# Model 340 Temperature Controller



### Features

- Operates down to 100 mK with appropriate NTC RTD sensors
- Two sensor inputs; expandable to ten sensor inputs
- Supports diode, RTD, capacitance, and thermocouple sensors
- Sensor excitation current reversal eliminates thermal EMF errors
- Two autotuning control loops: 100 W and 1 W
- IEEE-488 and RS-232C interfaces, analog outputs, digital I/O, and alarm relays

#### **Product Description**

The Model 340 is our most advanced temperature controller and offers unsurpassed resolution, accuracy, and stability for temperature measurement and control applications to as low as 100 mK. Operating with diodes, platinum RTDs, and negative temperature coefficient (NTC) resistor sensors, the Model 340 is expandable to ten sensor inputs or to operate with thermocouple or capacitance sensors. It has two control loops, with the first loop powered to 100 W.

### Sensor Inputs

The Model 340 features two inputs with high-resolution 24-bit analog-to-digital converter and low noise circuit design, providing temperature readings with resolution as low as 0.1 mK at 4.2 K. Sensors are optically isolated from other instrument functions for quiet and repeatable sensor measurements. Appropriate sensor excitation and input gain can be selected from the front panel. An autorange mode keeps the power in NTC resistors low to reduce self-heating as sensor resistance changes by many orders of magnitude. Automatic current reversal with rounded square wave excitation for NTC resistors eliminates the effect of thermal EMF.

Standard temperature response curves for silicon diodes, platinum RTDs, and many thermocouples are included. Up to twenty 200-point CalCurves<sup>™</sup> for Lake Shore calibrated sensors or user curves can be loaded into non-volatile memory via a computer interface or the instrument front panel. CalCurves<sup>™</sup> can be installed at the factory when purchased with a Model 340, or they can be field installed using the data card slot. A built-in SoftCal<sup>™1</sup> algorithm can also be used to generate curves for silicon diodes and platinum RTDs, for storage as user curves.

<sup>1</sup> The Lake Shore SoftCal<sup>™</sup> algorithm for silicon diode and platinum RTD sensors is a good solution for applications that need more accuracy than a standard sensor curve but do not warrant traditional calibration. SoftCal<sup>™</sup> uses the predictability of a standard curve to improve the accuracy of an individual sensor around a few known temperature reference points.

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### **Temperature Control**

The Model 340 offers two proportional-integral-derivative (PID) control loops. A PID control algorithm calculates control output based on temperature setpoint and feedback from the control sensor. Wide tuning parameters accommodate most cryogenic cooling systems and many small high-temperature ovens. Control output is generated by a high-resolution digital-to-analog converter for smooth continuous control. The user can manually set the PID values or the autotuning feature of the Model 340 can automate the tuning process.

The main heater output for the Model 340 is a well-regulated variable DC current source. Heater output is optically isolated from other circuits to reduce interference and ground loops. Heater output can provide up to 100 W of variable DC power to control Loop 1. Features have been added to the Model 340 to minimize the possibility of overheating delicate sensors and wiring in cryostats. These features include setpoint temperature limit, heater current range limit, internal heater diagnostics, and a fuse in the heater output wiring. The Model 340 also has the ability to run a second independent control loop, intended to reduce the temperature gradients in one cooling system rather than to run two different cooling systems.

The setpoint ramp feature allows smooth, continuous changes in setpoint. This feature permits faster experiment cycles, since data can be taken as the system is changing in temperature. It can also be used to make a more predictable approach to a setpoint temperature. The zone feature can automatically change control parameter values for operation over a large temperature range. Values for ten different temperature zones can be loaded into the instrument, which will select the next appropriate zone value on setpoint change. The Model 340 can run a set of instrument instructions called an internal program. Each program represents the temperature changes needed to conduct a user's experiment. The setpoint can be changed or ramped up and down, and other controller parameters can be programmed. For simple experiments the internal program eliminates the need for computer control. It is also common for the internal program to be used along with the computer interface so the computer is not slowed down by temperature control overhead.

Several math features are included to improve usability and aid in setting up experiments. It is often useful to have reading filters and maximum and minimum calculations easily available on the front panel. The Model 340 also computes a linear equation on reading data to allow flexibility in how the display represents experimental inputs.

### Interface

The Model 340 can be fully involved in computer-controlled experiments. It is equipped with IEEE-488 and RS-232C interfaces. Either interface can send settings to the Model 340 and collect reading data from it. Even the analog outputs, relays, and Digital I/O can be controlled by computer interface.

The Model 340 has several features to make it more valuable as part of a larger measuring system. Two analog voltage outputs can be used to report a voltage that is proportional to the temperature of an input. The outputs can be controlled manually as a voltage source for any other application. Two relays can be used with the alarm setpoints in latching mode for error detection, or in nonlatching mode for simple on and off control. Digital I/O can be used with an external scanner or manually.



### **Configurable Display**

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The Model 340 includes a graphic LCD with fluorescent backlight display that is fully configurable and can display up to eight readings.



This shows a variation of the display with a large loop 1 heater output graphic bar where the PID parameters are not displayed, but the heater output is more prominent.

R	EADING DIS	PLAY FORMAT	<more></more>
Input Dis	plays: <mark>8</mark>		
Disp1: A Disp3: B Disp5: C Disp7: D	SENSOR MAX TEMP C TEMP K	Disp2: 8 Disp4: 8 Disp6: C Disp8: 0	TEMP K MIN Linear Temp C

The user can display 1 to 8 readings from any of the available inputs. The units available are the sensor units of mV, V,  $\Omega$ ,  $k\Omega$ , nF, or temperature units of °C or K. Results of the math feature can also be selected.

Input: B	INPUT SETUP	
Enable: <mark>()</mark> Therm Comp: ()	N Type: Cernox N Sensor Unit:	ß
Curve: 22 CX- SN: X07975	Temp Coeff: 1070-SD Excitation: Range:	Ne9. 10m0 300kΩ

The user can select the sensor type, and the controller will automatically select the sensor units, excitation, and range. If 'special' type is selected, the user can choose any available excitation and input range.

# Additional Inputs Available For Model 340

The following optional inputs are available for the Model 340. Only one can be installed at a time, and the standard inputs stay in the instrument and remain fully functional. Calibration for the option is stored on the card so it can be installed in the field without recalibration.

## 3462 Dual Standard Input Option Card

Adds two standard inputs to the Model 340, appearing on the display as C and D. The card has separate A/Ds and excitation for each sensor. A microprocessor on the card manages the A/D and communication with the Model 340. Allows the Model 340 to read four sensors and use any of them as a control sensor.

### 3464 Dual Thermocouple Input Option Card

Adds two new thermocouple inputs to the Model 340, appearing on the display as C and D. The card has separate A/Ds and excitation for each sensor. A microprocessor on the card manages the A/D and communication with the Model 340. Thermocouple inputs range from cryogenic temperature to 1000 °C, with built-in room temperature compensation. Curves for thermocouple types E, K, and AuFe 0.07% vs. Cr are included. The user can add other types.

### 3465 Single Capacitance Input Option Card

Adds a new capacitance input to the Model 340, appearing on the display as C. The card has separate A/D and excitation for the sensor. A microprocessor on the card manages the A/D and communication with the Model 340. The 3465 is intended to control temperature in strong magnetic fields using a Lake Shore Model CS-501 capacitance temperature sensor.

