160	-7185.4	33.1	33.251	-120	-5695.5	40.6	40.849
-159	-7152.1	33.3	33.461	-119	-5654.8	40.7	40.979
-158	-7118.4	33.7	33.671	-118	-5613.9	40.9	41.109
-157	-7084.6	33.8	33.881	-117	-5572.8	41.1	41.239
-156	-7050.6	34.0	34.091	-116	-5531.6	41.2	41.369
-155	-7016.2	34.4	34.301	-115	-5490.3	41.3	41.499
-154	-6981.7	34.5	34.511	-114	-5448.9	41.4	41.629
-153	-6947.0	34.7	34.721	-113	-5407.3	41.6	41.759

THERMOCOUPLE TABLE FOR FE (Y) VS CONST., ISA TYPE YP-YN , BASED ON NAT. BUR. OF STANDARDS PUB. R-258 WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-112	-5365.5	41.8	41.889	-72	-3589.2	46.5	46.605
-111	-5323.7	41.8	42.019	-71	-3542.6	46.6	46.705
-110	-5281.7	42.0	42.149	-70	-3495.9	46.7	46.805
-109	-5239.6	42.1	42.279	-69	-3449.1	46.8	46.905
-108	-5197.3	42.3	42.409	-68	-3402.2	46.9	47.005
-107	-5154.8	42.5	42.539	-67	-3355.1	47.1	47.105
-106	-5112.2	42.6	42.669	-66	-3308.0	47.1	47.205
-105	-5069.5	42.7	42.799	-65	-3260.8	47.2	47.305
-104	-5026.7	42.8	42.929	-64	-3213.5	47.3	47.406
-103	-4983.6	43.1	43.059	-63	-3166.1	47.4	47.503
-102	-4940.5	43.1	43.189	-62	-3118.6	47.5	47.593
-101	-4897.2	43.3	43.319	-61	-3071.0	47.6	47.683
-100	-4853.8	43.4	43.449	-60	-3023.2	47.8	47.773
-99	-4810.3	43.5	43.579	-59	-2975.4	47.8	47.863
-98	-4766.6	43.7	43.709	-58	-2927.5	47.9	47.953
-97	-4722.8	43.8	43.839	-57	-2879.5	48.0	48.043
-96	-4678.9	43.9	43.969	-56	-2831.4	48.1	48.133
-95	-4634.9	44.0	44.099	-55	-2783.3	48.1	48.223
-94	-4590.7	44.2	44.229	-54	-2735.1	48.2	48.313
-93	-4546.3	44.4	44.359	-53	-2686.7	48.4	48.403
-92	-4501.9	44.4	44.489	-52	-2638.3	48.4	48.493
-91	-4457.4	44.5	44.619	-51	-2589.8	48.5	48.583
-90	-4412.7	44.7	44.749	-50	-2541.2	48.6	48.673
-89	-4367.9	44.8	44.879	-49	-2492.5	48.7	48.763
-88	-4322.9	45.0	45.010	-48	-2443.7	48.8	48.853
-87	-4277.8	45.1	45.139	-47	-2394.8	48.9	48.943
-86	-4232.6	45.2	45.257	-46	-2345.7	49.1	49.033
-85	-4187.3	45.3	45.365	-45	-2296.6	49.1	49.123
-84	-4141.9	45.4	45.465	-44	-2247.4	49.2	49.214
-83	-4096.4	45.5	45.565	-43	-2198.1	49.3	49.302
-82	-4050.8	45.6	45.665	-42	-2148.8	49.3	49.382
-81	-4005.0	45.8	45.765	-41	-2099.4	49.4	49.462
-80	-3959.2	45.8	45.865	-40	-2049.9	49.5	49.542
-79	-3913.3	45.9	45.966	-39	-2000.3	49.6	49.622
-78	-3867.3	46.0	46.063	-38	-1950.5	49.8	49.702
-77	-3821.2	46.1	46.153	-37	-1900.7	49.8	49.782
-76	-3775.0	46.2	46.243	-36	-1850.8	49.9	49.862
-75	-3728.6	46.4	46.333	-35	-1800.8	50.0	49.942
-74	-3682.2	46.4	46.423	-34	-1750.8	50.0	50.022
-73	-3635.7	46.5	46.513	-33	-1700.7	50.1	50.102

THERMOCOUPLE TABLE FOR FE (Y) VS CONST., ISA TYPE YP-YN , BASED ON NAT. BUR. OF STANDARDS PUB. R-258 WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-32	-1650.6	50.1	50.182				
-31	-1600.4	50.2	50.262				
-30	-1550.2	50.2	50.341				
-29	-1499.8	50.4	50.423				
-28	-1449.4	50.4	50.513				
-27	-1399.0	50.4	50.603				
-26	-1348.5	50.5	50.693				
-25	-1298.0	50.5	50.783				
-24	-1247.5	50.5	50.873				
-23	-1196.9	50.6	50.965				
-22	-1146.2	50.7	51.064				
-21	-1095.4	50.8	51.166				
-20	-1044.5	50.9	51.276				
-19	-993.5	51.0	51.388				
-18	-942.4	51.1	51.507				
-17	-891.3	51.1	51.629				
-16	-840.1	51.2	51.760				
-15	-788.8	51.3	51.903				
-14	-737.4	51.4	52.051				
-13	-685.8	51.6	52.191				
-12	-634.0	51.8	52.331				
-11	-582.2	51.8	52.471				
-10	-530.3	51.9	52.611				
-9	-478.2	52.1	52.750				
-8	-425.8	52.4	52.892				
-7	-373.3	52.5	53.042				
-6	-320.6	52.7	53.192				
-5	-267.6	53.0	53.342				
-4	-214.5	53.1	53.492				
-3	-161.2	53.3	53.642				
-2	-107.7	53.5	53.792				
-1	-53.9	53.8	53.942				
-0	0.0	53.8	54.092				
1	54.1	54.1	54.242				
2	108.5	54.4	54.392				
3	163.0	54.5	54.544				
4	217.7	54.7	54.704				
5	272.5	54.8	54.864				
6	327.6	55.1	55.024				

THERMOCOUPLE TABLE FOR N.AG VS CONST., ISA TYPE UNDESIG., BASED ON NAT. BUR. CF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTCR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
1	0.2	0.2	0.330	41	225.4	9.7	9.810
2	0.7	0.5	0.660	42	235.3	9.9	9.980
3	1.5	0.8	0.980	43	245.4	10.1	10.150
4	2.6	1.1	1.290	44	255.6	10.2	10.320
5	4.0	1.4	1.590	45	266.0	10.4	10.490
6	5.7	1.7	1.880	46	276.5	10.5	10.660
7	7.8	2.1	2.170	47	287.2	10.7	10.830
8	10.2	2.4	2.460	48	298.1	10.9	11.000
9	12.9	2.7	2.750	49	309.2	11.1	11.170
10	15.9	3.0	3.040	50	320.4	11.2	11.340
11	19.1	3.2	3.330	51	331.8	11.4	11.510
12	22.6	3.5	3.620	52	343.4	11.6	11.680
13	26.4	3.8	3.900	53	355.2	11.8	11.850
14	30.4	4.0	4.180	54	367.2	12.0	12.020
15	34.7	4.3	4.450	55	379.3	12.1	12.190
16	39.3	4.6	4.710	56	391.5	12.2	12.360
17	44.2	4.9	4.960	57	403.9	12.4	12.520
18	49.3	5.1	5.210	58	416.5	12.6	12.670
19	54.6	5.3	5.460	59	429.3	12.8	12.820
20	60.2	5.6	5.700	60	442.2	12.9	12.970
21	66.0	5.8	5.930	61	455.2	13.0	13.120
22	72.1	6.1	6.150	62	468.4	13.2	13.270
23	78.4	6.3	6.370	63	481.8	13.4	13.420
24	84.9	6.5	6.590	64	495.3	13.5	13.570
25	91.6	6.7	6.810	65	509.0	13.7	13.720
26	98.5	6.9	7.020	66	522.8	13.8	13.870
27	105.6	7.1	7.230	67	536.8	14.0	14.010
28	112.9	7.3	7.430	68	551.0	14.2	14.150
29	120.4	7.5	7.620	69	565.4	14.4	14.290
30	128.1	7.7	7.810	70	579.9	14.5	14.430
31	136.0	7.9	8.000	71	594.5	14.6	14.570
32	144.1	8.1	8.190	72	609.2	14.7	14.710
33	152.4	8.3	8.380	73	624.0	14.8	14.850
34	160.9	8.5	8.570	74	638.9	14.9	14.990
35	169.6	8.7	8.760	75	654.0	15.1	15.130
36	178.5	8.9	8.950	76	669.2	15.2	15.270
37	187.6	9.1	9.130	77	684.5	15.3	15.410
38	196.8	9.2	9.300	78	700.0	15.5	15.550
39	206.2	9.4	9.470	79	715.6	15.6	15.690
40	215.7	9.5	9.640	80	731.4	15.8	15.830

THERMOCOUPLE TABLE FOR N.AG VS CONST., ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
81	747.3	15.9	15.970	121	1496.5	21.3	21.360
82	763.3	16.0	16.110	122	1517.9	21.4	21.490
83	779.4	16.1	16.250	123	1539.5	21.6	21.620
84	795.7	16.3	16.390	124	1561.2	21.7	21.750
85	812.1	16.4	16.530	125	1583.0	21.8	21.880
86	828.7	16.6	16.670	126	1604.9	21.9	22.010
87	845.5	16.8	16.810	127	1627.0	22.1	22.140
88	862.5	17.0	16.950	128	1649.2	22.2	22.270
89	879.6	17.1	17.090	129	1671.5	22.3	22.400
90	896.9	17.3	17.230	130	1693.9	22.4	22.530
91	914.3	17.4	17.370	131	1716.5	22.6	22.660
92	931.8	17.5	17.510	132	1739.2	22.7	22.790
93	949.4	17.6	17.650	133	1762.0	22.8	22.920
94	967.1	17.7	17.790	134	1785.0	23.0	23.050
95	985.0	17.9	17.930	135	1808.1	23.1	23.180
96	1003.0	18.0	18.070	136	1831.3	23.2	23.310
97	1021.2	18.2	18.210	137	1854.7	23.4	23.440
98	1039.5	18.3	18.350	138	1878.2	23.5	23.570
99	1057.9	18.4	18.490	139	1901.8	23.6	23.690
100	1076.5	18.6	18.630	140	1925.5	23.7	23.810
101	1095.2	18.7	18.760	141	1949.3	23.8	23.930
102	1114.0	18.8	18.890	142	1973.3	24.0	24.050
103	1133.0	19.0	19.020	143	1997.4	24.1	24.170
104	1152.1	19.1	19.150	144	2021.6	24.2	24.290
105	1171.3	19.2	19.280	145	2046.0	24.4	24.410
106	1190.7	19.4	19.410	146	2070.5	24.5	24.530
107	1210.2	19.5	19.540	147	2095.1	24.6	24.650
108	1229.8	19.6	19.670	148	2119.8	24.7	24.770
109	1249.5	19.7	19.800	149	2144.7	24.9	24.890
110	1269.4	19.9	19.930	150	2169.7	25.0	25.010
111	1289.4	20.0	20.060	151	2194.8	25.1	25.130
112	1309.5	20.1	20.190	152	2220.0	25.2	25.250
113	1329.8	20.3	20.320	153	2245.4	25.4	25.370
114	1350.2	20.4	20.450	154	2270.9	25.5	25.490
115	1370.7	20.5	20.580	155	2296.5	25.6	25.610
116	1391.3	20.6	20.710	156	2322.2	25.7	25.730
117	1412.1	20.8	20.840	157	2348.0	25.8	25.850
118	1433.0	20.9	20.970	158	2373.9	25.9	25.970
119	1454.0	21.0	21.100	159	2400.0	26.1	26.090
120	1475.2	21.2	21.230	160	2426.2	26.2	26.210

THERMOCOUPLE TABLE FOR N.AG VS CONST., ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
161	2452.5	26.3	26.330	201	3597.6	30.8	30.860
162	2478.9	26.4	26.450	202	3628.5	30.9	30.970
163	2505.4	26.5	26.570	203	3659.5	31.0	31.080
164	2532.1	26.7	26.690	204	3690.6	31.1	31.190
165	2558.9	26.8	26.810	205	3721.8	31.2	31.300
166	2585.8	26.9	26.930	206	3753.1	31.3	31.410
167	2612.8	27.0	27.050	207	3784.5	31.4	31.520
168	2639.9	27.1	27.170	208	3816.0	31.5	31.630
169	2667.1	27.2	27.290	209	3847.6	31.6	31.730
170	2694.4	27.3	27.410	210	3879.3	31.7	31.830
171	2721.8	27.4	27.530	211	3911.2	31.9	31.930
172	2749.3	27.5	27.650	212	3943.2	32.0	32.030
173	2776.9	27.6	27.770	213	3975.3	32.1	32.130
174	2804.6	27.7	27.890	214	4007.5	32.2	32.230
175	2832.4	27.8	28.000	215	4039.8	32.3	32.330
176	2860.4	28.0	28.110	216	4072.2	32.4	32.430
177	2888.6	28.2	28.220	217	4104.7	32.5	32.530
178	2916.9	28.3	28.330	218	4137.3	32.6	32.630
179	2945.3	28.4	28.440	219	4170.0	32.7	32.730
180	2973.8	28.5	28.550	220	4202.8	32.8	32.830
181	3002.4	28.6	28.660	221	4235.7	32.9	32.940
182	3031.1	28.7	28.770	222	4268.7	33.0	33.040
183	3059.9	28.8	28.880	223	4301.8	33.1	33.140
184	3088.8	28.9	28.990	224	4334.9	33.1	33.240
185	3117.8	29.0	29.100	225	4368.1	33.2	33.340
186	3146.9	29.1	29.210	226	4401.4	33.3	33.440
187	3176.1	29.2	29.320	227	4434.8	33.4	33.540
188	3205.4	29.3	29.430	228	4468.4	33.6	33.640
189	3234.8	29.4	29.540	229	4502.1	33.7	33.740
190	3264.4	29.6	29.650	230	4535.9	33.8	33.840
191	3294.1	29.7	29.760	231	4569.8	33.9	33.940
192	3324.0	29.9	29.870	232	4603.8	34.0	34.040
193	3354.0	30.0	29.980	233	4637.9	34.1	34.140
194	3384.1	30.1	30.090	234	4672.1	34.2	34.240
195	3414.3	30.2	30.200	235	4706.4	34.3	34.340
196	3444.6	30.3	30.310	236	4740.8	34.4	34.440
197	3475.0	30.4	30.420	237	4775.3	34.5	34.540
198	3505.5	30.5	30.530	238	4809.9	34.6	34.640
199	3536.1	30.6	30.640	239	4844.6	34.7	34.740
200	3566.8	30.7	30.750	240	4879.4	34.8	34.840

THERMOCOUPLE TABLE FOR N.AG VS CONST., ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
241	4914.3	34.9	34.940	281	6387.7	38.6	38.670
242	4949.3	35.0	35.040	282	6426.4	38.7	38.760
243	4984.4	35.1	35.140	283	6465.2	38.8	38.840
244	5019.6	35.2	35.240	284	6504.1	38.9	38.930
245	5054.9	35.3	35.340	285	6543.1	39.0	39.020
246	5090.3	35.4	35.440	286	6582.2	39.1	39.110
247	5125.8	35.5	35.540	287	6621.4	39.2	39.200
248	5161.4	35.6	35.640	288	6660.6	39.2	39.290
249	5197.1	35.7	35.740	289	6699.9	39.3	39.380
250	5232.9	35.8	35.840	290	6739.3	39.4	39.470
251	5268.8	35.9	35.940	291	6778.8	39.5	39.560
252	5304.8	36.0	36.040	292	6818.4	39.6	39.650
253	5340.8	36.0	36.140	293	6858.0	39.6	39.740
254	5376.9	36.1	36.240	294	6897.7	39.7	39.830
255	5413.1	36.2	36.330	295	6937.5	39.8	39.910
256	5449.4	36.3	36.420	296	6977.4	39.9	39.990
257	5485.8	36.4	36.510	297	7017.4	40.0	40.070
258	5522.3	36.5	36.600	298	7057.5	40.1	40.150
259	5558.9	36.6	36.690	299	7097.7	40.2	40.230
260	5595.6	36.7	36.780	300	7137.9	40.2	40.310
261	5632.4	36.8	36.870				
262	5669.3	36.9	36.960				
263	5706.3	37.0	37.050				
264	5743.4	37.1	37.140				
265	5780.5	37.1	37.230				
266	5817.7	37.2	37.320				
267	5855.0	37.3	37.410				
268	5892.4	37.4	37.500				
269	5929.9	37.5	37.590				
270	5967.5	37.6	37.680				
271	6005.2	37.7	37.770				
272	6043.0	37.8	37.860				
273	6080.9	37.9	37.950				
274	6118.9	38.0	38.040				
275	6157.1	38.2	38.130				
276	6195.3	38.2	38.220				
277	6233.6	38.3	38.310				
278	6272.0	38.4	38.400				
279	6310.5	38.5	38.490				
280	6349.1	38.6	38.580				

THERMOCOUPLE TABLE FOR N.AG VS CONST., ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-272	-6086.3	0.3	0.380	-232	-5859.7	9.7	9.836
-271	-6085.8	0.5	0.709	-231	-5849.8	9.9	10.005
-270	-6084.9	0.9	1.027	-230	-5839.7	10.1	10.176
-269	-6083.8	1.1	1.336	-229	-5829.4	10.3	10.345
-268	-6082.4	1.4	1.634	-228	-5819.0	10.4	10.515
-267	-6080.6	1.8	1.923	-227	-5808.5	10.5	10.686
-266	-6078.4	2.2	2.213	-226	-5797.8	10.7	10.855
-265	-6076.0	2.4	2.504	-225	-5786.8	11.0	11.026
-264	-6073.2	2.8	2.794	-224	-5775.7	11.1	11.196
-263	-6070.2	3.0	3.084	-223	-5764.5	11.2	11.365
-262	-6067.0	3.2	3.374	-222	-5753.1	11.4	11.536
-261	-6063.4	3.6	3.662	-221	-5741.4	11.7	11.705
-260	-6059.6	3.8	3.943	-220	-5729.6	11.8	11.875
-259	-6055.6	4.0	4.221	-219	-5717.6	12.0	12.046
-258	-6051.2	4.4	4.490	-218	-5705.5	12.1	12.216
-257	-6046.6	4.6	4.748	-217	-5693.2	12.3	12.385
-256	-6041.6	5.0	4.998	-216	-5680.8	12.4	12.543
-255	-6036.5	5.1	5.248	-215	-5668.2	12.6	12.693
-254	-6031.2	5.3	5.497	-214	-5655.4	12.8	12.842
-253	-6025.5	5.7	5.735	-213	-5642.4	13.0	12.993
-252	-6019.7	5.8	5.963	-212	-5629.4	13.0	13.143
-251	-6013.6	6.1	6.183	-211	-5616.2	13.2	13.293
-250	-6007.2	6.4	6.403	-210	-5602.8	13.4	13.443
-249	-6000.7	6.5	6.624	-209	-5589.2	13.6	13.593
-248	-5994.0	6.7	6.841	-208	-5575.5	13.7	13.743
-247	-5987.0	7.0	7.052	-207	-5561.7	13.8	13.891
-246	-5979.9	7.1	7.261	-206	-5547.7	14.0	14.031
-245	-5972.6	7.3	7.459	-205	-5533.4	14.3	14.171
-244	-5965.0	7.6	7.648	-204	-5519.0	14.4	14.311
-243	-5957.3	7.7	7.838	-203	-5504.5	14.5	14.451
-242	-5949.4	7.9	8.028	-202	-5489.9	14.6	14.591
-241	-5941.3	8.1	8.218	-201	-5475.2	14.7	14.731
-240	-5932.9	8.4	8.408	-200	-5460.4	14.8	14.871
-239	-5924.4	8.5	8.599	-199	-5445.4	15.0	15.011
-238	-5915.7	8.7	8.789	-198	-5430.3	15.1	15.151
-237	-5906.7	9.0	8.978	-197	-5415.1	15.2	15.291
-236	-5897.6	9.1	9.156	-196	-5399.8	15.3	15.431
-235	-5888.4	9.2	9.326	-195	-5384.3	15.5	15.571
-234	-5879.0	9.4	9.495	-194	-5368.6	15.7	15.711
-233	-5869.4	9.6	9.666	-193	-5352.8	15.8	15.851

THERMOCOUPLE TABLE FOR N.AG VS CONST., ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-192	-5336.9	15.9	15.991	-152	-4586.9	21.3	21.379
-191	-5320.9	16.0	16.131	-151	-4565.5	21.4	21.509
-190	-5304.7	16.2	16.271	-150	-4543.8	21.7	21.640
-189	-5288.4	16.3	16.411	-149	-4522.1	21.7	21.770
-188	-5272.0	16.4	16.551	-148	-4500.3	21.8	21.900
-187	-5255.4	16.6	16.691	-147	-4478.4	21.9	22.030
-186	-5238.5	16.9	16.831	-146	-4456.3	22.1	22.160
-185	-5221.5	17.0	16.971	-145	-4434.0	22.3	22.289
-184	-5204.4	17.1	17.111	-144	-4411.7	22.3	22.420
-183	-5187.1	17.3	17.251	-143	-4389.3	22.4	22.549
-182	-5169.7	17.4	17.391	-142	-4366.7	22.6	22.679
-181	-5152.2	17.5	17.531	-141	-4344.0	22.7	22.809
-180	-5134.5	17.7	17.671	-140	-4321.1	22.9	22.940
-179	-5116.8	17.7	17.811	-139	-4298.1	23.0	23.069
-178	-5098.9	17.9	17.951	-138	-4275.0	23.1	23.199
-177	-5080.9	18.0	18.091	-137	-4251.8	23.2	23.329
-176	-5062.6	18.3	18.231	-136	-4228.4	23.4	23.460
-175	-5044.3	18.3	18.371	-135	-4204.9	23.5	23.588
-174	-5025.9	18.4	18.512	-134	-4181.2	23.7	23.708
-173	-5007.3	18.6	18.649	-133	-4157.5	23.7	23.828
-172	-4988.6	18.7	18.780	-132	-4133.7	23.8	23.948
-171	-4969.7	18.9	18.910	-131	-4109.7	24.0	24.068
-170	-4950.7	19.0	19.040	-130	-4085.6	24.1	24.188
-169	-4931.6	19.1	19.169	-129	-4061.3	24.3	24.308
-168	-4912.4	19.2	19.299	-128	-4036.9	24.4	24.428
-167	-4893.0	19.4	19.430	-127	-4012.4	24.5	24.548
-166	-4873.5	19.5	19.559	-126	-3987.8	24.6	24.668
-165	-4853.8	19.7	19.689	-125	-3963.1	24.7	24.788
-164	-4834.1	19.7	19.820	-124	-3938.1	25.0	24.908
-163	-4814.2	19.9	19.950	-123	-3913.1	25.0	25.028
-162	-4794.2	20.0	20.079	-122	-3888.0	25.1	25.148
-161	-4774.0	20.2	20.209	-121	-3862.8	25.2	25.268
-160	-4753.7	20.3	20.340	-120	-3837.4	25.4	25.388
-159	-4733.3	20.4	20.469	-119	-3811.9	25.5	25.508
-158	-4712.8	20.5	20.599	-118	-3786.2	25.7	25.628
-157	-4692.2	20.6	20.730	-117	-3760.5	25.7	25.748
-156	-4671.4	20.8	20.859	-116	-3734.7	25.8	25.868
-155	-4650.4	21.0	20.989	-115	-3708.8	25.9	25.988
-154	-4629.4	21.0	21.119	-114	-3682.7	26.1	26.108
-153	-4608.2	21.2	21.250	-113	-3656.4	26.3	26.228

THERMOCOUPLE TABLE FOR N.AG VS CONST., ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.00000.
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TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-112	-3630.1	26.3	26.348	-72	-2484.4	30.8	30.877
-111	-3603.7	26.4	26.468	-71	-2453.4	31.0	30.986
-110	-3577.2	26.5	26.588	-70	-2422.4	31.0	31.096
-109	-3550.5	26.7	26.708	-69	-2391.3	31.1	31.206
-108	-3523.7	26.8	26.828	-68	-2360.1	31.2	31.316
-107	-3496.7	27.0	26.948	-67	-2328.8	31.3	31.427
-106	-3469.7	27.0	27.068	-66	-2297.4	31.4	31.537
-105	-3442.6	27.1	27.188	-65	-2265.9	31.5	31.645
-104	-3415.4	27.2	27.308	-64	-2234.2	31.7	31.745
-103	-3388.1	27.3	27.428	-63	-2202.5	31.7	31.845
-102	-3360.7	27.4	27.548	-62	-2170.6	31.9	31.945
-101	-3333.2	27.5	27.668	-61	-2138.6	32.0	32.045
-100	-3305.5	27.7	27.789	-60	-2106.5	32.1	32.145
-99	-3277.8	27.7	27.907	-59	-2074.2	32.3	32.245
-98	-3250.0	27.8	28.017	-58	-2041.9	32.3	32.345
-97	-3222.0	28.0	28.127	-57	-2009.5	32.4	32.445
-96	-3193.7	28.3	28.237	-56	-1977.0	32.5	32.545
-95	-3165.4	28.3	28.347	-55	-1944.4	32.6	32.645
-94	-3137.0	28.4	28.457	-54	-1911.7	32.7	32.744
-93	-3108.5	28.5	28.567	-53	-1878.9	32.8	32.847
-92	-3079.9	28.6	28.677	-52	-1845.9	33.0	32.955
-91	-3051.2	28.7	28.786	-51	-1812.9	33.0	33.055
-90	-3022.4	28.8	28.896	-50	-1779.8	33.1	33.155
-89	-2993.4	29.0	29.007	-49	-1746.7	33.1	33.255
-88	-2964.4	29.0	29.117	-48	-1713.5	33.2	33.355
-87	-2935.3	29.1	29.227	-47	-1680.2	33.3	33.455
-86	-2906.1	29.2	29.337	-46	-1646.8	33.4	33.555
-85	-2876.8	29.3	29.447	-45	-1613.1	33.7	33.655
-84	-2847.4	29.4	29.556	-44	-1579.4	33.7	33.755
-83	-2817.7	29.7	29.667	-43	-1545.6	33.8	33.855
-82	-2788.0	29.7	29.777	-42	-1511.7	33.9	33.955
-81	-2758.1	29.9	29.887	-41	-1477.7	34.0	34.055
-80	-2728.1	30.0	29.997	-40	-1443.6	34.1	34.155
-79	-2698.0	30.1	30.107	-39	-1409.3	34.3	34.255
-78	-2667.7	30.3	30.216	-38	-1375.0	34.3	34.355
-77	-2637.4	30.3	30.326	-37	-1340.6	34.4	34.455
-76	-2607.0	30.4	30.437	-36	-1306.1	34.5	34.555
-75	-2576.5	30.5	30.547	-35	-1271.5	34.6	34.655
-74	-2545.9	30.6	30.657	-34	-1236.8	34.7	34.755
-73	-2515.2	30.7	30.767	-33	-1202.0	34.8	34.855

THERMOCOUPLE TABLE FOR N.AG VS CONST., ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.00000.
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TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-32	-1167.0	35.0	34.955	8	306.9	38.6	38.684
-31	-1132.0	35.0	35.055	9	345.6	38.7	38.771
-30	-1096.9	35.1	35.155	10	384.4	38.8	38.853
-29	-1061.7	35.2	35.255	11	423.4	39.0	38.944
-28	-1026.4	35.3	35.355	12	462.4	39.0	39.034
-27	-991.0	35.4	35.455	13	501.5	39.1	39.123
-26	-955.5	35.5	35.555	14	540.7	39.2	39.214
-25	-919.8	35.7	35.655	15	579.9	39.2	39.304
-24	-884.1	35.7	35.755	16	619.2	39.3	39.393
-23	-848.3	35.8	35.855	17	658.6	39.4	39.484
-22	-812.4	35.9	35.955	18	698.2	39.6	39.574
-21	-776.4	36.0	36.055	19	737.7	39.5	39.663
-20	-740.4	36.0	36.156	20	777.4	39.7	39.754
-19	-704.3	36.1	36.254	21	817.1	39.7	39.842
-18	-668.0	36.3	36.344	22	856.9	39.8	39.922
-17	-631.7	36.3	36.433	23	896.8	39.9	40.002
-16	-595.3	36.4	36.523	24	936.8	40.0	40.082
-15	-558.8	36.5	36.614	25	976.9	40.1	40.162
-14	-522.2	36.6	36.703	26	1017.1	40.2	40.242
-13	-485.5	36.7	36.793				
-12	-448.7	36.8	36.884				
-11	-411.7	37.0	36.973				
-10	-374.7	37.0	37.063				
-9	-337.6	37.1	37.154				
-8	-300.5	37.1	37.243				
-7	-263.3	37.2	37.334				
-6	-226.0	37.3	37.424				
-5	-188.6	37.4	37.514				
-4	-151.1	37.5	37.603				
-3	-113.4	37.7	37.694				
-2	-75.7	37.7	37.784				
-1	-37.9	37.8	37.873				
-0	0.0	37.8	37.964				
1	38.0	38.0	38.053				
2	76.2	38.2	38.143				
3	114.5	38.3	38.234				
4	152.8	38.3	38.323				
5	191.2	38.4	38.413				
6	229.7	38.5	38.503				
7	268.3	38.6	38.594				

THERMOCOUPLE TABLE FOR N.AG VS AUCO , ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.00000.
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TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
1	0.5	0.5	1.050	41	632.9	25.7	25.900
2	2.1	1.6	2.070	42	658.9	26.0	26.230
3	4.7	2.6	3.070	43	685.3	26.4	26.560
4	8.2	3.5	4.040	44	712.0	26.7	26.880
5	12.7	4.5	4.990	45	739.0	27.0	27.200
6	18.2	5.5	5.920	46	766.3	27.3	27.510
7	24.6	6.4	6.820	47	793.9	27.6	27.820
8	31.8	7.2	7.700	48	821.8	27.9	28.120
9	39.9	8.1	8.550	49	850.1	28.3	28.410
10	48.9	9.0	9.380	50	878.7	28.6	28.700
11	58.7	9.8	10.180	51	907.6	28.9	28.980
12	69.3	10.6	10.960	52	936.7	29.1	29.250
13	80.6	11.3	11.710	53	966.1	29.4	29.520
14	92.7	12.1	12.440	54	995.8	29.7	29.790
15	105.5	12.8	13.140	55	1025.7	29.9	30.050
16	119.0	13.5	13.820	56	1055.8	30.1	30.300
17	133.1	14.1	14.480	57	1086.2	30.4	30.550
18	147.9	14.8	15.120	58	1116.9	30.7	30.790
19	163.3	15.4	15.750	59	1147.8	30.9	31.020
20	179.4	16.1	16.370	60	1178.9	31.1	31.250
21	196.1	16.7	16.970	61	1210.3	31.4	31.470
22	213.4	17.3	17.550	62	1241.9	31.6	31.690
23	231.2	17.8	18.110	63	1273.7	31.8	31.900
24	249.6	18.4	18.660	64	1305.7	32.0	32.110
25	268.5	18.9	19.190	65	1337.9	32.2	32.310
26	287.9	19.4	19.700	66	1370.3	32.4	32.500
27	307.9	20.0	20.190	67	1402.9	32.6	32.690
28	328.4	20.5	20.670	68	1435.7	32.8	32.870
29	349.4	21.0	21.140	69	1468.7	33.0	33.050
30	370.8	21.4	21.600	70	1501.8	33.1	33.220
31	392.6	21.8	22.050	71	1535.1	33.3	33.390
32	414.8	22.2	22.480	72	1568.6	33.5	33.550
33	437.4	22.6	22.900	73	1602.2	33.6	33.710
34	460.4	23.0	23.310	74	1636.0	33.8	33.870
35	483.8	23.4	23.710	75	1669.9	33.9	34.030
36	507.7	23.9	24.100	76	1704.0	34.1	34.180
37	532.0	24.3	24.480	77	1738.2	34.2	34.330
38	556.7	24.7	24.850	78	1772.6	34.4	34.480
39	581.8	25.1	25.210	79	1807.2	34.6	34.630
40	607.2	25.4	25.560	80	1841.9	34.7	34.780