### 3468 Eight Channel Input Option Card

Adds eight sensor inputs to the Model 340. The optional inputs are broken into two groups of four and appear on the display as C1–C4 for Input C, D1–D4 for Input D. The 3468 includes two A/D converters, one for each group of four inputs, and individual excitation for each sensor. Each input group must use the same sensor type, but the two groups can be different. The multiplexed inputs provide new readings for all eight inputs twice each second. The 3468 inputs are not recommended for temperature control because the reading rate is too slow to allow good stability.

A variety of sensor types are supported by the Model 3468, but not as many as the standard inputs. Diode and platinum configurations have similar specifications to the standard inputs, reduced only slightly to account for multiplexing. However, the NTC RTD configuration is quite different than the standard inputs. The option has a limited resistance range of 7.5 k $\Omega$  with a fixed current excitation of 10  $\mu$ A. This limitation significantly reduces the low temperature range of the inputs. The option also does not support current reversal to reduce the effect of thermal EMF voltages. The original standard inputs remain fully functional allowing the Model 340 to measure 10 sensors when the option is installed.

### Sensor Temperature Range (sensors sold separately)

Diodes 340/3462         Silicon Diode Silicon Diode         DT-670:-SD DT-670:-BR         1.4 K to 500 K         T = 60 K & 8 ≤ 31 T = 60 K & 8 ≤ 31 Silicon Diode           Silicon Diode         DT-471:-SD         1.4 K to 325 K         T ≥ 60 K & 8 ≤ 31 T ≥ 60 K & 8 ≤ 31 Silicon Diode           Silicon Diode         DT-471:-SD         1.0 K to 500 K         T ≥ 60 K & 8 ≤ 31 T ≥ 60 K & 8 ≤ 31 Silicon Diode           GalAb Diode         TG-120-PL         1.4 K to 325 K         T > 42 K & 8 ≤ 51 T > 42 K & 8 ≤ 51 GalAb Diode           Coefficient NDs         100 Ω Platinum         PT-102/3         1.4 K to 500 K         T > 40 K & 8 ≤ 251 T > 40 K & 8 ≤ 251 Sa0/3462           Rhodium-Iron         RF-800-4         1.4 K to 500 K         T > 70 K & 8 ≤ 251 Sa0/3462           Rhodium-Iron         RF-100T/U         1.4 K to 500 K         T > 24 K & 8 ≤ 51 T > 77 K & 8 ≤ 81 FT Temperature           Cernox**         CX-1010         0.3 K to 325 K         T > 77 K & 8 ≤ 81 FT Temperature           Cernox**         CX-1030-HT         0.4 K to 120 K V         T > 2 K & 8 ≤ 191 T Cernox**           Gardas         Circon**         CX-1010         0.3 K to 325 K         T > 2 K & 8 ≤ 191 T A K to 420 K V         T > 2 K & 8 ≤ 191 T = 2 K & 8 ≤ 191 T Carbon-Giass           Gardas         Circon**         CX-1020-HT         4 K to 420 K V         T > 2 K & 8 ≤ 191 T < Carbon-Giass			Model	Useful Range	Magnetic Field Use	
340/3462         Silicon Diode         DT-670E-BR         30 K to 500 K         T > 60 K & B ≤ 31 T > 60 K & B ≤ 31 Silicon Diode           Silicon Diode         DT-411         1.4 K to 325 K         T ≥ 60 K & B ≤ 31 T ≥ 60 K & B ≤ 31 Silicon Diode           Silicon Diode         DT-471 - 50         1.4 K to 325 K         T ≥ 60 K & B ≤ 31 T ≥ 60 K & B ≤ 31 GaAlAs Diode           GaAlAs Diode         TG-120-PL         1.4 K to 325 K         T > 42 K & B ≤ 51 GaAlAs Diode           GaAlAs Diode         TG-120-PL         1.4 K to 325 K         T > 42 K & B ≤ 51 GaAlAs Diode           Cefficient RTDs         340/362         T > 42 K & B ≤ 51 Rhodium-Iron         RF-100-23         1.4 K to 325 K         T > 42 K & B ≤ 51 T > 42 K & B ≤ 151 T > 42 K & B ≤ 151 Coefficient RTDs           A0/3462         Rhodium-Iron         RF-10017/J         1.4 K to 325 K         T > 2 K & B ≤ 191 T > 77 K & B ≤ 81 T > 27 K & B ≤ 191 Coefficient RTDs           A0/3462         Cernox <sup>™</sup> CX-1030-HT         0.3 K to 325 K T         T > 2 K & B ≤ 191 C Cernox <sup>™</sup> CX-1030-HT         2.4 K to 420 K <sup>3</sup> T > 2 K & B ≤ 191 C Cernox <sup>™</sup> Cernox <sup>™</sup> CX-1030-HT         0.3 K to 120 K <sup>3</sup> T > 2 K & B ≤ 191 C Cernox <sup>™</sup> C × 1020 K <sup>4</sup> T > 2 K & B ≤ 191 C Cernox <sup>™</sup> Cernox <sup>™</sup> CX-1030-HT         0.4 K to 420 K <sup>3</sup> T > 2 K & B ≤ 191 C Cernox <sup>™</sup> <td< th=""><th>Diodes</th><th>Silicon Diode</th><th>DT-670-SD</th><th>1.4 K to 500 K</th><th><math display="block">T \geq 60 \; K \; \&amp; \; B \leq 3 \; T</math></th></td<>	Diodes	Silicon Diode	DT-670-SD	1.4 K to 500 K	$T \geq 60 \; K \; \& \; B \leq 3 \; T$	
Silicon Diode         DT-414         1.4 K to 375 K.         T ≥ 60 K & B ≤ 31           Silicon Diode         DT-421         1.4 K to 325 K.         T ≥ 60 K & B ≤ 31           Silicon Diode         DT-470-SD         1.4 K to 325 K.         T ≥ 60 K & B ≤ 31           GaAlAs Diode         TG-120-PL         1.4 K to 500 K.         T ≥ 60 K & B ≤ 31           GaAlAs Diode         TG-120-PL         1.4 K to 500 K.         T > 42 K & B ≤ 51           GaAlAs Diode         TG-120-SD         1.4 K to 500 K.         T > 42 K & B ≤ 51           Coefficient RTDs         340/3462         T > 40 K & B ≥ 251         T > 42 K & B ≥ 251           Megative         Temperature         Cernox <sup>™</sup> CX-1010         0.3 K to 320 K T > 77 K & B ≥ 81           Coefficient RTDs         Cernox <sup>™</sup> CX-1050-HT         1.4 K to 420 K <sup>3</sup> T > 2 K & B ≤ 191           Cernox <sup>™</sup> CX-1050-HT         1.4 K to 325 K         T > 2 K & B ≤ 191           Cernox <sup>™</sup> CX-1050-HT         1.4 K to 420 K <sup>3</sup> T > 2 K & B ≤ 191           Cernox <sup>™</sup> CX-1030-HT         0.3 K to 420 K <sup>3</sup> T > 2 K & B ≤ 191           Cernox <sup>™</sup> CX-1030-HT         0.3 K to 100 K <sup>4</sup> Not Recommended           Germanium         GR-300-AA         0.3 K to 100 K <sup>4</sup>	340/3462	Silicon Diode	DT-670E-BR	30 K to 500 K	$T \geq 60 \text{ K \& B} \leq 3 \text{ T}$	