THERMOCOUPLE TABLE FOR N.AG VS AUCO , ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.00000.
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TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
81	1876.7	34.8	34.930	121	3370.8	39.2	39.200
82	1911.7	35.0	35.080	122	3410.0	39.2	39.270
83	1946.9	35.2	35.230	123	3449.3	39.3	39.340
84	1982.2	35.3	35.380	124	3488.7	39.4	39.410
85	2017.6	35.4	35.530	125	3528.2	39.5	39.480
86	2053.2	35.6	35.680	126	3567.7	39.5	39.550
87	2089.0	35.8	35.820	127	3607.3	39.6	39.620
88	2124.9	35.9	35.960	128	3646.9	39.6	39.690
89	2160.9	36.0	36.100	129	3686.6	39.7	39.760
90	2197.0	36.1	36.240	130	3726.4	39.8	39.830
91	2233.3	36.3	36.380	131	3766.2	39.8	39.890
92	2269.7	36.4	36.520	132	3806.1	39.9	39.940
93	2306.3	36.6	36.660	133	3846.0	39.9	39.990
94	2343.0	36.7	36.800	134	3886.0	40.0	40.040
95	2379.8	36.8	36.930	135	3926.0	40.0	40.090
96	2416.7	36.9	37.050	136	3966.1	40.1	40.140
97	2453.7	37.0	37.160	137	4006.3	40.2	40.190
98	2490.8	37.1	37.260	138	4046.5	40.2	40.240
99	2528.1	37.3	37.350	139	4086.8	40.3	40.290
100	2565.5	37.4	37.440	140	4127.1	40.3	40.340
101	2603.0	37.5	37.530	141	4167.5	40.4	40.390
102	2640.6	37.6	37.620	142	4207.9	40.4	40.440
103	2678.2	37.6	37.710	143	4248.4	40.5	40.490
104	2715.9	37.7	37.800	144	4288.9	40.5	40.540
105	2753.7	37.8	37.890	145	4329.5	40.6	40.580
106	2791.6	37.9	37.980	146	4370.1	40.6	40.620
107	2829.6	38.0	38.070	147	4410.7	40.6	40.660
108	2867.7	38.1	38.160	148	4451.4	40.7	40.700
109	2905.9	38.2	38.250	149	4492.1	40.7	40.740
110	2944.2	38.3	38.340	150	4532.9	40.8	40.780
111	2982.6	38.4	38.430	151	4573.7	40.8	40.820
112	3021.1	38.5	38.510	152	4614.5	40.8	40.860
113	3059.6	38.5	38.590	153	4655.4	40.9	40.900
114	3098.2	38.6	38.670	154	4696.3	40.9	40.940
115	3136.9	38.7	38.750	155	4737.3	41.0	40.980
116	3175.7	38.8	38.830	156	4778.3	41.0	41.020
117	3214.6	38.9	38.910	157	4819.3	41.0	41.060
118	3253.5	38.9	38.990	158	4860.4	41.1	41.090
119	3292.5	39.0	39.060	159	4901.5	41.1	41.120
120	3331.6	39.1	39.130	160	4942.6	41.1	41.150

THERMOCOUPLE TABLE FOR N.AG VS AUCO , ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
161	4983.8	41.2	41.180	201	6650.8	42.1	42.060
162	5025.0	41.2	41.210	202	6692.9	42.1	42.070
163	5066.2	41.2	41.240	203	6735.0	42.1	42.080
164	5107.5	41.3	41.270	204	6777.1	42.1	42.090
165	5148.8	41.3	41.300	205	6819.2	42.1	42.100
166	5190.1	41.3	41.330	206	6861.3	42.1	42.110
167	5231.5	41.4	41.360	207	6903.4	42.1	42.120
168	5272.9	41.4	41.390	208	6945.5	42.1	42.130
169	5314.3	41.4	41.420	209	6987.6	42.1	42.140
170	5355.7	41.4	41.450	210	7029.7	42.1	42.150
171	5397.1	41.4	41.480	211	7071.9	42.2	42.160
172	5438.6	41.5	41.510	212	7114.1	42.2	42.170
173	5480.1	41.5	41.540	213	7156.3	42.2	42.180
174	5521.6	41.5	41.560	214	7198.5	42.2	42.190
175	5563.1	41.5	41.580	215	7240.7	42.2	42.200
176	5604.7	41.6	41.600	216	7282.9	42.2	42.210
177	5646.3	41.6	41.620	217	7325.1	42.2	42.220
178	5687.9	41.6	41.640	218	7367.3	42.2	42.230
179	5729.5	41.6	41.660	219	7409.5	42.2	42.240
180	5771.2	41.7	41.680	220	7451.7	42.2	42.250
181	5812.9	41.7	41.700	221	7493.9	42.2	42.260
182	5854.6	41.7	41.720	222	7536.2	42.3	42.270
183	5896.3	41.7	41.740	223	7578.5	42.3	42.280
184	5938.0	41.7	41.760	224	7620.8	42.3	42.290
185	5979.8	41.8	41.780	225	7663.1	42.3	42.300
186	6021.6	41.8	41.800	226	7705.4	42.3	42.310
187	6063.4	41.8	41.820	227	7747.7	42.3	42.310
188	6105.2	41.8	41.840	228	7790.0	42.3	42.310
189	6147.1	41.9	41.860	229	7832.3	42.3	42.310
190	6189.0	41.9	41.880	230	7874.6	42.3	42.310
191	6230.9	41.9	41.900	231	7916.9	42.3	42.310
192	6272.8	41.9	41.920	232	7959.2	42.3	42.310
193	6314.7	41.9	41.940	233	8001.5	42.3	42.310
194	6356.7	42.0	41.960	234	8043.8	42.3	42.310
195	6398.7	42.0	41.980	235	8086.1	42.3	42.310
196	6440.7	42.0	42.000	236	8128.4	42.3	42.310
197	6482.7	42.0	42.020	237	8170.7	42.3	42.310
198	6524.7	42.0	42.030	238	8213.0	42.3	42.310
199	6566.7	42.0	42.040	239	8255.3	42.3	42.310
200	6608.7	42.0	42.050	240	8297.6	42.3	42.310

THERMOCOUPLE TABLE FOR N.AG VS AUCO , ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
241	8339.9	42.3	42.310	281	10031.7	42.3	42.310
242	8382.2	42.3	42.310	282	10074.0	42.3	42.310
243	8424.5	42.3	42.310	283	10116.3	42.3	42.310
244	8466.8	42.3	42.310	284	10158.5	42.2	42.300
245	8509.1	42.3	42.310	285	10200.7	42.2	42.290
246	8551.4	42.3	42.310	286	10242.9	42.2	42.280
247	8593.7	42.3	42.310	287	10285.1	42.2	42.270
248	8636.0	42.3	42.310	288	10327.3	42.2	42.260
249	8678.3	42.3	42.310	289	10369.5	42.2	42.250
250	8720.6	42.3	42.310	290	10411.7	42.2	42.240
251	8762.9	42.3	42.310	291	10453.9	42.2	42.230
252	8805.2	42.3	42.310	292	10496.1	42.2	42.220
253	8847.5	42.3	42.310	293	10538.3	42.2	42.210
254	8889.8	42.3	42.310	294	10580.5	42.2	42.200
255	8932.1	42.3	42.310	295	10622.7	42.2	42.190
256	8974.4	42.3	42.310	296	10664.8	42.1	42.180
257	9016.7	42.3	42.310	297	10706.9	42.1	42.170
258	9059.0	42.3	42.310	298	10749.0	42.1	42.160
259	9101.3	42.3	42.310	299	10791.1	42.1	42.150
260	9143.6	42.3	42.310	300	10833.2	42.1	42.140
261	9185.9	42.3	42.310				
262	9228.2	42.3	42.310				
263	9270.5	42.3	42.310				
264	9312.8	42.3	42.310				
265	9355.1	42.3	42.310				
266	9397.4	42.3	42.310				
267	9439.7	42.3	42.310				
268	9482.0	42.3	42.310				
269	9524.3	42.3	42.310				
270	9566.6	42.3	42.310				
271	9608.9	42.3	42.310				
272	9651.2	42.3	42.310				
273	9693.5	42.3	42.310				
274	9735.7	42.2	42.310				
275	9777.9	42.2	42.310				
276	9820.2	42.3	42.310				
277	9862.5	42.3	42.310				
278	9904.8	42.3	42.310				
279	9947.1	42.3	42.310				
280	9989.4	42.3	42.310				

THERMOCOUPLE TABLE FOR N.AG VS AUCO , ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-272	-9699.2	0.7	1.204	-232	-9063.1	25.7	25.950
-271	-9697.4	1.8	2.222	-231	-9037.0	26.1	26.280
-270	-9694.7	2.7	3.217	-230	-9010.5	26.5	26.608
-269	-9691.0	3.7	4.184	-229	-8983.8	26.7	26.929
-268	-9686.4	4.6	5.131	-228	-8956.8	27.0	27.247
-267	-9680.7	5.7	6.056	-227	-8929.4	27.4	27.557
-266	-9674.2	6.5	6.954	-226	-8901.8	27.6	27.866
-265	-9666.9	7.3	7.829	-225	-8873.8	28.0	28.164
-264	-9658.6	8.3	8.676	-224	-8845.5	28.3	28.454
-263	-9649.5	9.1	9.501	-223	-8816.8	28.7	28.743
-262	-9639.6	9.9	10.299	-222	-8787.9	28.9	29.021
-261	-9628.9	10.7	11.074	-221	-8758.7	29.2	29.291
-260	-9617.5	11.4	11.821	-220	-8729.3	29.4	29.561
-259	-9605.3	12.2	12.546	-219	-8699.6	29.7	29.830
-258	-9592.3	13.0	13.243	-218	-8669.6	30.0	30.087
-257	-9578.8	13.5	13.920	-217	-8639.5	30.1	30.338
-256	-9564.5	14.3	14.577	-216	-8609.0	30.5	30.587
-255	-9549.7	14.8	15.215	-215	-8578.3	30.7	30.825
-254	-9534.2	15.5	15.844	-214	-8547.4	30.9	31.055
-253	-9518.0	16.2	16.461	-213	-8516.2	31.2	31.283
-252	-9501.2	16.8	17.058	-212	-8484.8	31.4	31.504
-251	-9483.8	17.4	17.635	-211	-8453.2	31.6	31.721
-250	-9465.9	17.9	18.194	-210	-8421.3	31.9	31.932
-249	-9447.4	18.5	18.741	-209	-8389.3	32.0	32.141
-248	-9428.5	18.9	19.268	-208	-8357.1	32.2	32.339
-247	-9409.0	19.5	19.774	-207	-8324.7	32.4	32.529
-246	-9388.9	20.1	20.263	-206	-8292.0	32.7	32.717
-245	-9368.3	20.6	20.741	-205	-8259.2	32.8	32.898
-244	-9347.2	21.1	21.210	-204	-8226.2	33.0	33.076
-243	-9325.8	21.4	21.669	-203	-8193.0	33.2	33.246
-242	-9303.9	21.9	22.115	-202	-8159.7	33.3	33.414
-241	-9281.7	22.2	22.544	-201	-8126.2	33.5	33.574
-240	-9259.0	22.7	22.962	-200	-8092.6	33.6	33.734
-239	-9236.0	23.0	23.371	-199	-8058.8	33.8	33.895
-238	-9212.5	23.5	23.769	-198	-8024.8	34.0	34.053
-237	-9188.5	24.0	24.158	-197	-7990.7	34.1	34.203
-236	-9164.2	24.3	24.536	-196	-7956.5	34.2	34.352
-235	-9139.4	24.8	24.905	-195	-7922.0	34.5	34.502
-234	-9114.2	25.2	25.263	-194	-7887.4	34.6	34.653
-233	-9088.8	25.4	25.612	-193	-7852.7	34.7	34.803

THERMOCOUPLE TABLE FOR N.AG VS AUCO , ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-192	-7817.9	34.8	34.953	-152	-6323.2	39.1	39.211
-191	-7782.9	35.0	35.102	-151	-6283.9	39.3	39.280
-190	-7747.6	35.3	35.253	-150	-6244.6	39.3	39.351
-189	-7712.3	35.3	35.403	-149	-6205.2	39.4	39.420
-188	-7676.9	35.4	35.553	-148	-6165.7	39.5	39.490
-187	-7641.3	35.6	35.701	-147	-6126.2	39.5	39.560
-186	-7605.5	35.8	35.841	-146	-6086.6	39.6	39.630
-185	-7569.5	36.0	35.981	-145	-6047.0	39.6	39.701
-184	-7533.5	36.0	36.121	-144	-6007.3	39.7	39.771
-183	-7497.4	36.1	36.261	-143	-5967.5	39.8	39.840
-182	-7461.1	36.3	36.401	-142	-5927.6	39.9	39.898
-181	-7424.6	36.5	36.541	-141	-5887.8	39.8	39.947
-180	-7388.0	36.6	36.682	-140	-5847.8	40.0	39.998
-179	-7351.3	36.7	36.820	-139	-5807.8	40.0	40.048
-178	-7314.5	36.8	36.949	-138	-5767.8	40.0	40.097
-177	-7277.6	36.9	37.067	-137	-5727.7	40.1	40.148
-176	-7240.6	37.0	37.176	-136	-5687.5	40.2	40.197
-175	-7203.4	37.2	37.273	-135	-5647.3	40.2	40.247
-174	-7166.1	37.3	37.364	-134	-5607.0	40.3	40.298
-173	-7128.7	37.4	37.453	-133	-5566.7	40.3	40.347
-172	-7091.2	37.5	37.543	-132	-5526.3	40.4	40.398
-171	-7053.6	37.6	37.634	-131	-5485.9	40.4	40.448
-170	-7016.0	37.6	37.723	-130	-5445.4	40.5	40.498
-169	-6978.3	37.7	37.813	-129	-5404.8	40.6	40.546
-168	-6940.5	37.8	37.903	-128	-5364.2	40.6	40.586
-167	-6902.5	38.0	37.993	-127	-5323.6	40.6	40.626
-166	-6864.5	38.0	38.083	-126	-5283.0	40.6	40.666
-165	-6826.4	38.1	38.174	-125	-5242.3	40.7	40.706
-164	-6788.2	38.2	38.264	-124	-5201.6	40.7	40.746
-163	-6749.9	38.3	38.354	-123	-5160.8	40.8	40.786
-162	-6711.5	38.4	38.442	-122	-5120.0	40.8	40.826
-161	-6673.0	38.5	38.522	-121	-5079.2	40.8	40.866
-160	-6634.4	38.6	38.602	-120	-5038.3	40.9	40.906
-159	-6595.8	38.6	38.682	-119	-4997.4	40.9	40.946
-158	-6557.1	38.7	38.762	-118	-4956.4	41.0	40.986
-157	-6518.3	38.8	38.842	-117	-4915.4	41.0	41.027
-156	-6479.4	38.9	38.923	-116	-4874.4	41.0	41.064
-155	-6440.5	38.9	39.001	-115	-4833.3	41.1	41.094
-154	-6401.5	39.0	39.071	-114	-4792.2	41.1	41.124
-153	-6362.3	39.2	39.140	-113	-4751.0	41.2	41.154

THERMOCOUPLE TABLE FOR N.AG VS AUCO , ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-112	-4709.8	41.2	41.184	-72	-3042.7	42.1	42.062
-111	-4668.7	41.1	41.214	-71	-3000.6	42.1	42.071
-110	-4627.4	41.3	41.244	-70	-2958.5	42.1	42.082
-109	-4586.1	41.3	41.274	-69	-2916.4	42.1	42.091
-108	-4544.8	41.3	41.305	-68	-2874.3	42.1	42.101
-107	-4503.5	41.3	41.334	-67	-2832.2	42.1	42.111
-106	-4462.1	41.4	41.365	-66	-2790.1	42.1	42.122
-105	-4420.7	41.4	41.394	-65	-2748.0	42.1	42.131
-104	-4379.3	41.4	41.424	-64	-2705.9	42.1	42.141
-103	-4337.9	41.4	41.455	-63	-2663.8	42.1	42.151
-102	-4296.5	41.4	41.484	-62	-2621.6	42.2	42.161
-101	-4255.0	41.5	41.515	-61	-2579.4	42.2	42.171
-100	-4213.5	41.5	41.543	-60	-2537.2	42.2	42.181
-99	-4172.0	41.5	41.563	-59	-2495.0	42.2	42.192
-98	-4130.5	41.5	41.583	-58	-2452.8	42.2	42.201
-97	-4088.9	41.6	41.603	-57	-2410.6	42.2	42.211
-96	-4047.3	41.6	41.623	-56	-2368.4	42.2	42.222
-95	-4005.7	41.6	41.643	-55	-2326.2	42.2	42.231
-94	-3964.1	41.6	41.663	-54	-2284.0	42.2	42.241
-93	-3922.4	41.7	41.683	-53	-2241.8	42.2	42.251
-92	-3880.7	41.7	41.703	-52	-2199.6	42.2	42.261
-91	-3839.0	41.7	41.723	-51	-2157.3	42.3	42.272
-90	-3797.3	41.7	41.743	-50	-2115.0	42.3	42.281
-89	-3755.6	41.7	41.763	-49	-2072.7	42.3	42.292
-88	-3713.8	41.8	41.783	-48	-2030.4	42.3	42.302
-87	-3672.0	41.8	41.803	-47	-1988.1	42.3	42.310
-86	-3630.2	41.8	41.823	-46	-1945.8	42.3	42.310
-85	-3588.3	41.9	41.843	-45	-1903.5	42.3	42.310
-84	-3546.4	41.9	41.863	-44	-1861.2	42.3	42.310
-83	-3504.5	41.9	41.883	-43	-1818.9	42.3	42.310
-82	-3462.6	41.9	41.903	-42	-1776.6	42.3	42.310
-81	-3420.8	41.8	41.923	-41	-1734.3	42.3	42.310
-80	-3378.8	42.0	41.943	-40	-1692.0	42.3	42.310
-79	-3336.8	42.0	41.963	-39	-1649.7	42.3	42.310
-78	-3294.8	42.0	41.983	-38	-1607.4	42.3	42.310
-77	-3252.8	42.0	42.004	-37	-1565.1	42.3	42.310
-76	-3210.8	42.0	42.022	-36	-1522.8	42.3	42.310
-75	-3168.8	42.0	42.031	-35	-1480.5	42.3	42.310
-74	-3126.8	42.0	42.042	-34	-1438.2	42.3	42.310
-73	-3084.8	42.0	42.052	-33	-1395.9	42.3	42.310

THERMOCOUPLE TABLE FOR N.AG VS AUCO , ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. UNPUB. WITH CALC. MULT. FACTOR OF 1.00000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-32	-1353.6	42.3	42.310	8	338.2	42.3	42.310
-31	-1311.3	42.3	42.310	9	380.5	42.3	42.311
-30	-1269.0	42.3	42.310	10	422.8	42.3	42.308
-29	-1226.7	42.3	42.310	11	465.0	42.2	42.298
-28	-1184.4	42.3	42.310	12	507.2	42.2	42.289
-27	-1142.1	42.3	42.310	13	549.4	42.2	42.279
-26	-1099.8	42.3	42.310	14	591.6	42.2	42.268
-25	-1057.5	42.3	42.310	15	633.8	42.2	42.259
-24	-1015.2	42.3	42.310	16	676.0	42.2	42.248
-23	-972.9	42.3	42.310	17	718.2	42.2	42.239
-22	-930.6	42.3	42.310	18	760.4	42.2	42.228
-21	-888.3	42.3	42.310	19	802.6	42.2	42.218
-20	-846.0	42.3	42.310	20	844.8	42.2	42.208
-19	-803.7	42.3	42.310	21	887.0	42.2	42.198
-18	-761.4	42.3	42.310	22	929.2	42.2	42.188
-17	-719.1	42.3	42.310	23	971.3	42.1	42.178
-16	-676.8	42.3	42.310	24	1013.4	42.1	42.168
-15	-634.5	42.3	42.310	25	1055.5	42.1	42.158
-14	-592.2	42.3	42.310	26	1097.6	42.1	42.148
-13	-549.9	42.3	42.310				
-12	-507.6	42.3	42.310				
-11	-465.3	42.3	42.310				
-10	-423.0	42.3	42.310				
-9	-380.7	42.3	42.310				
-8	-338.4	42.3	42.310				
-7	-296.1	42.3	42.310				
-6	-253.8	42.3	42.310				
-5	-211.5	42.3	42.310				
-4	-169.2	42.3	42.310				
-3	-126.9	42.3	42.310				
-2	-84.6	42.3	42.310				
-1	-42.3	42.3	42.310				
-0	0.0	42.2	42.310				
1	42.2	42.2	42.310				
2	84.4	42.2	42.310				
3	126.7	42.3	42.310				
4	169.0	42.3	42.310				
5	211.3	42.3	42.310				
6	253.6	42.3	42.310				
7	295.9	42.3	42.310				

APPENDIX B

Low temperature thermocouple information and services.

I. "STANDARD" TABLES

The Cryogenic Data Center of the National Bureau of Standards maintains "standard" tables of voltage vs. temperature for ten thermocouple pairs frequently used at low temperatures. These tables contain interim values which will be useful until national NBS, ASTM, and ASA tables are established for cryogenic temperatures. The "standard" tables now available are slightly different than the previously published tables. The differences are caused by adjusting the older tables to obtain smoother first and second differences of the voltages and sensitivities. The materials, ISA designations, temperature ranges of the data, and literature references are shown below.

Material	Letter Designations	Temp Range	References
Copper vs Constantan	TP-TN	1-300°K	1,2
Copper vs Gold-cobalt	None	1-300°K	1,2
Copper vs "normal" Silver	None	1-300°K	1,2
Chromel* vs Alumel*	KP-KN	1-280°K	2
Chromel* vs Constantan	EP-EN	1-280°K	- -
Chromel* vs Gold-cobalt	None	1-280°K	- -
Iron vs Constantan (modified 1913)	JP-JN	1-280°K	2
Iron vs Constantan (R.P. 1080)	YP-YN	1-280°K	2
"Normal" Silver vs Constantan	None	1-300°K	- -
"Normal" Silver vs Gold-cobalt	None	1-300°K	- -

* Registered Trademark

II. MODIFICATIONS OF "STANDARD" TABLES

Users should recognize that a particular thermocouple pair will not normally generate voltages identical to those listed in the "standard" tables. For example, if two copper vs. constantan thermocouples are made from two different spools of constantan, the voltages produced by these thermocouples will be different, and neither will be in exact agreement with the "standard" copper vs. constantan table.

To overcome this difficulty and achieve the best possible accuracy in the use of thermocouples the user generally resorts to a spot calibration. The spot calibration establishes a voltage for a given thermocouple for a definite temperature difference. The ratio of voltage (measured) to voltage ("standard" table) is then applied as a factor to the existing "standard" table voltage. The result is a working table for a particular thermocouple. A working calibration table could be established for every thermocouple in use; however, it will generally suffice to have one working table for all of the thermocouples made from one spool of wire.

Calibrations and certifications of thermocouple materials in some temperature ranges can be obtained from the Temperature Physics Section of the Institute for Basic Standards, National Bureau of Standards, Washington, D. C. The Cryogenics Division of the Institute for Materials Research does not perform spot calibrations or thermocouple certifications.

III. AVAILABLE SERVICES AND DATA

The Cryogenic Data Center will furnish, at cost, the following materials or services upon request.

1. "Standard" thermocouple tables. "Standard" thermocouple tables are available for the ten materials listed in part I. These printed tables contain the following information: temperature (one degree Kelvin or Celsius intervals), voltage (microvolts), sensitivity (microvolts per degree), and the first differences in the voltages (microvolts). Samples of the tabular data are shown in examples 1 and 2. Example 1 is in degrees Kelvin with a 0.0 degree Kelvin reference temperature and example 2 is in degrees Celsius with a 0.0 degree Celsius reference temperature.

2. "Standard" thermocouple data decks. The data on the computer cards is the same as that in the printed tables except that the voltage first differences are omitted and the cards have only degree Kelvin intervals with a 0.0 degree Kelvin reference temperature. The card decks are color striped to agree as nearly as possible with ISA's recommended color code for positive thermocouple extension wire. Example 3 is a typical data card.

3. A program deck, FACTOR, written in FORTRAN II or IV. FACTOR was developed to adjust the "standard" data to fit a particular thermocouple. This program will be discussed in detail later in this report.

4. Computer modified tables and data decks. The Cryogenic Data Center will process, on the NBS computer, spot calibration data furnished by the user. The Data Center will then supply the user with any combination of adjusted working tables and data decks. The following information must be given by the user in order to produce a working table or card deck for a particular thermocouple:

a) Users name (1 to 12 characters)

b) Company or laboratory (1 to 15 characters)

c) Thermocouple material

d) Lot identification (1 to 6 characters)

e) Temperature units (degree Kelvin or degrees Celsius)

f) Reference temperature (same units as in (e))

g) Spot calibration high temperature (same units as in (e))

h) Spot calibration low temperature (same units as in (e))

i) Resulting voltage (absolute value in microvolts)

j) Test date (1 to 14 characters)

k) Output form: Tables only or tables and cards

Support necessary for the development of the services described in this paper has been supplied by NASA, Marshall Space Flight Center, Huntsville, Alabama. The Cryogenic Data Center will assume the responsibility of maintaining the services on a cost basis.

THERMOCOUPLE TABLE FOR COPPER VS AUCO , ISA TYPE UNDESIG., BASED ON NAT. BUR. OF STANDARDS PUB. R-188 WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. K
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

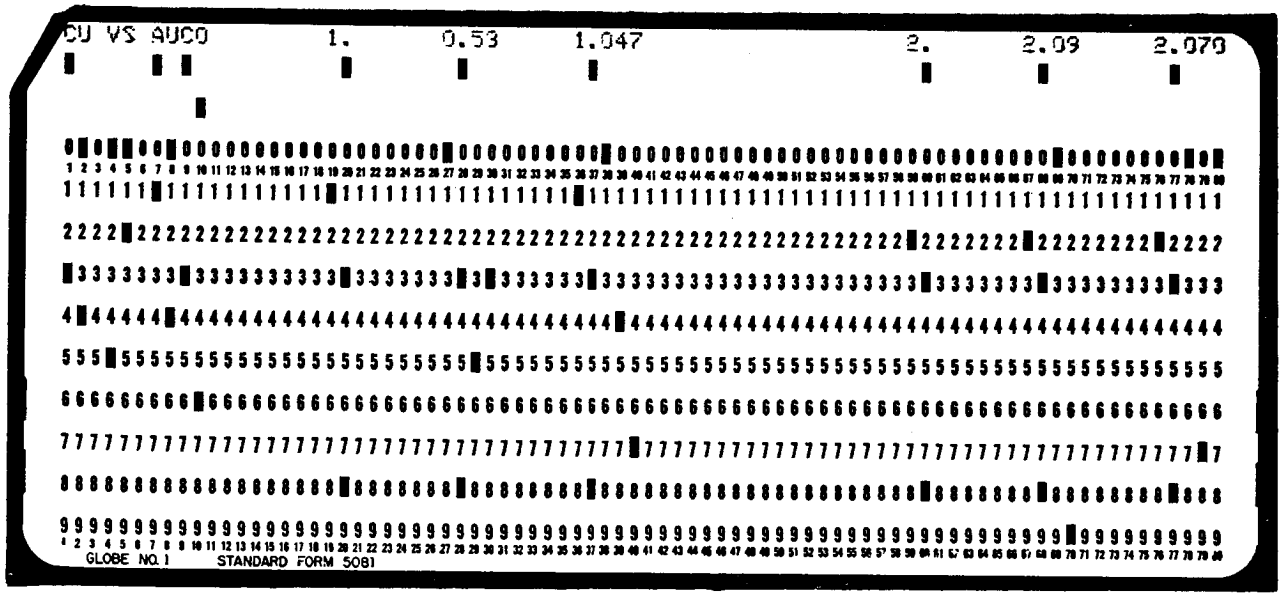
TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK	TEMP DEG K	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGK
1	0.53	0.53	1.047	41	640.6	26.4	26.600
2	2.09	1.56	2.070	42	667.4	26.8	26.963
3	4.66	2.57	3.069	43	694.6	27.2	27.317
4	8.22	3.56	4.044	44	722.1	27.5	27.662
5	12.74	4.52	4.994	45	749.9	27.8	27.998
6	18.20	5.46	5.920	46	778.1	28.2	28.326
7	24.57	6.37	6.822	47	806.6	28.5	28.646
8	31.83	7.26	7.700	48	835.4	28.8	28.958
9	39.96	8.13	8.554	49	864.5	29.1	29.262
10	48.93	8.97	9.383	50	893.9	29.4	29.558
11	58.72	9.79	10.188	51	923.6	29.7	29.846
12	69.30	10.58	10.969	52	953.6	30.0	30.127
13	80.65	11.35	11.726	53	983.9	30.3	30.402
14	92.75	12.10	12.458	54	1014.4	30.5	30.669
15	105.6	12.9	13.165	55	1045.2	30.8	30.929
16	119.1	13.5	13.848	56	1076.2	31.0	31.183
17	133.2	14.1	14.513	57	1107.5	31.3	31.430
18	148.0	14.8	15.165	58	1139.1	31.6	31.671
19	163.5	15.5	15.803	59	1170.9	31.8	31.906
20	179.6	16.1	16.427	60	1202.9	32.0	32.134
21	196.4	16.8	17.038	61	1235.1	32.2	32.356
22	213.7	17.3	17.635	62	1267.5	32.4	32.573
23	231.6	17.9	18.219	63	1300.2	32.7	32.784
24	250.1	18.5	18.791	64	1333.1	32.9	32.989
25	269.2	19.1	19.349	65	1366.2	33.1	33.189
26	288.8	19.6	19.893	66	1399.5	33.3	33.384
27	308.9	20.1	20.424	67	1433.0	33.5	33.574
28	329.6	20.7	20.941	68	1466.7	33.7	33.759
29	350.8	21.2	21.446	69	1500.5	33.8	33.938
30	372.5	21.7	21.938	70	1534.5	34.0	34.112
31	394.7	22.2	22.417	71	1568.7	34.2	34.280
32	417.3	22.6	22.884	72	1603.1	34.4	34.442
33	440.4	23.1	23.340	73	1637.6	34.5	34.599
34	464.0	23.6	23.785	74	1672.3	34.7	34.753
35	488.0	24.0	24.218	75	1707.1	34.8	34.905
36	512.4	24.4	24.640	76	1742.1	35.0	35.056
37	537.3	24.9	25.052	77	1777.2	35.1	35.205
38	562.6	25.3	25.454	78	1812.5	35.3	35.352
39	588.2	25.6	25.846	79	1847.9	35.4	35.497
40	614.2	26.0	26.228	80	1883.5	35.6	35.641

EXAMPLE I

THERMOCOUPLE TABLE FOR COPPER VS AUCO , ISA TYPE UNDESIG., BASED ON
NAT. BUR. OF STANDARDS PUB. R-188 WITH CALC. MULT. FACTOR OF 1.000.
GENERAL , LOT ANY . USERS REFERENCE TEMPERATURE 0. DEG. C
TEST DATE SEPTEMBER 1,60 BY POWELL,BUNCH

TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC	TEMP DEG C	EMF MIC V	DELEMF MIC V	DE/DT MIC V/DGC
-272	-9871.05	0.70	1.202	-232	-9227.2	26.4	26.655
-271	-9869.34	1.71	2.221	-231	-9200.3	26.9	27.017
-270	-9866.62	2.72	3.217	-230	-9173.0	27.3	27.369
-269	-9862.91	3.71	4.188	-229	-9145.5	27.5	27.713
-268	-9858.25	4.66	5.134	-228	-9117.6	27.9	28.048
-267	-9852.65	5.60	6.057	-227	-9089.4	28.2	28.375
-266	-9846.15	6.50	6.955	-226	-9060.8	28.6	28.693
-265	-9838.75	7.40	7.830	-225	-9032.0	28.8	29.004
-264	-9830.50	8.25	8.680	-224	-9002.9	29.1	29.307
-263	-9821.40	9.10	9.505	-223	-8973.4	29.5	29.602
-262	-9811.49	9.91	10.307	-222	-8943.7	29.7	29.889
-261	-9800.80	10.69	11.084	-221	-8913.6	30.1	30.169
-260	-9789.33	11.47	11.837	-220	-8883.3	30.3	30.442
-259	-9777.11	12.22	12.566	-219	-8852.7	30.6	30.708
-258	-9764.2	12.9	13.269	-218	-8821.9	30.8	30.968
-257	-9750.6	13.6	13.949	-217	-8790.9	31.0	31.220
-256	-9736.4	14.2	14.612	-216	-8759.5	31.4	31.467
-255	-9721.5	14.9	15.262	-215	-8727.9	31.6	31.707
-254	-9705.9	15.6	15.897	-214	-8696.1	31.8	31.941
-253	-9689.7	16.2	16.520	-213	-8664.0	32.1	32.168
-252	-9672.8	16.9	17.128	-212	-8631.8	32.2	32.389
-251	-9655.4	17.4	17.723	-211	-8599.4	32.4	32.605
-250	-9637.4	18.0	18.306	-210	-8566.6	32.8	32.815
-249	-9618.8	18.6	18.876	-209	-8533.7	32.9	33.019
-248	-9599.6	19.2	19.431	-208	-8500.6	33.1	33.219
-247	-9580.0	19.6	19.974	-207	-8467.2	33.4	33.413
-246	-9559.8	20.2	20.502	-206	-8433.7	33.5	33.602
-245	-9539.0	20.8	21.018	-205	-8400.0	33.7	33.786
-244	-9517.7	21.3	21.521	-204	-8366.2	33.8	33.964
-243	-9495.9	21.8	22.011	-203	-8332.1	34.1	34.138
-242	-9473.7	22.2	22.488	-202	-8297.9	34.2	34.305
-241	-9451.0	22.7	22.953	-201	-8263.5	34.4	34.466
-240	-9427.8	23.2	23.408	-200	-8229.0	34.5	34.622
-239	-9404.2	23.6	23.851	-199	-8194.2	34.8	34.776
-238	-9380.1	24.1	24.282	-198	-8159.4	34.8	34.928
-237	-9355.6	24.5	24.702	-197	-8124.4	35.0	35.078
-236	-9330.7	24.9	25.113	-196	-8089.3	35.1	35.227
-235	-9305.3	25.4	25.513	-195	-8054.0	35.3	35.374
-234	-9279.7	25.6	25.904	-194	-8018.5	35.5	35.519
-233	-9253.6	26.1	26.284	-193	-7982.9	35.6	35.663

EXAMPLE 2



EXAMPLE 3

The Program FACTOR:

To help the user prepare working tables for given thermocouples a computer program called FACTOR has been developed. In order to use the FACTOR program to generate his own "working" data the user is presumed to have:

1. The program FACTOR (card deck),
2. The appropriate "standard" thermocouple card deck,
3. Results from the user's spot calibration (to be punched as data cards), and
4. Access to a computer which will accept either FORTRAN II or IV.