Silicon Diode         DT-471         1.4 K to 325 K         T = 80 K & B ≤ 31 Silicon Diode           Silicon Diode         DT-470-SD         1.4 K to 500 K         T = 60 K & B ≤ 31 Silicon Diode           GaAlAs Diode         TG-120-PL         1.4 K to 325 K         T > 42 K & B ≤ 51 GaAlAs Diode           GaAlAs Diode         TG-120-PL         1.4 K to 325 K         T > 42 K & B ≤ 51 GaAlAs Diode           Coefficient RTDs         100 Ω Platinum         PT-102/3         1.4 K to 873 K         T > 40 K & B ≥ 251 T           340/3462         Rhodium-Iron         RF-800-4         1.4 K to 325 K         T > 77 K & B ≤ 81 F1           Temperature         Cernox <sup>™</sup> CX-1010         0.3 K to 325 K         T > 2 K & B ≤ 191 T           Coefficient RTDs         Gernamium         GR-50-AA         0.3 K to 325 K         T > 2 K & B ≤ 191 T           Cernox <sup>™</sup> CX-1070-HT         4 K to 420 K <sup>2</sup> T > 2 K & B ≤ 191 T         Cernox <sup>™</sup> CX-1070-HT         4 K to 420 K <sup>2</sup> T > 2 K & B ≤ 191 T           Cernox <sup>™</sup> CX-1070-HT         4 K to 420 K <sup>2</sup> T > 2 K & B ≤ 191 T         Cernox <sup>™</sup> CX-1070-HT         4 K to 420 K <sup>2</sup> T > 2 K & B ≤ 191 T           Cernox <sup>™</sup> CX-1070-HT         4 K to 420 K <sup>2</sup> T > 2 K & B ≤ 191 T         Cernox <sup>™</sup> CX-1070-HT<		Silicon Diode	DT-414	1.4 K to 375 K	$T \geq 60 \ K \ \& \ B \leq 3 \ T$	
Silicon Diode         DT-470-SD         1.4 K to 500 K         T ≥ 60 K & B ≤ 31           Silicon Diode         DT-471-SD         10 K to 500 K         T ≥ 60 K & B ≤ 31           GaAlAS Diode         TG-120-PL         1.4 K to 325 K         T > 42 K & B ≤ 51           GaAlAS Diode         TG-120-PL         1.4 K to 325 K         T > 42 K & B ≤ 51           Coefficient RTDs         GaAlAS Diode         TG-120-SD         1.4 K to 673 K         T > 40 K & B ≥ 251           Modium-Iron         RF-800-4         1.4 K to 525 K         T > 77 K & B ≤ 81         T           Temperature         Cernox."         CX-1010         0.3 K to 325 K         T > 77 K & B ≤ 81         T           Cernox."         CX-1050-HT         1.4 K to 325 K         T > 77 K & B ≤ 81         T           Cernox."         CX-1010         0.3 K to 420 K <sup>33</sup> T > 2 K & B ≤ 197           Cernox."         CX-1050-HT         1.4 K to 420 K <sup>31</sup> T > 2 K & B ≤ 197           Gernanium         GR-50-AA         0.1 K to 325 K         T > 2 K & B ≤ 197           Gernox."         CX-1000-HT         4.4 K to 420 K <sup>31</sup> T > 2 K & B ≤ 197           Garbon-Glass         CGR-1-500         1.4 K to 325 K         T > 2 K & B ≤ 197           Carbon-Glass         CGR-1-2000         <		Silicon Diode	DT-421	1.4 K to 325 K	$T \geq 60 \text{ K \& B} \leq 3 \text{ T}$	
Silicon Diode         DT-471-SD         10 K to 500 K         T ≥ 60 K & B ≤ 31 T ≥ 42 K & B ≤ 51 GaAlAs Diode           GaAlAs Diode         TG-120-PL         1.4 K to 325 K         T > 42 K & B ≤ 51 GaAlAs Diode           Coefficient RTDs         GaAlAs Diode         TG-120-PL         1.4 K to 500 K         T > 42 K & B ≤ 51 T > 42 K & B ≤ 51 GaAlAs Diode           2407.462         Dio Ω Platinum         PT-102/3         14 K to 673 K         T > 40 K & B ≤ 251 T > 40 K & B ≤ 251 S40/3462           Negative         Cernox <sup>™</sup> CX-1010         0.3 K to 325 K         T > 77 K & B ≤ 81 PT T K & B ≤ 81 PT           Coefficient RTDs         Cernox <sup>™</sup> CX-1010         0.3 K to 325 K         T > 2 K & B ≤ 19 T           240/3462         Cernox <sup>™</sup> CX-1030-HT         0.3 K to 325 K         T > 2 K & B ≤ 19 T           Coefficient RTDs         Cernox <sup>™</sup> CX-1000-HT         4 K to 420 K <sup>3</sup> T > 2 K & B ≤ 19 T           Germanium         GR-1400-AA         0.3 K to 325 K         T > 2 K & B ≤ 19 T           Germanium         GR-1400-AA         0.3 K to 100 K <sup>4</sup> Not Recommended           Germanium         GR-1400-AA         1.4 K to 100 K <sup>4</sup> Not Recommended           Garbon-Glass         CGR-1-1000         1.7 K to 325 K         T > 2 K & B ≤ 19 T           Carbon-Glass<		Silicon Diode	DT-470-SD	1.4 K to 500 K	$T \geq 60 \text{ K \& B} \leq 3 \text{ T}$	
GaAlAS Diode GaAlAS Diode         TG-120-PL TG-120-SD TG-120-SD TA K to 325 K         T > 42 K & 85 ST T > 42 K & 88 ST T > 40 K & 82 ST DO Ω Platinum           Positive Temperature Coefficient RTDs 340/3462         100 Ω Platinum Rhodium-Iron         PT-111 RF-800-4         14 K to 573 K         T > 40 K & 88 S2 ST T > 77 K & 88 ST T > 77 K & 88 ST T > 40 K & 88 S2 ST DO Ω Platinum           Negative Coefficient RTDs 340/3462         Cernox "         CX-1010         0.3 K to 325 K <sup>3</sup> T > 2 K & 88 S1 PT C 2 K & 88 S1 PT C 2 K & 100 Ω C X-1030-HT         0.3 K to 420 K <sup>3</sup> T > 2 K & 88 S1 PT C 2 K & 88 S1 PT C 2 K & 100 C X - 100 C H         1.4 K to 420 K <sup>3</sup> T > 2 K & 88 S1 PT C 2 K & 88 S1 PT C 2 K & 100 C X - 100 C H           Comox "         CX-1000-HT         0.3 K to 420 K <sup>3</sup> T > 2 K & 88 S1 PT C 2 K & 88 S1 PT C 2 K & 100 C H         Not Recommended G 2 K + 100 C H           Cernox "         CX-1000-HT         20 K to 420 K <sup>3</sup> T > 2 K & 8 S1 PT C 2 K &		Silicon Diode	DT-471-SD	10 K to 500 K	$T \geq 60 \text{ K \& B} \leq 3 \text{ T}$	