The FORTRAN II version of FACTOR was written for an IBM model 7090, but should be compatible with IBM models 7070/7074, 705 and 704. FACTOR may be compatible as written or easily adapted to some other types of computers. When ordering a FACTOR program, the type of computer to be used should be specified.

The FACTOR program calculates the proper ratio of voltage (measured) to voltage ("standard" table), applies it to the existing "standard" thermocouple table and produces a working table for a particular thermocouple. FACTOR is designed to allow any number of data decks to be processed at one time, and any number of adjustments to be made on any or all of the decks. The options available in the FACTOR program are:

1. FACTOR program in either FORTRAN II or FORTRAN IV language,
2. Output in degrees Kelvin, °K, reference temperature in °K,

3. Output in degrees Celsius, °C, reference temperature in °C,
4. Output in the form of printed tables,
5. Output in the form of printed tables and punched data cards,
6. The reference temperature (emf zero) may be any temperature that falls within the range of the "standard" tables.

These options are selected by the user by punching cards as described below.

Description of User Punched Cards:

There are three cards with which the user must concern himself. Two cards must be punched by the user for each set of output (tables or tables and cards in either °K or °C with one reference temperature).

1. Card A contains the information from the spot calibration.
2. Card B identifies the material, user, date, etc.

Card Punching Detail:

Card A

Columns 1 - 6:	System of units; either DEG. K or DEG. C. The space between the period and K or C is required.
Columns 11 - 20:	High temperature of spot calibration; must include a decimal point (number of decimal points carried is users option) and units must be consistent with system of units chosen in columns 1 - 6.
Columns 21 - 30:	Low temperature of spot calibration; same form as used in columns 11 - 20 (number of decimal places need not be the same).

Columns 31 - 40: Voltage from spot calibration; units must be microvolts. There must be a decimal point.

Columns 41 - 50: Reference temperature; there must be a decimal point and must be in the units chosen in columns 1 - 6.

Columns 58 - 60: Punch YES if punched cards are desired in addition to a printed table. Punch NO in columns 58 - 59 if only a table is wanted.

Card B

Columns 1 - 15: Company or laboratory name; may be any length up to 15 letters.

Columns 21 - 26: Material lot number; may be any coding desired to identify the particular spool of wire in question, and may be any length up to six characters.

Columns 31 - 42: Users name; may be any length up to 12 characters.

Columns 51 - 64: Date of test; may be written in any form desired within the given space, and may be any length up to 14 characters.

The third card is called REPEAT card and is used as follows: the repeat card is used only when more than one set of output is desired for the same material. If the user wishes to process two or more thermocouples of the same material in one machine run he must punch a REPEAT card as described below for each extra thermocouple.

REPEAT Card

Columns 1 - 21:	Punch REPEAT LAST T.C. DECK
Column 50	Punch 0 (Ed. zero)
Columns 55 - 60:	Punch DEG. K; must punch DEG. K regardless of units wanted. There must be a space between the period and K.
Columns 68 - 70:	Punch YES

Example:

As an example of how the FACTOR program may be used suppose the user has two "standard" thermocouple decks - one of type XP-XN and the other of type ZP-ZN. The temperature range of the "standard" deck for the X material is 0 - 300°K and for the Z material it is 0 - 280°K. The user has three spools of the X material and two spools of the Z material. The user identifies the three spools of X material as 001, 002, and 003; the two spools of Z material are identified as 101 and 102.

Spot calibrations are made on each spool in question (5 tests). Each spot calibration was done with a high temperature of 273.15°K (0.0°C) and a low temperature of 76.7°K (-196.95°C). The data taken in each test was the high and low temperatures and the resulting voltage in microvolts.

Let us further suppose that the user is JOHN DOE of DUMMY COMPANY, and that the test date was JANUARY 3, 1965.

XP-XN Material

Spool 001:	The output is to be a table in °K with a 90.0°K reference temperature (first set of output). The user would also like a table and punched cards in °C with a 0.0°C reference temperature. (second set of output).

Spool 002: The output is to be a table in °K with 0.0°K reference temperature (third set of output).

Spool 003: The output is to be a table and punched cards in °K with a 77.0°K reference temperature (fourth set of output).

Spool 101: The output is to be a table in °C with a reference temperature of -167.90°C (fifth set of output).

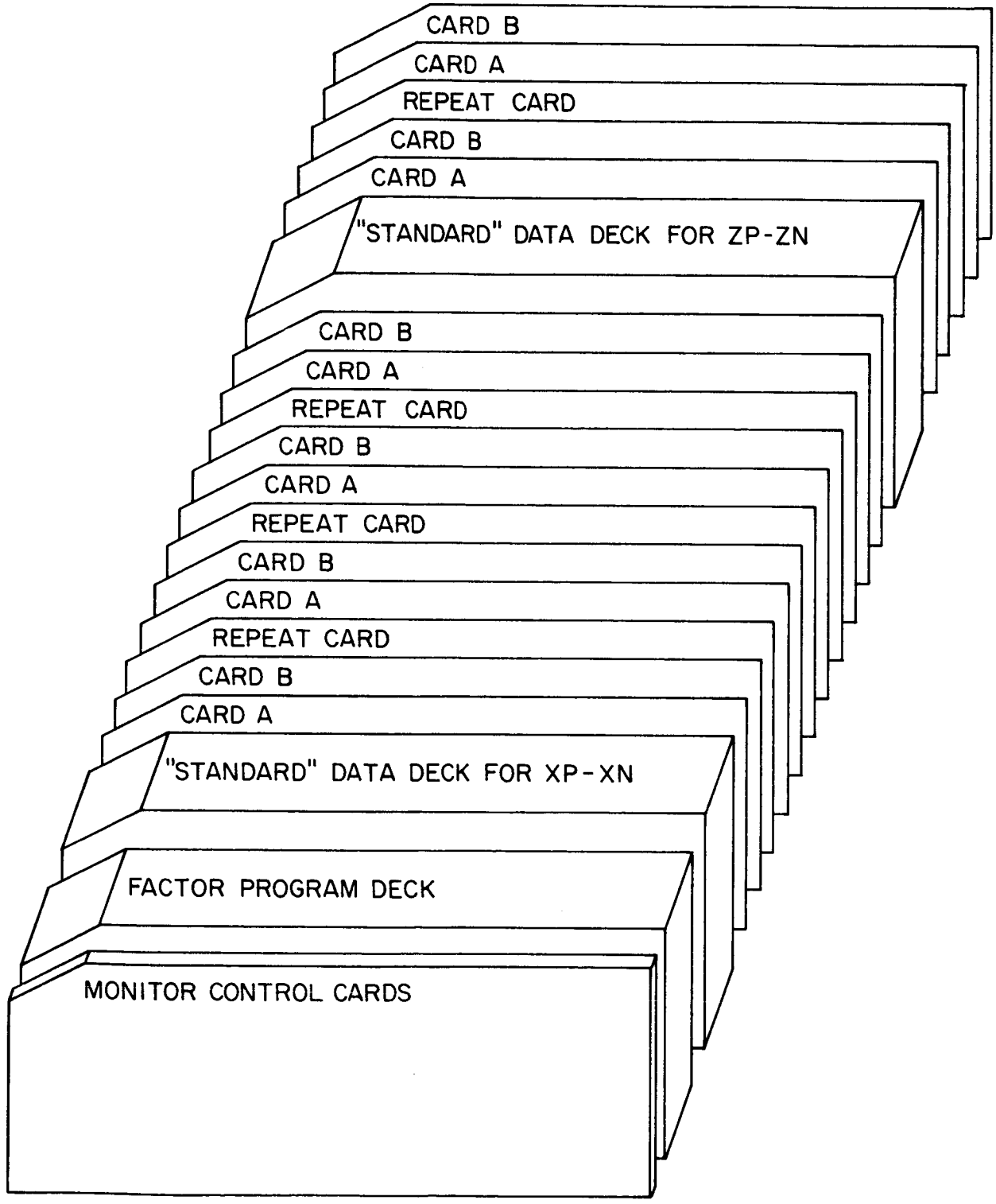
Spool 102: The output is to be a table and cards in °K with a 20.0°K reference temperature (sixth set of output).

The deck arrangement and the "user punched cards" for this example are illustrated on the following pages.

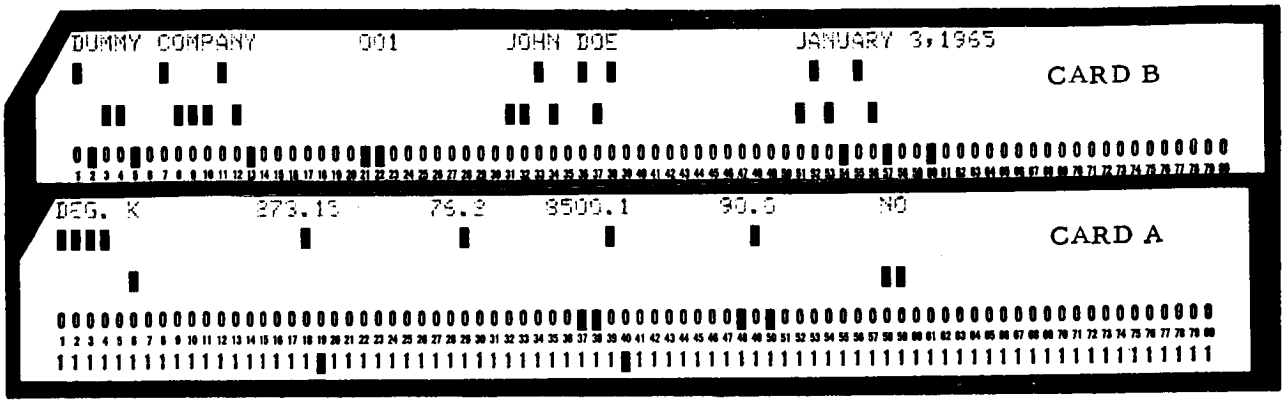
The MONITOR CONTROL CARDS shown in the deck arrangement will differ to some degree for most computer installations. Information concerning what cards are necessary and how to punch them should be available from the particular computer facilities.

The "standard" data deck for each thermocouple material will consist of KEY CARD 1, KEY CARD 2, and the thermocouple data. These KEY cards are already punched and must not be changed.

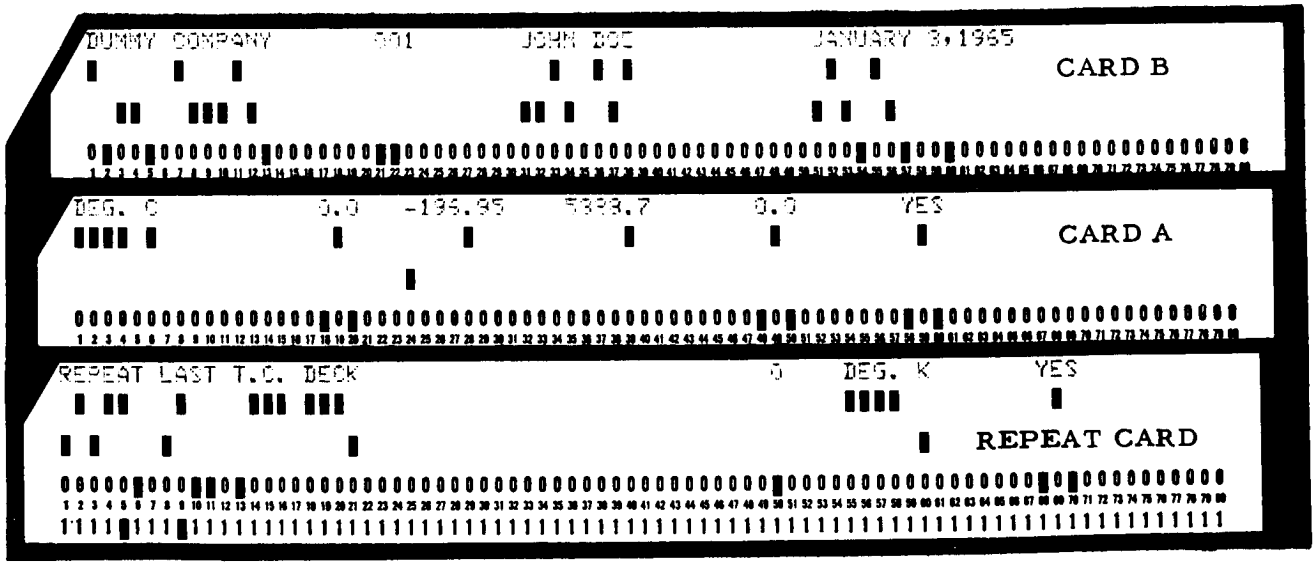
NOTE: The monitors used in some computer facilities will differ to some extent from the standard IBM monitor for which FACTOR was written. The FACTOR program uses tape five as a peripheral read unit, tape six as a peripheral print unit, and tape seven as a peripheral punch unit. If the monitor being used utilizes different tape units for these functions the program must be altered to indicate the tape units needed. As it is now written the FACTOR program uses the read units in statements 100, 105, 120, 140 and 150, the print unit in statements 665, 680, 690, 700, 725, 735, 800, 810, 865, 870, 880, 890, 955, 965, 1020 and 1030, and the punch unit in statements 1095 and 1097.



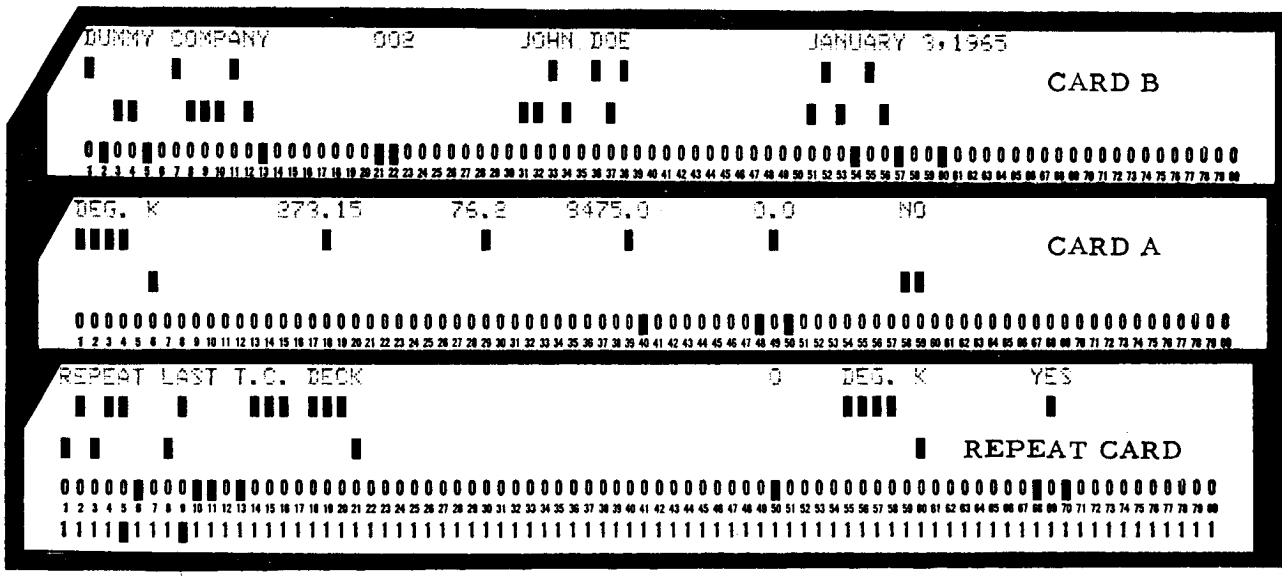
EXAMPLE DECK ARRANGEMENT



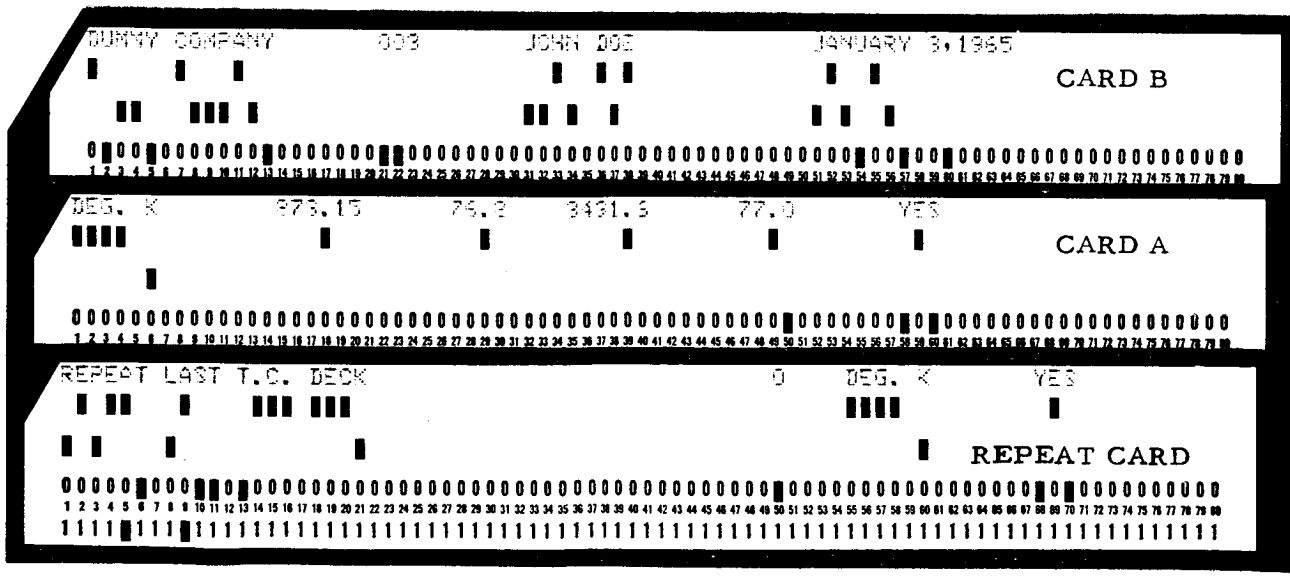
These cards immediately follow the data deck of the XP-XN material. They furnish the FACTOR program with the data required to generate the first set of output from spool 001.



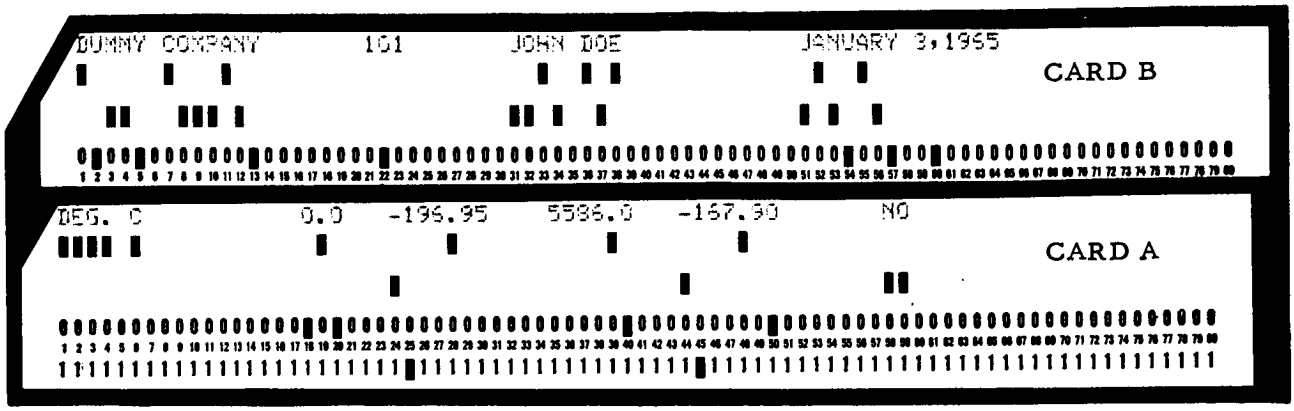
Information for the second set of output from spool 001 is supplied by these three cards.



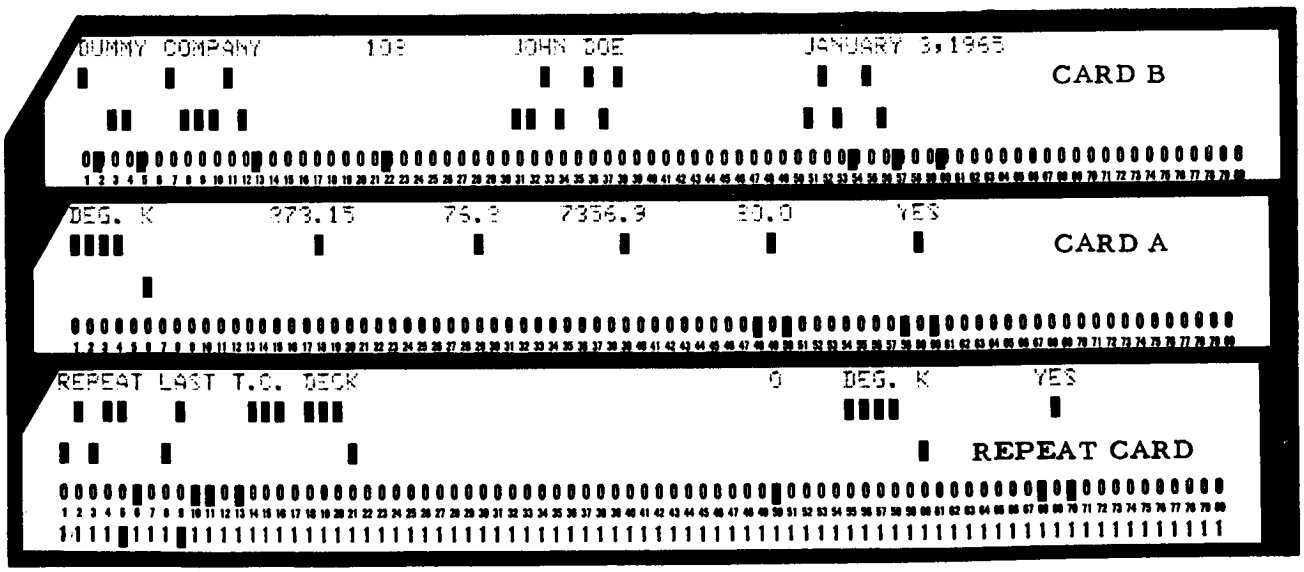
Third set of output



Fourth set of output



These cards follow the "standard" data deck for the ZP-ZN material. Generate the fifth set of output.



Sixth and final set of output.

APPENDIX C

FACTOR program listing in Fortran II, Fortran IV, and Fortran 3600.

FACTOR PROGRAM (FORTRAN II)

```
   10 FORMAT(A6,4X,4F10.0,7X,A3)
   11 FORMAT(49X,I1,4X,A6,7X,A3)
   12 FORMAT(A6,A6,A3,5X,A6,4X,A6,A6,8X,A6,A6,A2)
   13 FORMAT(A6,A4,F10.0,F10.2,F10.3,10X,F10.0,F10.2,F10.3)
   14 FORMAT(10X,3I10,4A6,A2)
   16 FORMAT(2(10X,3F10.0))
   30 FORMAT(3X,4HTEMP,5X,3HEMF,3X,6HDELEMF,5X,5HDE/DT,7X,4HTEMP,5X,
  3013HEMF,3X,6HDELEMF,5X,5HDE/DT,3X)
   40 FORMAT(2X,5HDEG K,4X,5HMIC V,2X,5HMIC V,4X,9HMIC V/DGK,4X,5HDEG K,
  4014X,5HMIC V,2X,5HMIC V,4X,9HMIC V/DGK//)
   41 FORMAT(2X,5HDEG C,4X,5HMIC V,2X,5HMIC V,4X,9HMIC V/DGC,4X,5HDEG C,
  4114X,5HMIC V,2X,5HMIC V,4X,9HMIC V/DGC//)
   50 FORMAT(I7,F10.2,F7.2,F10.3,I11,F10.1,F7.1,F10.3//)
   55 FORMAT(I7,F10.2,F7.2,F10.3,I11,F10.1,F7.1,F10.3)
   60 FORMAT(I7,F9.1,F7.1,F11.3,I11,F10.1,F7.1,F10.3//)
   65 FORMAT(I7,F9.1,F7.1,F11.3,I11,F10.1,F7.1,F10.3)
   70 FORMAT(I7,F9.1,F7.1,F11.3//)
   80 FORMAT(1H1,24H THERMOCOUPLE TABLE FOR ,A6,4H VS ,A6,11H, ISA TYPE
  801,A6,A2,10H, BASED ON/29H NAT. BUR. OF STANDARDS PUB. ,A6,28H WITH
  802CALC. MULT. FACTOR OF ,F7.5,1H./1X,A6,A6,A3,6H, LOT ,A6,29H. USERS
  803 REFERENCE TEMPERATURE,F7.3,1X,A6/16X,10HTEST DATE ,A6,A6,A2,5H  E
  804Y ,A6,A6//)
   90 DIMENSION T(300),IT(300),TOC(300),EMFIN(300),EMF(300),DELEM(300),
  901DEDTIN(300),DEDT(300)
   95 FREQUENCY 115(300),400(300),425(300),375(300),470(300),625(300),
  951705(300),780(300),1080(300),640(300)
C
C      DATA DECK AND KEY CARDS READ IN
  100 READ INPUT TAPE 5,11,IA,ATEST1,ATEST2
  102 IF(IA)140,140,105
  105 READ INPUT TAPE 5,14,ITEMPI,ITABLE,IFMTCH,AMATP,AMATN,APUB,
 1051         ATYPE1,ATYPE2
  110 K2=IFMTCH+1
  112 ITEMPL=ITABLE
  115 DO 130 I=ITEMPI,ITEMPL,2
  120 READ INPUT TAPE 5,16,T(I),EMFIN(I),DEDTIN(I),T(I+1),EMFIN(I+1),
 1201DEDTIN(I+1)
  130 CONTINUE
  132 K9=K2
  133 IF(IFMTCH)134,134,140
  134 K9=K2+1
  140 READ INPUT TAPE 5,10,AUNIT,TEMPHI,TEMPLO,ETEST,UREFT,ACARD
  141 ITABLE=ITEMPL
  142 IUNIT=1
  144 REFTMP=UREFT
  150 READ INPUT TAPE 5,12,ACOMP1,ACOMP2,ACOMP3,ALOT,ANAMEI,ANAMEL,
 1501ADATE1,ADATE2,ADATE3
C
C      CONVERSION OF REFTMP,TEMPHI, AND TEMPLO INTO DEG. K SYSTEM
  151 IF(AUNIT-ATEST1)152,155,152
  152 REFTMP=REFTMP+273.15
 1152 TEMPHI=TEMPHI+273.15
 2152 TEMPLO=TEMPLO+273.15
 3152 IUNIT=2
```

```
C
C      COMPUTATION OF FACTOR
  155 ITEMLO=TEMPLO
  160 TEMP3=ITEMLO-1
  165 TEMP4=ITEMLO
  170 TEMP5=ITEMLO+1
  175 EMFI3=EMFIN(ITEMLO-1)
  180 EMFI4=EMFIN(ITEMLO)
  185 EMFI5=EMFIN(ITEMLO+1)
  190 U=EMFI3*(TEMPLO-TEMP4)*(TEMPLO-TEMP5)/2.0
  195 V=EMFI4*(TEMPLO-TEMP3)*(TEMP5-TEMPLO)
  200 W=EMFI5*(TEMPLO-TEMP3)*(TEMPLO-TEMP4)/2.0
  205 EMFLO=U+V+W
  210 ITEMHI=TEMPHI
  215 TEMP6=ITEMHI-1
  220 TEMP7=ITEMHI
  225 TEMP8=ITEMHI+1
  230 EMFI6=EMFIN(ITEMHI-1)
  235 EMFI7=EMFIN(ITEMHI)
  240 EMFI8=EMFIN(ITEMHI+1)
  245 X=EMFI6*(TEMPHI-TEMP7)*(TEMPHI-TEMP8)/2.0
  250 Y=EMFI7*(TEMPHI-TEMP6)*(TEMP8-TEMPHI)
  255 Z=EMFI8*(TEMPHI-TEMP6)*(TEMPHI-TEMP7)/2.0
  260 EMFHI=X+Y+Z
  265 ETABLE=EMFHI-EMFLO
  270 FACTOR=ETEST/ETABLE
C
C      CALCULATION OF EMFR
  305 IF(REFTMP)320,310,320
  310 EMFR=0.0
  315 GO TO 375
  320 ITEMP0=REFTMP
  325 TEMP0=ITEMP0
  330 TEMP1=TEMP0+1.0
  335 TEMP2=TEMP0+2.0
  340 EMFI0=EMFIN(ITEMP0)
  345 EMFI1=EMFIN(ITEMP0+1)
  350 EMFI2=EMFIN(ITEMP0+2)
  355 A=EMFI0*(REFTMP-TEMP1)*(REFTMP-TEMP2)/2.0
  360 B=EMFI1*(REFTMP-TEMP0)*(TEMP2-REFTMP)
  365 C=EMFI2*(REFTMP-TEMP0)*(REFTMP-TEMP1)/2.0
  372 EMFR=(A+B+C)*FACTOR
  374 IF(IUNIT-1)465,375,465
C
C      CALCULATION OF EMF AND DEDT FOR ENTIRE TEMP. RANGE
  375 DO 395 J=ITEMPI,ITEMPL
  380 IT(J)=T(J)
  385 EMF(J)=EMFIN(J)*FACTOR-EMFR
  390 DEDT(J)=DEDTIN(J)*FACTOR
  395 CONTINUE
  396 GO TO 398
C
C      EMF,DELEMF,AND DEDT VALUES CORRESPONDING TO EVEN DEG. C
  465 K3=ITEMPL-2
```

```
  470 DO 540 I=ITEMPI,K3
  480 D=EMFIN(I)*0.78625
  485 E=EMFIN(I+1)*0.27750
  490 F=EMFIN(I+2)*(-0.06375)
  495 EMF(I)=(D+E+F)*FACTOR-EMFR
  500 X=DEDTIN(I)*0.78625
  505 Y=DEDTIN(I+1)*0.27750
  510 Z=DEDTIN(I+2)*(-0.06375)
  515 DEDT(I)=(X+Y+Z)*FACTOR
  540 CONTINUE
  545 K4=K3+1
  560 D1=EMFIN(K4-1)*(-0.06375)
  565 E1=EMFIN(K4)*0.97750
  570 F1=EMFIN(K4+1)*0.08625
  575 EMF(K4)=(D1+E1+F1)*FACTOR-EMFR
  580 X1=DEDTIN(K4-1)*(-0.06375)
  585 Y1=DEDTIN(K4)*0.97750
  590 Z1=DEDTIN(K4+1)*0.08625
  595 DEDT(K4)=(X1+Y1+Z1)*FACTOR
  620 ITABLE=ITABLE-1
  625 DO 635 I=ITEMPI,273
  630 IT(I)=T(I)-273.15
  635 CONTINUE
  640 DO 650 I=274,ITABLE
  645 IT(I)=T(I)-272.85
  650 CONTINUE
C
C     CALCULATION OF DELEMF
  398 DELEM(1)=EMF(1)+EMFR
  399 L1=ITEMPI+1
  400 DO 420 J=L1,IFMTCH
  405 E2=EMF(J)+0.005
  410 E3=EMF(J-1)+0.005
  415 DELEM(J)=EMF(J)-EMF(J-1)-MODF(E2,0.01)+MODF(E3,0.01)
  420 CONTINUE
  425 DO 445 J=K9,ITABLE
  430 E4=EMF(J)+0.05
  435 E5=EMF(J-1)+0.05
  440 DELEM(J)=EMF(J)-EMF(J-1)-MODF(E4,0.1)+MODF(E5,0.1)
  445 CONTINUE
C
C     PAGE HEADING WRITEOUT
  665 WRITE OUTPUT TAPE 6,80,AMATP,AMATN,ATYPE1,ATYPE2,APUB,FACTOR,
 6651ACOMP1,ACOMP2,ACOMP3,ALOT,UREFT,AUNIT,ADATE1,ADATE2,ADATE3,
 6652ANAMEI,ANAMEL
  680 WRITE OUTPUT TAPE 6,30
  685 GO TO (690,700),IUNIT
  690 WRITE OUTPUT TAPE 6,40
  695 GO TO 704
  700 WRITE OUTPUT TAPE 6,41
C
C     WRITEOUT FOR PARAMETERS FROM T=1 TO T=FORMAT CHANGE
  704 IF(IFMTCH)780,780,705
  705 DO 775 L=ITEMPI,IFMTCH
```

```
  710 IF(XMODF(L-ITEMPI+1,5))735,715,735
  715 IF(XMODF(L-ITEMPI+1,40))735,735,725
  725 WRITE OUTPUT TAPE 6,50,IT(L),EMF(L),DELEM(L),DEDT(L),IT(L+40),
 7251EMF(L+40),DELEM(L+40),DEDT(L+40)
  730 GO TO 775
  735 WRITE OUTPUT TAPE 6,55,IT(L),EMF(L),DELEM(L),DEDT(L),IT(L+40),
 7351EMF(L+40),DELEM(L+40),DEDT(L+40)
  775 CONTINUE
C
C     WRITE OUT FOR PARAMETERS FROM T=FORMAT CHANGE TO T=40
  780 DO 850 L=K2,40
  785 IF(XMODF(L-ITEMPI+1,5))810,790,810
  790 IF(XMODF(L-ITEMPI+1,40))810,810,800
  800 WRITE OUTPUT TAPE 6,60,IT(L),EMF(L),DELEM(L),DEDT(L),IT(L+40),
 8001EMF(L+40),DELEM(L+40),DEDT(L+40)
  805 GO TO 850
  810 WRITE OUTPUT TAPE 6,65,IT(L),EMF(L),DELEM(L),DEDT(L),IT(L+40),
 8101EMF(L+40),DELEM(L+40),DEDT(L+40)
  850 CONTINUE
  855 N=0
C
C     PAGE HEADING WRITE OUT
  865 WRITE OUTPUT TAPE 6,80,AMATP,AMATN,ATYPE1,ATYPE2,APUB,FACTOR,
 8651ACOMP1,ACOMP2,ACOMP3,ALOT,UREFT,AUNIT,ADATE1,ADATE2,ADATE3,
 8652ANAMEI,ANAMEL
  870 WRITE OUTPUT TAPE 6,30
  875 GO TO (880,890),IUNIT
  880 WRITE OUTPUT TAPE 6,40
  885 GO TO 900
  890 WRITE OUTPUT TAPE 6,41
C
C     PARAMETER WRITE OUT FOR SECOND,THIRD,ETC. PAGES
  900 N=N+1
  905 J=80*N+1
  906 JE=J+39
  910 DO 1065 L=J,JE
  930 IF(L-ITABLE)935,935,1075
  935 IF(L+40-ITABLE)940,940,1005
  940 IF(XMODF(L-ITEMPI+1,5))965,945,965
  945 IF(XMODF(L-ITEMPI+1,40))965,965,955
  955 WRITE OUTPUT TAPE 6,60,IT(L),EMF(L),DELEM(L),DEDT(L),IT(L+40),
 9551EMF(L+40),DELEM(L+40),DEDT(L+40)
  960 GO TO 1065
  965 WRITE OUTPUT TAPE 6,65,IT(L),EMF(L),DELEM(L),DEDT(L),IT(L+40),
 9651EMF(L+40),DELEM(L+40),DEDT(L+40)
  970 GO TO 1065
 1005 IF(XMODF(L-ITEMPI+1,5))1030,1010,1030
 1010 IF(XMODF(L-ITEMPI+1,40))1030,1030,1020
 1020 WRITE OUTPUT TAPE 6,70,IT(L),EMF(L),DELEM(L),DEDT(L)
 1025 GO TO 1065
 1030 WRITE OUTPUT TAPE 6,65,IT(L),EMF(L),DELEM(L),DEDT(L)
 1065 CONTINUE
 1070 IF(J+79-ITABLE)865,1075,1075
C
```

```
C      PUNCHED DECK OUTPUT
 1075 IF(ACARD-ATEST2)1200,1080,1200
 1080 DO 1100 I=ITEMPI,ITABLE,2
 1085 TOC(I)=IT(I)
 1090 TOC(I+1)=IT(I+1)
 1091 IF(I-ITABLE)1095,1097,1097
 1095 WRITE OUTPUT TAPE 7,13,AMATP,AMATN,TOC(I),EMF(I),DEDT(I),TOC(I+1),
 10951EMF(I+1),DEDT(I+1)
 1096 GO TO 1100
 1097 WRITE OUTPUT TAPE 7,13,AMATP,AMATN,TOC(I),EMF(I),DEDT(I)
 1100 CONTINUE
 1200 GO TO 100
      END
*      DATA
```