GaAlAs Diode GaAlAs Diode         TG-120-PL TG-120-SD         1.4 K to 325 K         T> 42 K & 8 - 5 T           Positive Temperature Coefficient RTDs 340/3462         D0 Ω Platinum         PT-102/3         14 K to 873 K         T> 40 K & 82 - 25 T           Negative Temperature Coefficient RTDs 340/3462         Cernox."         CK-1010         0.3 K to 325 K         T> 77 K & 8 = 81 T           Negative Temperature Coefficient RTDs 340/3462         Cernox."         CX-1030-HT         0.3 K to 420 K <sup>35</sup> T> 2 K & 8 = 19 T           Coefficient RTDs 340/3462         Cernox."         CX-1030-HT         0.3 K to 420 K <sup>35</sup> T> 2 K & 8 = 19 T           Germanium Germanium GR-500-AA         0.3 K to 420 K <sup>35</sup> T> 2 K & 8 = 19 T         Cernox."         CX-1030-HT         0.4 K to 420 K <sup>37</sup> T> 2 K & 8 = 19 T           Germanium GR-500-AA         0.3 K to 100 K <sup>4</sup> Not Recommended Germanium GR-51400-AA         0.3 K to 100 K <sup>4</sup> Not Recommended Germanium GR-51400-AA         0.1 K to 325 K         T> 2 K & 8 = 19 T           Carbon-Glass         CGR-1-500         1.4 K to 100 K <sup>4</sup> Not Recommended Germanium         CA + 20 C         1.4 K to 325 K         T> 2 K & 8 = 19 T           Carbon-Glass         CGR-1-2000         1.7 K to 325 K <sup>4</sup> T> 2 K & 8 = 10 T         T           Rox.""         RX-102         0.1 K to 40 K <sup>4</sup>		GaAIAs Diode	TG-120-P	1.4 K to 325 K	$T>4.2$ K & B $\leq 5$ T	
GaAlAs Diode         TG-120-SD         1.4 K to 500 K         T > 42 k & 8 ≤ 5 T           Positive Temperature Coefficient RTDs         100 Ω Platinum         PT-102/3         1.4 K to 573 K         T > 40 K & 8 ≥ 5 T           340/3462         Rhodium-Iron         RF-800-4         1.4 K to 500 K         T > 77 K & 8 ≥ 8 T           Negative Temperature Coefficient RTDs         Cernox"         CX-1010         0.3 K to 325 K         T > 27 K & 8 ≥ 197           Coefficient RTDs         Cernox"         CX-1030-HT         0.3 K to 325 K         T > 27 K & 8 ≥ 197           Coefficient RTDs         Cernox"         CX-1050-HT         1.4 K to 420 K <sup>3</sup> T > 27 K & 8 ≥ 197           Germanium         GR-300-AA         0.1 K to 325 K         T > 27 K & 8 ≥ 197         Cernox"           Germanium         GR-300-AA         0.1 K to 325 K         T > 27 K & 8 ≥ 197         Cernox-1000         1.4 K to 325 K         T > 27 K & 8 ≥ 197           Garbon-Glass         CGR-1-1000         1.7 K to 325 K         T > 27 K & 8 ≥ 197         Carbon-Glass         CGR-1-2000         2 K to 325 K         T > 27 K & 8 ≥ 197           Garbon-Glass         CGR-1-1000         1.7 K to 325 K         T > 27 K & 8 ≥ 197         Carbon-Glass         CGR-1-2000         2 K to 325 K         T > 27 K & 8 ≥ 197           Rox"         RX		GaAIAs Diode	TG-120-PL	1.4 K to 325 K	$T>4.2$ K & B $\leq 5$ T	
Positive Temperature Coefficient RTDs 340/3462         100 Ω Platinum PT-110         14 K to 873 K         T > 40 K & B = 2.5 T           340/3462         Rhodium-Iron Rhodium-Iron         RF-800-4         1.4 K to 500 K         T > 77 K & B ≤ 8 T           Negative Temperature Coefficient RTDs 340/3462         Cernox <sup>***</sup> CX-1010         0.3 K to 325 K <sup>3</sup> T > 27 K & B ≤ 19 T           Cernox <sup>***</sup> CX-1030-HT         0.3 K to 325 K <sup>3</sup> T > 27 K & B ≤ 19 T           Cernox <sup>***</sup> CX-1030-HT         0.3 K to 420 K <sup>3</sup> T > 27 K & B ≤ 19 T           Cernox <sup>***</sup> CX-1030-HT         0.3 K to 420 K <sup>3</sup> T > 27 K & B ≤ 19 T           Cernox <sup>***</sup> CX-1070-HT         1.4 K to 420 K <sup>3</sup> T > 27 K & B ≤ 19 T           Cernox <sup>***</sup> CX-1030-HT         20 K to 420 K <sup>3</sup> T > 27 K & B ≤ 19 T           Cernox <sup>***</sup> CX-1030-AA         0.3 K to 100 K <sup>4</sup> Not Recommended           Germanium         GR-300-AA         0.3 K to 100 K <sup>4</sup> Not Recommended           Garbon-Glass         CGR-1-500         1.4 K to 325 K <sup>4</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-1000         1.7 K to 325 K <sup>4</sup> T > 2 K & B ≤ 10 T           Rox <sup>**</sup> RX-102         0.1 K to 40 K <sup>5</sup> T > 2 K & B ≤ 10 T		GaAIAs Diode	TG-120-SD	1.4 K to 500 K	$T>4.2$ K & B $\leq 5$ T	
Coefficient RTDs 340/3462         100 (2) Platinum Rhodium-Iron         PT-111         14 K to 507 K         T > 40 K & B ≥ 25 T           Negative Temperature Coefficient RTDs 340/3462         Cernox ***         CX-1010         0.3 K to 325 K <sup>3</sup> T > 77 K & B ≥ 8 T           Coefficient RTDs 340/3462         Cernox ***         CX-1010         0.3 K to 420 K <sup>3</sup> T > 2 K & B ≥ 191 T ≥ 2 K & B ≥ 191 Cernox ***           Coefficient RTDs 340/3462         Cernox ***         CX-1070-HT         4 K to 420 K <sup>3</sup> T > 2 K & B ≥ 191 T ≥ 2 K & B ≥ 191 Cernox ***           Cernox ***         CX-1080-HT         1.4 K to 420 K <sup>3</sup> T > 2 K & B ≥ 191 Cernox ***         CX-1050-HT         1.4 K to 420 K <sup>3</sup> T > 2 K & B ≥ 191 Cernox ***         CX-1050-HT         1.4 K to 100 K <sup>4</sup> Not Recommended More Reammended Germanium         GR-300-AA         0.3 K to 100 K <sup>4</sup> Not Recommended More Reammended Gernanium         GR-1400-AA         1.4 K to 100 K <sup>4</sup> Not Recommended Carbon-Glass         CGR-1-1000         1.7 K to 325 K <sup>4</sup> T > 2 K & B ≥ 191 Carbon-Glass         CGR-1-2000         2 K to 325 K         T > 2 K & B ≥ 191 Carbon-Glass         CGR-1-2000         2 K to 325 K         T > 2 K & B ≥ 191 Carbon-Glass         Not recommended           Adv**         Rx-102         0.1 K to 40 K <sup>5</sup> T > 2 K & B ≥ 101 Rox **         Rx-102         0.1 K to 40 K <sup>5</sup> T > 2 K & B ≥ 101 Rox **	Positive Temperature	<b>100</b> $\Omega$ Platinum	PT-102/3	14 K to 873 K	$T>40$ K & B $\leq 2.5$ T	
340/3462         Rhodium-Iron         RF-800-4         1.4 k to 500 k         T > 77 K & 8 ≤ 8 T           Regative         Cernox <sup>™</sup> CX-1010         0.3 k to 325 k         T > 77 K & 8 ≤ 8 T           Coefficient RTDs         Cernox <sup>™</sup> CX-1010         0.3 k to 420 k <sup>-5</sup> T > 2 K & 8 E 19 T           Coefficient RTDs         Cernox <sup>™</sup> CX-1050-HT         1.4 k to 420 k <sup>-1</sup> T > 2 K & 8 E 19 T           Cernox <sup>™</sup> CX-1060-HT         1.4 k to 420 k <sup>-1</sup> T > 2 K & 8 E 19 T         Cernox <sup>™</sup> Germanium         GR-50-AA         0.1 k to 420 k <sup>-1</sup> T > 2 K & 8 E 19 T         Cernox <sup>™</sup> Germanium         GR-1400-AA         1.4 k to 100 k <sup>4</sup> Not Recommended         Carbon-Glass         CGR-1-500         1.4 k to 325 k <sup>4</sup> T > 2 K & 8 E 19 T           Carbon-Glass         CGR-1-2000         2 k to 325 k <sup>4</sup> T > 2 k & 8 E 10 T         Rox <sup>™</sup> Rx-102         0.1 k to 40 k <sup>6</sup> T > 2 k & 8 E 10 T           Rox <sup>™</sup> Rx-102         0.1 k to 40 k <sup>6</sup> T > 2 k & 8 E 10 T         Rox <sup>™</sup> Rx-102         0.1 k to 40 k <sup>6</sup> T > 2 k & 8 E 10 T           Rox <sup>™</sup> Rx-102         0.1 k to 40 k <sup>6</sup> T > 2 k & 8 E 10 T         Rox <sup>™</sup> Rx-102         0.1 k to 40 k <sup>6</sup> <t< th=""><th>Coefficient RTDs</th><th><b>100</b> <math>\Omega</math> Platinum</th><th>PT-111</th><th>14 K to 673 K</th><th><math display="inline">T&gt;40</math> K &amp; B <math display="inline">\leq 2.5</math> T</th></t<>	Coefficient RTDs	<b>100</b> $\Omega$ Platinum	PT-111	14 K to 673 K	$T>40$ K & B $\leq 2.5$ T	
Rhodium-Iron         RF-100T/U         1.4 k to 325 k         T > 77.8 & 8 ≤ 8 T           Negative Temperature Cerenox***         Cx-1010         0.3 k to 325 k <sup>3</sup> T > 2 & k & 8 ≤ 19 T           S40/3462         Cernox***         CX-1030-HT         0.3 k to 320 k <sup>3</sup> T > 2 & k & 8 ≤ 19 T           340/3462         Cernox***         CX-1050-HT         1.4 k to 420 k <sup>3</sup> T > 2 & k & 8 ≤ 19 T           340/3462         Cernox***         CX-1070-HT         4 k to 420 k <sup>3</sup> T > 2 & k & 8 ≤ 19 T           340/3462         Cernox***         CX-1070-HT         4 k to 420 k <sup>3</sup> T > 2 & k & 8 ≤ 19 T           340/3462         Germanium         GR-300-AA         0.3 k to 100 k <sup>4</sup> Not Recommended           Germanium         GR-300-AA         0.3 k to 100 k <sup>4</sup> Not Recommended           Germanium         GR-300-AA         0.3 k to 100 k <sup>4</sup> Not Recommended           Garbon-Glass         CGR-1-5000         1.4 k to 325 k <sup>4</sup> T > 2 k & 8 ≤ 19T           Carbon-Glass         CGR-1-2000         2 k to 40 k <sup>6</sup> T > 2 k & 8 ≤ 10T           Rox**         Rx-102         0.1 k to 40 k <sup>6</sup> T > 2 k & 8 ≤ 10T           Rox**         Rx-202         0.1 k to 40 k <sup>6</sup> T > 2 k & 8 ≤ 10T           Rox**	340/3462	Rhodium-Iron	RF-800-4	1.4 K to 500 K	$T > 77~K~\&~B \le 8~T$	
Negative Temperature Coefficient RTDs 340/3462         Cernox "         CX-1030-HT         0.3 K to 325 K³         T> 2 K & B ≤ 19 T           340/3462         Cernox "         CX-1030-HT         0.3 K to 420 K³         T> 2 K & B ≤ 19 T           340/3462         Cernox "         CX-1050-HT         1.4 K to 420 K³         T> 2 K & B ≤ 19 T           340/3462         Cernox "         CX-1070-HT         4 K to 420 K³         T> 2 K & B ≤ 19 T           Germanium         GR-50-AA         0.1 K to 5 K <sup>4</sup> Not Recommended           Germanium         GR-1400-AA         1.4 K to 325 K <sup>4</sup> T> 2 K & B ≤ 19 T           Garbon-Glass         CGR-1-500         1.4 K to 325 K <sup>4</sup> T> 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-2000         2 K to 325 K <sup>4</sup> T> 2 K & B ≤ 19 T           Rox ""         RX-102         0.1 K to 40 K <sup>5</sup> T> 2 K & B ≤ 10 T           Rox ""         RX-102         0.1 K to 40 K <sup>5</sup> T> 2 K & B ≤ 10 T           Rox ""         RX-202         0.1 K to 40 K <sup>5</sup> T> 2 K & B ≤ 10 T           Rox ""         RX-202         0.1 K to 40 K <sup>5</sup> T> 2 K & B ≤ 10 T           Rox ""         RX-202         0.1 K to 40 K <sup>5</sup> T> 2 K & B ≤ 10 T           Rox ""         Rox ""         RX-202		Rhodium-Iron	RF-100T/U	1.4 K to 325 K	$T>77~K~\&~B\leq 8~T$	
Temperature Coefficient RTDs 340/3462         Cernox <sup>™</sup> Crow <sup>™</sup> CX:1030-HT CX:1050-HT CX:1070-HT         1.4 K to 420 K <sup>3</sup> 4 K to 420 K <sup>3</sup> T > 2 K & B ≤ 19 T Cernox <sup>™</sup> 340/3462         Cernox <sup>™</sup> CX:070-HT         1.4 K to 420 K <sup>3</sup> 4 K to 420 K <sup>3</sup> T > 2 K & B ≤ 19 T Cernox <sup>™</sup> CX:1070-HT         4 K to 420 K <sup>3</sup> T > 2 K & B ≤ 19 T Cernox <sup>™</sup> Germanium         GR-300-AA         0.1 K to 5 K <sup>4</sup> Not Recommended Germanium         Not Recommended Carbon-Glass           Gernon-Glass         CGR-1-500         1.4 K to 100 K <sup>4</sup> Not Recommended Carbon-Glass         CGR-1-500           Carbon-Glass         CGR-1-1000         1.7 K to 325 K <sup>4</sup> T > 2 K & B ≤ 19 T Carbon-Glass         CGR-1-2000           Rox <sup>™</sup> RX:102         0.1 K to 40 K <sup>5</sup> T > 2 K & B ≤ 19 T Carbon-Glass         CGR-1-2000           Rox <sup>™</sup> RX:02         0.1 K to 40 K <sup>5</sup> T > 2 K & B ≤ 10 T Rox <sup>™</sup> T > 2 K & B ≤ 10 T Rox <sup>™</sup> Rox <sup>™</sup> RX:02         0.1 K to 40 K <sup>5</sup> T > 2 K & B ≤ 10 T Rox <sup>™</sup> T > 2 K & B ≤ 10 T Rox <sup>™</sup> Box <sup>™</sup> RX:02         0.1 K to 40 K <sup>5</sup> T > 2 K & B ≤ 10 T Rox <sup>™</sup> T > 2 K & B ≤ 10 T Rox <sup>™</sup> Box <sup>™</sup> RX:03         1.4 K to 40 K         T > 2 K & B ≤ 10 T Rox <sup>™</sup> Box <sup>™</sup> Rox <sup>™</sup> RX:03         1.4 K to 40 K           T > 2 K & B ≤ 10 T Rox <sup>™</sup> Rox <sup>™</sup> Not recommended	Negative	Cernox™	CX-1010	0.3 K to 325 K <sup>3</sup>	$T>2$ K & B $\leq 19$ T	