FACTOR PROGRAM (FORTRAN IV)

```
CFCTOR  ADJUSTMENT OF PUBLISHED TABLES FOR UNITS,REF. TEMPS,AND FACTOR
      DIMENSION T(300),IT(300),TOC(300),EMFIN(300),EMF(300),DELEM(300),
     1DEDTIN(300),DEDT(300)
   10 FORMAT(A6,4X,4F10.0,7X,A3)
   11 FORMAT(49X,I1,4X,A6,7X,A3)
   12 FORMAT(A6,A6,A3,5X,A6,4X,A6,A6,8X,A6,A6,A2)
   13 FORMAT(A6,A4,F10.0,F10.2,F10.3,10X,F10.0,F10.2,F10.3)
   14 FORMAT(10X,3I10,4A6,A2)
   16 FORMAT(2(10X,3F10.0))
   30 FORMAT(3X,4HTEMP,5X,3HEMF,3X,6HDELEMF,5X,5HDE/DT,7X,4HTEMP,5X,
     13HEMF,3X,6HDELEMF,5X,5HDE/DT,3X)
   40 FORMAT(2X,5HDEG K,4X,5HMIC V,2X,5HMIC V,4X,9HMIC V/DGK,4X,5HDEG K,
     14X,5HMIC V,2X,5HMIC V,4X,9HMIC V/DGK//)
   41 FORMAT(2X,5HDEG C,4X,5HMIC V,2X,5HMIC V,4X,9HMIC V/DGC,4X,5HDEG C,
     14X,5HMIC V,2X,5HMIC V,4X,9HMIC V/DGC//)
   50 FORMAT(I7,F10.2,F7.2,F10.3,I11,F10.1,F7.1,F10.3//)
   55 FORMAT(I7,F10.2,F7.2,F10.3,I11,F10.1,F7.1,F10.3)
   60 FORMAT(I7,F9.1,F7.1,F11.3,I11,F10.1,F7.1,F10.3//)
   65 FORMAT(I7,F9.1,F7.1,F11.3,I11,F10.1,F7.1,F10.3)
   70 FORMAT(I7,F9.1,F7.1,F11.3//)
   80 FORMAT(1H1,24H THERMOCOUPLE TABLE FOR ,A6,4H VS ,A6,11H, ISA TYPE
     1,A6,A2,10H, BASED ON/29H NAT. BUR. OF STANDARDS PUB. ,A6,28H WITH
     2CALC. MULT. FACTOR OF ,F7.5,1H./1X,A6,A6,A3,6H, LOT ,A6,29H. USERS
     3 REFERENCE TEMPERATURE,F7.3,1X,A6/16X,10HTEST DATE ,A6,A6,A2,5H  B
     4Y ,A6,A6//)
C  90 DIMENSION T(300),IT(300),TOC(300),EMFIN(300),EMF(300),DELEM(300),
C    1DEDTIN(300),DEDT(300)
C  95 FREQUENCY 115(300),400(300),425(300),375(300),470(300),625(300),
C    1705(300),780(300),1080(300),640(300)
C
C     DATA DECK AND KEY CARDS READ IN
  100 READ (5,11)IA,ATEST1,ATEST2
  102 IF(IA)140,140,105
  105 READ (5,14)ITEMPI,ITABLE,IFMTCH,AMATP,AMATN,APUB, ATYPE1,ATYPE2
  110 K2=IFMTCH+1
  112 ITEMPL=ITABLE
  115 DO 130 I=ITEMPI,ITEMPL,2
  120 READ (5,16)T(I),EMFIN(I),DEDTIN(I),T(I+1),EMFIN(I+1), DEDTIN(I+1)
  130 CONTINUE
  132 K9=K2
  133 IF(IFMTCH)134,134,140
  134 K9=K2+1
  140 READ (5,10)AUNIT,TEMPHI,TEMPLO,ETEST,UREFT,ACARD
  141 ITABLE=ITEMPL
  142 IUNIT=1
  144 REFTMP=UREFT
  150 READ (5,12)ACOMP1,ACOMP2,ACOMP3,ALOT,ANAMEI,ANAMEL, ADATE1,ADATE2,
     1ADATE3
C
C     CONVERSION OF REFTMP,TEMPHI, AND TEMPLO INTO DEG. K SYSTEM
  151 IF(AUNIT-ATEST1)152,155,152
  152 REFTMP=REFTMP+273.15
 1152 TEMPHI=TEMPHI+273.15
 2152 TEMPLO=TEMPLO+273.15
```

```
 3152 IUNIT=2
C
C      COMPUTATION OF FACTOR
  155 ITEMLO=TEMPLO
  160 TEMP3=ITEMLO-1
  165 TEMP4=ITEMLO
  170 TEMP5=ITEMLO+1
  175 EMFI3=EMFIN(ITEMLO-1)
  180 EMFI4=EMFIN(ITEMLO)
  185 EMFI5=EMFIN(ITEMLO+1)
  190 U=EMFI3*(TEMPLO-TEMP4)*(TEMPLO-TEMP5)/2.0
  195 V=EMFI4*(TEMPLO-TEMP3)*(TEMP5-TEMPLO)
  200 W=EMFI5*(TEMPLO-TEMP3)*(TEMPLO-TEMP4)/2.0
  205 EMFLO=U+V+W
  210 ITEMHI=TEMPHI
  215 TEMP6=ITEMHI-1
  220 TEMP7=ITEMHI
  225 TEMP8=ITEMHI+1
  230 EMFI6=EMFIN(ITEMHI-1)
  235 EMFI7=EMFIN(ITEMHI)
  240 EMFI8=EMFIN(ITEMHI+1)
  245 X=EMFI6*(TEMPHI-TEMP7)*(TEMPHI-TEMP8)/2.0
  250 Y=EMFI7*(TEMPHI-TEMP6)*(TEMP8-TEMPHI)
  255 Z=EMFI8*(TEMPHI-TEMP6)*(TEMPHI-TEMP7)/2.0
  260 EMFHI=X+Y+Z
  265 ETABLE=EMFHI-EMFLO
  270 FACTOR=ETEST/ETABLE
C
C      CALCULATION OF EMFR
  305 IF(REFTMP)320,310,320
  310 EMFR=0.0
  315 GO TO 375
  320 ITEMP0=REFTMP
  325 TEMP0=ITEMP0
  330 TEMP1=TEMP0+1.0
  335 TEMP2=TEMP0+2.0
  340 EMFI0=EMFIN(ITEMP0)
  345 EMFI1=EMFIN(ITEMP0+1)
  350 EMFI2=EMFIN(ITEMP0+2)
  355 A=EMFI0*(REFTMP-TEMP1)*(REFTMP-TEMP2)/2.0
  360 B=EMFI1*(REFTMP-TEMP0)*(TEMP2-REFTMP)
  365 C=EMFI2*(REFTMP-TEMP0)*(REFTMP-TEMP1)/2.0
  372 EMFR=(A+B+C)*FACTOR
  374 IF(IUNIT-1)465,375,465
C
C      CALCULATION OF EMF AND DEDT FOR ENTIRE TEMP. RANGE
  375 DO 395 J=ITEMPI,ITEMPL
  380 IT(J)=T(J)
  385 EMF(J)=EMFIN(J)*FACTOR-EMFR
  390 DEDT(J)=DEDTIN(J)*FACTOR
  395 CONTINUE
  396 GO TO 398
C
C      EMF,DELEMF,AND DEDT VALUES CORRESPONDING TO EVEN DEG. C
```

```
  465 K3=ITEMPL-2
  470 DO 540 I=ITEMPI,K3
  480 D=EMFIN(I)*0.78625
  485 E=EMFIN(I+1)*0.27750
  490 F=EMFIN(I+2)*(-0.06375)
  495 EMF(I)=(D+E+F)*FACTOR-EMFR
  500 X=DEDTIN(I)*0.78625
  505 Y=DEDTIN(I+1)*0.27750
  510 Z=DEDTIN(I+2)*(-0.06375)
  515 DEDT(I)=(X+Y+Z)*FACTOR
  540 CONTINUE
  545 K4=K3+1
  560 D1=EMFIN(K4-1)*(-0.06375)
  565 E1=EMFIN(K4)*0.97750
  570 F1=EMFIN(K4+1)*0.08625
  575 EMF(K4)=(D1+E1+F1)*FACTOR-EMFR
  580 X1=DEDTIN(K4-1)*(-0.06375)
  585 Y1=DEDTIN(K4)*0.97750
  590 Z1=DEDTIN(K4+1)*0.08625
  595 DEDT(K4)=(X1+Y1+Z1)*FACTOR
  620 ITABLE=ITABLE-1
  625 DO 635 I=ITEMPI,273
  630 IT(I)=T(I)-273.15
  635 CONTINUE
  640 DO 650 I=274,ITABLE
  645 IT(I)=T(I)-272.85
  650 CONTINUE
C
C     CALCULATION OF DELEMF
  398 DELEM(1)=EMF(1)+EMFR
  399 L1=ITEMPI+1
  400 DO 420 J=L1,IFMTCH
  405 E2=EMF(J)+0.005
  410 E3=EMF(J-1)+0.005
  415 DELEM(J)=EMF(J)-EMF(J-1)-AMOD(E2,0.01)+AMOD(E3,0.01)
  420 CONTINUE
  425 DO 445 J=K9,ITABLE
  430 E4=EMF(J)+0.05
  435 E5=EMF(J-1)+0.05
  440 DELEM(J)=EMF(J)-EMF(J-1)-AMOD(E4,0.1)+AMOD(E5,0.1)
  445 CONTINUE
C
C     PAGE HEADING WRITEOUT
  665 WRITE (6,80)AMATP,AMATN,ATYPE1,ATYPE2,APUB,FACTOR, ACOMP1,ACOMP2,A
     1COMP3,ALOT,UREFT,AUNIT,ADATE1,ADATE2,ADATE3, ANAME1,ANAME2
  680 WRITE (6,30)
  685 GO TO (690,700),IUNIT
  690 WRITE (6,40)
  695 GO TO 704
  700 WRITE (6,41)
C
C     WRITEOUT FOR PARAMETERS FROM T=1 TO T=FORMAT CHANGE
  704 IF(IFMTCH)780,780,705
  705 DO 775 L=ITEMPI,IFMTCH
```

```
  710 IF(MOD(L-ITEMPI+1,5))735,715,735
  715 IF(MOD(L-ITEMPI+1,40))735,735,725
  725 WRITE (6,50)IT(L),EMF(L),DELEM(L),DEDT(L),IT(L+40), EMF(L+40),DELE
     1M(L+40),DEDT(L+40)
  730 GO TO 775
  735 WRITE (6,55)IT(L),EMF(L),DELEM(L),DEDT(L),IT(L+40), EMF(L+40),DELE
     1M(L+40),DEDT(L+40)
  775 CONTINUE
C
C     WRITE OUT FOR PARAMETERS FROM T=FORMAT CHANGE TO T=40
  780 DO 850 L=K2,40
  785 IF(MOD(L-ITEMPI+1,5))810,790,810
  790 IF(MOD(L-ITEMPI+1,40))810,810,800
  800 WRITE (6,60)IT(L),EMF(L),DELEM(L),DEDT(L),IT(L+40), EMF(L+40),DELE
     1M(L+40),DEDT(L+40)
  805 GO TO 850
  810 WRITE (6,65)IT(L),EMF(L),DELEM(L),DEDT(L),IT(L+40), EMF(L+40),DELE
     1M(L+40),DEDT(L+40)
  850 CONTINUE
  855 N=0
C
C     PAGE HEADING WRITE OUT
  865 WRITE (6,80)AMATP,AMATN,ATYPE1,ATYPE2,APUB,FACTOR, ACOMP1,ACOMP2,A
     1COMP3,ALOT,UREFT,AUNIT,ADATE1,ADATE2,ADATE3, ANAME1,ANAME1
  870 WRITE (6,30)
  875 GO TO (880,890),IUNIT
  880 WRITE (6,40)
  885 GO TO 900
  890 WRITE (6,41)
C
C     PARAMETER WRITE OUT FOR SECOND,THIRD,ETC. PAGES
  900 N=N+1
  905 J=80*N+1
  906 JE=J+39
  910 DO 1065 L=J,JE
  930 IF(L-ITABLE)935,935,1075
  935 IF(L+40-ITABLE)940,940,1005
  940 IF(MOD(L-ITEMPI+1,5))965,945,965
  945 IF(MOD(L-ITEMPI+1,40))965,965,955
  955 WRITE (6,60)IT(L),EMF(L),DELEM(L),DEDT(L),IT(L+40), EMF(L+40),DELE
     1M(L+40),DEDT(L+40)
  960 GO TO 1065
  965 WRITE (6,65)IT(L),EMF(L),DELEM(L),DEDT(L),IT(L+40), EMF(L+40),DELE
     1M(L+40),DEDT(L+40)
  970 GO TO 1065
 1005 IF(MOD(L-ITEMPI+1,5))1030,1010,1030
 1010 IF(MOD(L-ITEMPI+1,40))1030,1030,1020
 1020 WRITE (6,70)IT(L),EMF(L),DELEM(L),DEDT(L)
 1025 GO TO 1065
 1030 WRITE (6,65)IT(L),EMF(L),DELEM(L),DEDT(L)
 1065 CONTINUE
 1070 IF(J+79-ITABLE)865,1075,1075
C
C     PUNCHED DECK OUTPUT
```

```
1075 IF(ACARD-ATEST2)1200,1080,1200
1080 DO 1100 I=ITEMPI,ITABLE,2
1085 TOC(I)=IT(I)
1090 TOC(I+1)=IT(I+1)
1091 IF(I-ITABLE)1095,1097,1097
1095 WRITE (7,13)AMATP,AMATN,TOC(I),EMF(I),DEDT(I),TOC(I+1),EMF(I+1),DE
    1DT(I+1)
1096 GO TO 1100
1097 WRITE (7,13)AMATP,AMATN,TOC(I),EMF(I),DEDT(I)
1100 CONTINUE
1200 GO TO 100
     END
```