Coefficient RTDs 340/3462         Cernox <sup>™</sup> Crow <sup>™</sup> CX-1050-HT         1.4 K to 420 K <sup>3</sup> T > 2 K & B ≤ 19 T           340/3462         Cernox <sup>™</sup> CX-1070-HT         4 K to 420 K <sup>3</sup> T > 2 K & B ≤ 19 T           Germanium         GR-300-AA         0.1 K to 5 K <sup>4</sup> Not Recommended           Germanium         GR-300-AA         0.3 K to 100 K <sup>4</sup> Not Recommended           Germanium         GR-1400-AA         1.4 K to 325 K <sup>4</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-500         1.4 K to 325 K <sup>4</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-2000         2 K to 325 K <sup>4</sup> T > 2 K & B ≤ 19 T           Rox <sup>™</sup> RX-102         0.1 K to 40 K <sup>5</sup> T > 2 K & B ≤ 10 T           Rox <sup>™</sup> RX-102         0.1 K to 40 K <sup>5</sup> T > 2 K & B ≤ 10 T           Rox <sup>™</sup> RX-102         0.1 K to 40 K <sup>5</sup> T > 2 K & B ≤ 10 T           Rox <sup>™</sup> RX-102         0.1 K to 40 K <sup>5</sup> T > 2 K & B ≤ 10 T           Rox <sup>™</sup> RX-102         0.1 K to 40 K <sup>5</sup> T > 2 K & B ≤ 10 T           Rox <sup>™</sup> RX-102         0.1 K to 40 K <sup>5</sup> T > 2 K & B ≤ 10 T           Rox <sup>™</sup> RX-102         0.1 K to 40 K <sup>5</sup> T > 2 K & B ≤ 10 T	Temperature	Cernox™	CX-1030-HT	0.3 K to 420 K <sup>3, 5</sup>	$T>2~K~\&~B\leq19~T$	
340/3462         Cerrox <sup>**</sup> CX-1070-HT         4 K to 420 K <sup>3</sup> T > 2 K & B ≤ 19 T           Cerrox <sup>**</sup> CX-1080-HT         20 K to 420 K <sup>3</sup> T > 2 K & B ≤ 19 T           Germanium         GR-50-AA         0.1 K to 5 K <sup>4</sup> Mol Recommended           Germanium         GR-300-AA         0.3 K to 100 K <sup>4</sup> Not Recommended           Germanium         GR-1400-AA         1.4 K to 325 K <sup>4</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-1000         1.7 K to 325 K <sup>4</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-2000         2 K to 325 K <sup>4</sup> T > 2 K & B ≤ 10 T           Rox <sup>***</sup> RX-102         0.1 K to 40 K <sup>5</sup> T > 2 K & B ≤ 10 T           Rox <sup>***</sup> RX-103         1.4 K to 40 K         T > 2 K & B ≤ 10 T           Rox <sup>***</sup> RX-103         1.4 K to 40 K         T > 2 K & B ≤ 10 T           Rox <sup>***</sup> RX-103         1.4 K to 40 K         T > 2 K & B ≤ 10 T           Rox <sup>***</sup> RX-103         1.4 K to 40 K         T > 2 K & B ≤ 10 T           Rox <sup>***</sup> RX-103         1.4 K to 40 K         T > 2 K & B ≤ 10 T           Rox <sup>***</sup> RX-103         1.4 K to 00 K         T > 2 K & B ≤ 10 T           Stitoro Diode         DT-	Coefficient RTDs	Cernox™	CX-1050-HT	1.4 K to 420 K <sup>3</sup>	$T>2~K~\&~B\leq19~T$	
Cernox <sup>™</sup> CX-1080-HT         20 K to 420 K <sup>3</sup> T > 2 K & B ≤ 19 T           Germanium         GR-50-AA         0.1 K to 5 K <sup>4</sup> Not Recommended           Germanium         GR-300-AA         0.3 K to 100 K <sup>4</sup> Not Recommended           Germanium         GR-1400-AA         1.4 K to 100 K <sup>4</sup> Not Recommended           Germanium         GR-1400-AA         1.4 K to 100 K <sup>4</sup> Not Recommended           Carbon-Glass         CGR-1-500         1.4 K to 325 K <sup>4</sup> T > 2 K & 8 ≤ 19 T           Carbon-Glass         CGR-1-2000         2 K to 325 K <sup>4</sup> T > 2 K & 8 ≤ 10 T           Rox <sup>™</sup> RX-102         0.1 K to 40 K <sup>5</sup> T > 2 K & 8 ≤ 10 T           Rox <sup>™</sup> RX-102         0.1 K to 40 K <sup>5</sup> T > 2 K & 8 ≤ 10 T           Rox <sup>™</sup> RX-102         0.1 K to 40 K <sup>5</sup> T > 2 K & 8 ≤ 10 T           Rox <sup>™</sup> RX-202         0.1 K to 40 K <sup>5</sup> T > 2 K & 8 ≤ 10 T           Rox <sup>™</sup> RX-202         0.1 K to 40 K <sup>5</sup> T > 2 K & 8 ≤ 10 T           Rox <sup>™</sup> RX-202         0.1 K to 40 K <sup>5</sup> T > 2 K & 8 ≤ 10 T           Stilicon Diode         DT-670-SD         1.4 K to 40 K <sup>5</sup> Not recommended           3464         Silicon Diode         D	340/3462	Cernox™	CX-1070-HT	4 K to 420 K <sup>3</sup>	$T > 2 K \& B \le 19 T$	
Germanium         GR-50-AA         0.1 K to 5 K <sup>4</sup> Not Recommended           Germanium         GR-300-AA         0.3 K to 100 K <sup>4</sup> Not Recommended           Germanium         GR-1400-AA         1.4 K to 100 K <sup>4</sup> Not Recommended           Carbon-Glass         CGR-1-500         1.4 K to 325 K <sup>4</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-2000         2 K to 325 K <sup>4</sup> T > 2 K & B ≤ 19 T           Rox <sup>™</sup> RX-102         0.1 K to 40 K <sup>5</sup> T > 2 K & B ≤ 10 T           Rox <sup>™</sup> RX-102         0.1 K to 40 K <sup>5</sup> T > 2 K & B ≤ 10 T           Rox <sup>™</sup> RX-102         0.1 K to 40 K <sup>5</sup> T > 2 K & B ≤ 10 T           Rox <sup>™</sup> RX-202         0.1 K to 40 K <sup>5</sup> T > 2 K & B ≤ 10 T           Rox <sup>™</sup> RX-202         0.1 K to 40 K <sup>5</sup> T > 2 K & B ≤ 10 T           Rox <sup>™</sup> RX-202         0.1 K to 40 K <sup>5</sup> T > 2 K & B ≤ 10 T           Store         9006-004         3.2 K to 150 K         Not recommended           Geromaliance         9006-002         1.2 K to 610 K         Not recommended           Jdios         Silicon Diode         DT-670-SD         1.4 K to 290 K         Not recommended           Jdios         Silicon Diode		Cernox™	CX-1080-HT	20 K to 420 K <sup>3</sup>	$T>2$ K & B $\leq 19$ T	