FACTOR PROGRAM (FORTRAN 3600)

```
   10 FORMAT(A6,4X,4F10.0,7X,A3)
   11 FORMAT(49X,I1,4X,A6,7X,A3)
   12 FORMAT(A6,A6,A3,5X,A6,4X,A6,A6,8X,A6,A6,A2)
   13 FORMAT(A6,A4,F10.0,F10.2,F10.3,10X,F10.0,F10.2,F10.3)
   14 FORMAT(10X,3I10,4A6,A2)
   16 FORMAT(2(10X,3F10.0))
   30 FORMAT(3X,4HTEMP,5X,3HEMF,3X,6HDELEMF,5X,5HDE/DT,7X,4HTEMP,5X,
     13HEMF,3X,6HDELEMF,5X,5HDE/DT,3X)
   40 FORMAT(2X,5HDEG K,4X,5HMIC V,2X,5HMIC V,4X,9HMIC V/DGK,4X,5HDEG K,
     14X,5HMIC V,2X,5HMIC V,4X,9HMIC V/DGK/)
   41 FORMAT(2X,5HDEG C,4X,5HMIC V,2X,5HMIC V,4X,9HMIC V/DGC,4X,5HDEG C,
     14X,5HMIC V,2X,5HMIC V,4X,9HMIC V/DGC/)
   50 FORMAT(I7,F10.2,F7.2,F10.3,I11,F10.1,F7.1,F10.3/)
   55 FORMAT(I7,F10.2,F7.2,F10.3,I11,F10.1,F7.1,F10.3)
   60 FORMAT(I7,F9.1,F7.1,F11.3,I11,F10.1,F7.1,F10.3/)
   65 FORMAT(I7,F9.1,F7.1,F11.3,I11,F10.1,F7.1,F10.3)
   70 FORMAT(I7,F9.1,F7.1,F11.3/)
   80 FORMAT(1H1,24H THERMOCOUPLE TABLE FOR ,A6,4H VS ,A6,11H, ISA TYPE
     1,A6,A2,10H, BASED ON/29H NAT. BUR. OF STANDARDS PUB. ,A6,28H WITH
     2CALC. MULT. FACTOR OF ,F7.5,1H./1X,A6,A6,A3,6H, LOT ,A6,29H. USERS
     3 REFERENCE TEMPERATURE,F7.3,1X,A6/16X,10HTEST DATE ,A6,A6,A2,5H  B
     4Y ,A6,A6/)
   90 DIMENSION T(300),IT(300),TOC(300),EMFIN(300),EMF(300),DELEM(300),
     1DEDTIN(300),DEDT(300)
C
C      DATA DECK AND KEY CARDS READ IN
  100 READ(60,11)IA,ATEST1,ATEST2  $ IF(EOF,60)1300,102
  102 IF(IA)140,140,105
  105 READ(60,14)ITEMPI,ITABLE,IFMTCH,AMATP,AMATN,APUB, ATYPE1,ATYPE2
  110 K2=IFMTCH+1
  112 ITEMPL=ITABLE
  115 DO 130 I=ITEMPI,ITEMPL,2
  120 READ(60,16)T(I),EMFIN(I),DEDTIN(I),T(I+1),EMFIN(I+1), DEDTIN(I+1)
  130 CONTINUE
  132 K9=K2
  133 IF(IFMTCH)134,134,140
  134 K9=K2+1
  140 READ(60,10)AUNIT,TEMPHI,TEMPLO,ETEST,UREFT,ACARD
  141 ITABLE=ITEMPL
  142 IUNIT=1
  144 REFTMP=UREFT
  150 READ(60,12)ACOMP1,ACOMP2,ACOMP3,ALOT,ANAMEI,ANAMEL, ADATE1,ADATE2,
     1ADATE3
C
C      CONVERSION OF REFTMP,TEMPHI, AND TEMPLO INTO DEG. K SYSTEM
  151 IF(AUNIT-ATEST1)152,155,152
  152 REFTMP=REFTMP+273.15
 1152 TEMPHI=TEMPHI+273.15
 2152 TEMPLO=TEMPLO+273.15
 3152 IUNIT=2
C
C      COMPUTATION OF FACTOR
  155 ITEMLO=TEMPLO
  160 TEMP3=ITEMLO-1
  165 TEMP4=ITEMLO
```

```
  170 TEMP5=ITEMLO+1
  175 EMFI3=EMFIN(ITEMLO-1)
  180 EMFI4=EMFIN(ITEMLO)
  185 EMFI5=EMFIN(ITEMLO+1)
  190 U=EMFI3*(TEMPLO-TEMP4)*(TEMPLO-TEMP5)/2.0
  195 V=EMFI4*(TEMPLO-TEMP3)*(TEMP5-TEMPLO)
  200 W=EMFI5*(TEMPLO-TEMP3)*(TEMPLO-TEMP4)/2.0
  205 EMFLO=U+V+W
  210 ITEMHI=TEMPHI
  215 TEMP6=ITEMHI-1
  220 TEMP7=ITEMHI
  225 TEMP8=ITEMHI+1
  230 EMFI6=EMFIN(ITEMHI-1)
  235 EMFI7=EMFIN(ITEMHI)
  240 EMFI8=EMFIN(ITEMHI+1)
  245 X=EMFI6*(TEMPHI-TEMP7)*(TEMPHI-TEMP8)/2.0
  250 Y=EMFI7*(TEMPHI-TEMP6)*(TEMP8-TEMPHI)
  255 Z=EMFI8*(TEMPHI-TEMP6)*(TEMPHI-TEMP7)/2.0
  260 EMFHI=X+Y+Z
  265 ETABLE=EMFHI-EMFLO
  270 FACTOR=ETEST/ETABLE
C
C     CALCULATION OF EMFR
  305 IF(REFTMP)320,310,320
  310 EMFR=0.0
  315 GO TO 375
  320 ITEMP0=REFTMP
  325 TEMP0=ITEMP0
  330 TEMP1=TEMP0+1.0
  335 TEMP2=TEMP0+2.0
  340 EMFI0=EMFIN(ITEMP0)
  345 EMFI1=EMFIN(ITEMP0+1)
  350 EMFI2=EMFIN(ITEMP0+2)
  355 A=EMFI0*(REFTMP-TEMP1)*(REFTMP-TEMP2)/2.0
  360 B=EMFI1*(REFTMP-TEMP0)*(TEMP2-REFTMP)
  365 C=EMFI2*(REFTMP-TEMP0)*(REFTMP-TEMP1)/2.0
  372 EMFR=(A+B+C)*FACTOR
  374 IF(IUNIT-1)465,375,465
C
C     CALCULATION OF EMF AND DEDT FOR ENTIRE TEMP. RANGE
  375 DO 395 J=ITEMPI,ITEMPL
  380 IT(J)=T(J)
  385 EMF(J)=EMFIN(J)*FACTOR-EMFR
  390 DEDT(J)=DEDTIN(J)*FACTOR
  395 CONTINUE
  396 GO TO 398
C
C     EMF,DELEMF,AND DEDT VALUES CORRESPONDING TO EVEN DEG. C
  465 K3=ITEMPL-2
  470 DO 540 I=ITEMPI,K3
  480 D=EMFIN(I)*0.78625
  485 E=EMFIN(I+1)*0.27750
  490 F=EMFIN(I+2)*(-0.06375)
  495 EMF(I)=(D+E+F)*FACTOR-EMFR
  500 X=DEDTIN(I)*0.78625
  505 Y=DEDTIN(I+1)*0.27750
```

```
      510 Z=DEDTIN(I+2)*(-0.06375)
      515 DEDT(I)=(X+Y+Z)*FACTOR
      540 CONTINUE
      545 K4=K3+1
      560 D1=EMFIN(K4-1)*(-0.06375)
      565 E1=EMFIN(K4)*0.97750
      570 F1=EMFIN(K4+1)*0.08625
      575 EMF(K4)=(D1+E1+F1)*FACTOR-EMFR
      580 X1=DEDTIN(K4-1)*(-0.06375)
      585 Y1=DEDTIN(K4)*0.97750
      590 Z1=DEDTIN(K4+1)*0.08625
      595 DEDT(K4)=(X1+Y1+Z1)*FACTOR
      620 ITABLE=ITABLE-1
      625 DO 635 I=ITEMP1,273
      630 IT(I)=T(I)-273.15
      635 CONTINUE
      640 DO 650 I=274,ITABLE
      645 IT(I)=T(I)-272.85
      650 CONTINUE
C
C     CALCULATION OF DELEMF
      398 DELEM(1)=EMF(1)+EMFR
      399 L1=ITEMP1+1
      400 DO 420 J=L1,IFMTCH
      405 E2=EMF(J)+0.005
      410 E3=EMF(J-1)+0.005
      415 DELEM(J)=EMF(J)-EMF(J-1)-AMOD(E2,0.01)+AMOD(E3,0.01)
      420 CONTINUE
      425 DO 445 J=K9,ITABLE
      430 E4=EMF(J)+0.05
      435 E5=EMF(J-1)+0.05
      440 DELEM(J)=EMF(J)-EMF(J-1)-AMOD(E4,0.1)+AMOD(E5,0.1)
      445 CONTINUE
C
C     PAGE HEADING WRITEOUT
      665 WRITE(61,80)AMATP,AMATN,ATYPE1,ATYPE2,APUB,FACTOR, ACOMP1,ACOMP2,A
         1COMP3,ALOT,UREFT,AUNIT,ADATE1,ADATE2,ADATE3, ANAME1,ANAME1
      680 WRITE(61,30)
      685 GO TO (690,700),IUNIT
      690 WRITE(61,40)
      695 GO TO 704
      700 WRITE(61,41)
C
C     WRITEOUT FOR PARAMETERS FROM T=1 TO T=FORMAT CHANGE
      704 IF(IFMTCH)780,780,705
      705 DO 775 L=ITEMP1,IFMTCH
      710 IF(MOD(L-ITEMP1+1,5))735,715,735
      715 IF(MOD(L-ITEMP1+1,40))735,735,725
      725 WRITE(61,50)IT(L),EMF(L),DELEM(L),DEDT(L),IT(L+40), EMF(L+40),DELE
         1M(L+40),DEDT(L+40)
      730 GO TO 775
      735 WRITE(61,55)IT(L),EMF(L),DELEM(L),DEDT(L),IT(L+40), EMF(L+40),DELE
         1M(L+40),DEDT(L+40)
      775 CONTINUE
C
C     WRITE OUT FOR PARAMETERS FROM T=FORMAT CHANGE TO T=40
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```
      780 DO 850 L=K2,40
      785 IF(MOD(L-ITEMP1+1,5))810,790,810
      790 IF(MOD(L-ITEMP1+1,40))810,810,800
      800 WRITE(61,60)IT(L),EMF(L),DELEM(L),DEDT(L),IT(L+40), EMF(L+40),DELE
         1M(L+40),DEDT(L+40)
      805 GO TO 850
      810 WRITE(61,65)IT(L),EMF(L),DELEM(L),DEDT(L),IT(L+40), EMF(L+40),DELE
         1M(L+40),DEDT(L+40)
      850 CONTINUE
      855 N=0
C
C     PAGE HEADING WRITE OUT
      865 WRITE(61,80)AMATP,AMATN,ATYPE1,ATYPE2,APU8,FACTOR, ACOMP1,ACOMP2,A
         1COMP3,ALOT,UREFT,AUNIT,ADATE1,ADATE2,ADATE3, ANAME1,ANAME2
      870 WRITE(61,30)
      875 GO TO (880,890),IUNIT
      880 WRITE(61,40)
      885 GO TO 900
      890 WRITE(61,41)
C
C     PARAMETER WRITE OUT FOR SECOND,THIRD,ETC. PAGES
      900 N=N+1
      905 J=80*N+1
      906 JE=J+39
      910 DO 1065 L=J,JE
      930 IF(L-ITABLE)935,935,1075
      935 IF(L+40-ITABLE)940,940,1005
      940 IF(MOD(L-ITEMP1+1,5))965,945,965
      945 IF(MOD(L-ITEMP1+1,40))965,965,955
      955 WRITE(61,60)IT(L),EMF(L),DELEM(L),DEDT(L),IT(L+40), EMF(L+40),DELE
         1M(L+40),DEDT(L+40)
      960 GO TO 1065
      965 WRITE(61,65)IT(L),EMF(L),DELEM(L),DEDT(L),IT(L+40), EMF(L+40),DELE
         1M(L+40),DEDT(L+40)
      970 GO TO 1065
     1005 IF(MOD(L-ITEMP1+1,5))1030,1010,1030
     1010 IF(MOD(L-ITEMP1+1,40))1030,1030,1020
     1020 WRITE(61,70)IT(L),EMF(L),DELEM(L),DEDT(L)
     1025 GO TO 1065
     1030 WRITE(61,65)IT(L),EMF(L),DELEM(L),DEDT(L)
     1065 CONTINUE
     1070 IF(J+79-ITABLE)865,1075,1075
C
C     PUNCHED DECK OUTPUT
     1075 IF(ACARD-ATEST2)1200,1080,1200
     1080 DO 1100 I=ITEMP1,ITABLE,2
     1085 TOC(I)=IT(I)
     1090 TOC(I+1)=IT(I+1)
     1091 IF(I-ITABLE)1095,1097,1097
     1095 WRITE(62,13)AMATP,AMATN,TOC(I),EMF(I),DEDT(I),TOC(I+1),EMF(I+1),DE
         1DT(I+1)
     1096 GO TO 1100
     1097 WRITE(62,13)AMATP,AMATN,TOC(I),EMF(I),DEDT(I)
     1100 CONTINUE
     1200 GO TO 100
     1300 END
```