Germanium         GR-300-AA         0.3 K to 100 K <sup>4</sup> Not Recommended           Germanium         GR-1400-AA         1.4 K to 100 K <sup>4</sup> Not Recommended           Carbon-Glass         CGR-1-500         1.4 K to 325 K         T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-1000         1.7 K to 325 K <sup>4</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-2000         2 K to 325 K <sup>4</sup> T > 2 K & B ≤ 19 T           Rox <sup>™</sup> RX-102         0.1 K to 40 K <sup>6</sup> T > 2 K & B ≤ 10 T           Rox <sup>™</sup> RX-202         0.1 K to 40 K <sup>6</sup> T > 2 K & B ≤ 10 T           Rox <sup>™</sup> RX-202         0.1 K to 40 K <sup>6</sup> T > 2 K & B ≤ 10 T           Thermocouples         Type K         9006-006         3.2 K to 934 K         Not recommended           3464         Type E         9006-002         1.2 K to 610 K         Mot recommended           Grapacitance         Silicon Diode         DT-670-SD         1.4 K to 290 K         Not recommended           3468         Silicon Diode         DT-670-SD         1.4 K to 305 K         T ≥ 60 K & B ≤ 3T           Silicon Diode         DT-471-SD         1.4 K to 305 K         T ≥ 60 K & B ≤ 3T           Silicon Diode         DT-472-SD         1.4 K to 500 K         <		Germanium	GR-50-AA	0.1 K to 5 K <sup>4</sup>	Not Recommended	
Germanium         GR-1400-AA         1.4 k to 100 K <sup>4</sup> Not Recommended           Carbon-Glass         CGR-1-500         1.4 k to 325 k <sup>4</sup> T > 2 k & 8 ≤ 19 T           Carbon-Glass         CGR-1-1000         1.7 k to 325 k <sup>4</sup> T > 2 k & 8 ≤ 19 T           Carbon-Glass         CGR-1-2000         2 k to 325 k <sup>4</sup> T > 2 k & 8 ≤ 19 T           Rox™         RX-102         0.1 k to 40 k <sup>5</sup> T > 2 k & 8 ≤ 10 T           Rox™         RX-102         0.1 k to 40 k <sup>5</sup> T > 2 k & 8 ≤ 10 T           Rox™         RX-202         0.1 k to 40 k <sup>5</sup> T > 2 k & 8 ≤ 10 T           Rox™         RX-202         0.1 k to 40 k <sup>5</sup> T > 2 k & 8 ≤ 10 T           Rox™         RX-202         0.1 k to 40 k <sup>5</sup> T > 2 k & 8 ≤ 10 T           Rox™         RX-202         0.1 k to 40 k <sup>5</sup> Not recommended           3464         Type K         9006-002         3.2 k to 1505 k         Not recommended           3465         Silicon Diode         DT-670E-BR         30 k to 500 k         T ≥ 60 k & 8 ≤ 3T           3468         Silicon Diode         DT-414         1.4 k to 325 k         T ≥ 60 k & 8 ≤ 3T           Silicon Diode         DT-471-SD         1.4 k to 325 k         T ≥ 60 k & 8 ≤ 3T           S		Germanium	GR-300-AA	0.3 K to 100 K <sup>4</sup>	Not Recommended	
Carbon-Glass         CGR-1-500         1.4 k to 325 k         T > 2 k & B ≤ 19 T           Carbon-Glass         CGR-1-1000         1.7 k to 325 k <sup>4</sup> T > 2 k & B ≤ 19 T           Carbon-Glass         CGR-1-2000         2 k to 325 k <sup>4</sup> T > 2 k & B ≤ 19 T           Rox <sup>™</sup> RX-102         0.1 k to 40 k <sup>5</sup> T > 2 k & B ≤ 10 T           Rox <sup>™</sup> RX-103         1.4 k to 40 k <sup>5</sup> T > 2 k & B ≤ 10 T           Rox <sup>™</sup> RX-202         0.1 k to 40 k <sup>5</sup> T > 2 k & B ≤ 10 T           Thermocouples         Type K         9006-006         3.2 k to 934 k         Not recommended           3464         Type E         9006-002         1.2 k to 610 k         Not recommended           Juice         Diodes         Silicon Diode         DT-670-SD         1.4 k to 290 k         Not recommended           3468         Silicon Diode         DT-670-SD         1.4 k to 500 k         T ≥ 60 k & 8 ≤ 3T           Silicon Diode         DT-470-SD         1.4 k to 500 k         T ≥ 60 k & 8 ≤ 3T           Silicon Diode         DT-470-SD         1.4 k to 500 k         T ≥ 60 k & 8 ≤ 3T           Silicon Diode         DT-470-SD         1.4 k to 500 k         T ≥ 60 k & 8 ≤ 3T           Silicon Diode         DT-470-SD         1.4 k t		Germanium	GR-1400-AA	1.4 K to 100 K <sup>4</sup>	Not Recommended	
Carbon-Glass         CGR-1-1000         1.7 K to 325 K <sup>4</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-2000         2 K to 325 K <sup>4</sup> T > 2 K & B ≤ 19 T           Rox <sup>™</sup> RX-102         0.1 K to 40 K <sup>5</sup> T > 2 K & B ≤ 10 T           Rox <sup>™</sup> RX-102         0.1 K to 40 K <sup>5</sup> T > 2 K & B ≤ 10 T           Rox <sup>™</sup> RX-202         0.1 K to 40 K <sup>5</sup> T > 2 K & B ≤ 10 T           Rox <sup>™</sup> RX-202         0.1 K to 40 K <sup>5</sup> T > 2 K & B ≤ 10 T           Thermocouples         Type K         9006-006         3.2 K to 1505 K         Not recommended           3464         Type E         9006-002         1.2 K to 610 K         Not recommended           Aufe 0.07%         CS-501         1.4 K to 290 K         Not recommended           3463         Silicon Diode         DT-670-SD         1.4 K to 500 K         T ≥ 60 K & B ≤ 3 T           3468         Silicon Diode         DT-470-SD         1.4 K to 500 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-470-SD         1.4 K to 500 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-470-SD         1.4 K to 500 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-470-SD         1.4 K to 500 K         T > 40 K		Carbon-Glass	CGR-1-500	1.4 K to 325 K	$T>2~K~\&~B\leq19~T$	
Carbon-Glass         CGR-1-2000         2 K to 325 K <sup>4</sup> T > 2 K & B ≤ 19 T           Rox <sup>™</sup> RX-102         0.1 K to 40 K <sup>3</sup> T > 2 K & B ≤ 10 T           Rox <sup>™</sup> RX-103         1.4 K to 40 K <sup>3</sup> T > 2 K & B ≤ 10 T           Rox <sup>™</sup> RX-202         0.1 K to 40 K <sup>3</sup> T > 2 K & B ≤ 10 T           Thermocouples         Type K         9006-006         3.2 K to 1505 K         Not recommended           3464         Type E         9006-002         1.2 K to 610 K         Not recommended           AuFe 0.07%         CS-501         1.4 K to 290 K         Not recommended           3463         Silicon Diode         DT-670-SD         1.4 K to 500 K         T ≥ 60 K & B ≤ 3 T           3468         Silicon Diode         DT-670-SD         1.4 K to 375 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-471         1.4 K to 375 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-471-SD         10 K to 500 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-471-SD         10 K to 500 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-471-SD         10 K to 500 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-472.0         1.4 K to 325 K         T > 42 K		Carbon-Glass	CGR-1-1000	1.7 K to 325 K <sup>4</sup>	$T>2~K~\&~B\leq19~T$	
Rox <sup>™</sup> RX-102         0.1 K to 40 K <sup>3</sup> T > 2 K & B ≤ 10 T           Rox <sup>™</sup> RX-103         1.4 K to 40 K         T > 2 K & B ≤ 10 T           Rox <sup>™</sup> RX-202         0.1 K to 40 K <sup>3</sup> T > 2 K & B ≤ 10 T           Rox <sup>™</sup> RX-202         0.1 K to 40 K <sup>3</sup> T > 2 K & B ≤ 10 T           Rox <sup>™</sup> RX-202         0.1 K to 40 K <sup>3</sup> T > 2 K & B ≤ 10 T           More         9006-006         3.2 K to 1505 K         Not recommended           Jype E         9006-002         1.2 K to 610 K         Not recommended           Gasciance         Silicon Diode         DT-670-SD         1.4 K to 500 K         T ≥ 60 K & B ≤ 3 T           Jideo         DT-670E-BR         30 K to 500 K         T ≥ 60 K & B ≤ 3 T         Silicon Diode         DT-471         1.4 K to 325 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-471-SD         1.4 K to 325 K         T ≥ 60 K & B ≤ 3 T         Silicon Diode         DT-471         1.4 K to 325 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-471-SD         10 K to 325 K         T ≥ 60 K & B ≤ 3 T         Silicon Diode         DT-471-SD         10 K to 325 K         T > 42 K & B ≤ 5 T           GaAlAS Diode         TG-120-PI         1.4 K to 325 K         T > 42 K & B ≤		Carbon-Glass	CGR-1-2000	2 K to 325 K <sup>4</sup>	$T>2~K~\&~B\leq19~T$	
Rox™         RX-103         1.4 K to 40 K         T > 2 K & B ≤ 10 T           Rox™         RX-202         0.1 K to 40 K <sup>3</sup> T > 2 K & B ≤ 10 T           Thermocouples         Type K         9006-006         3.2 K to 1505 K         Not recommended           3464         Type E         9006-002         3.2 K to 934 K         Not recommended           Chromel- AuFe 0.07%         9006-002         1.2 K to 610 K         Not recommended           3468         Silicon Diode         DT-670-SD         1.4 K to 500 K         T ≥ 60 K & B ≤ 3 T           3468         Silicon Diode         DT-670-SD         1.4 K to 300 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-670-SD         1.4 K to 300 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-4714         1.4 K to 325 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-470-SD         1.4 K to 325 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-471-SD         10 K to 500 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-471-SD         10 K to 500 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-471-SD         10 K to 500 K         T > 42 K & B ≤ 5 T           GaAlAs Diode         TG-120-PL         1.4 K to 325 K         <		Rox™	RX-102	0.1 K to 40 K <sup>5</sup>	$T>2$ K & B $\leq 10$ T	
Rox™         RX-202         0.1 K to 40 K <sup>5</sup> T > 2 K & B ≤ 10 T           Thermocouples 3464         Type K         9006-006         3.2 K to 1505 K         Not recommended           3464         Type E         9006-004         3.2 K to 934 K         Not recommended           Capacitance 3465         AuFe 0.07%         1.2 K to 610 K         Not recommended           3468         Silicon Diode         DT-670-SD         1.4 K to 290 K         Not recommended           3468         Silicon Diode         DT-670E-BR         30 K to 500 K         T ≥ 60 K & B ≤ 3 T           3468         Silicon Diode         DT-470-SD         1.4 K to 375 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-471-SD         1.4 K to 325 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-471-SD         10 K to 500 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-471-SD         10 K to 500 K         T ≥ 60 K & B ≤ 3 T           GaAlAs Diode         TG-120-P         1.4 K to 325 K         T > 42 K & B ≤ 5 T           GaAlAs Diode         TG-120-P         1.4 K to 500 K         T > 42 K & B ≤ 5 T           GaAlAs Diode         TG-120-PL         1.4 K to 500 K         T > 42 K & B ≤ 5 T           GaAlAs Diode         TG-120-PL		Rox™	RX-103	1.4 K to 40 K	$T>2~K~\&~B\leq10~T$	
Thermocouples 3464         Type K         9006-006         3.2 K to 1505 K         Not recommended           3464         Type E         9006-004         3.2 K to 934 K         Not recommended           Chromel- AuFe 0.07%         9006-002         1.2 K to 610 K         Not recommended           3468         Silicon Diode         DT-670-SD         1.4 K to 290 K         Not recommended           3468         Silicon Diode         DT-670-SD         1.4 K to 500 K         T ≥ 60 K & B ≤ 3 T           3468         Silicon Diode         DT-670-BR         30 K to 500 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-470-SD         1.4 K to 325 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-470-SD         1.4 K to 325 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-471-SD         10 K to 500 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-471-SD         10 K to 500 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-471-SD         10 K to 500 K         T ≥ 60 K & B ≤ 3 T           GaAlAs Diode         TG-120-P         1.4 K to 325 K         T > 42 K & B ≤ 5 T           GaAlAs Diode         TG-120-P         1.4 K to 800 K         T > 40 K & B ≤ 2.5 T           Coefficient RTDs         3468 </th <th></th> <th>Rox™</th> <th>RX-202</th> <th>0.1 K to 40 K<sup>5</sup></th> <th><math display="block">T&gt;2~K~\&amp;~B\leq10~T</math></th>		Rox™	RX-202	0.1 K to 40 K <sup>5</sup>	$T>2~K~\&~B\leq10~T$	
3464         Type E         9006-004         3.2 K to 934 K         Not recommended           Chromel- AuFe 0.07%         9006-002         1.2 K to 610 K         Not recommended           Capacitance 3465         Silicon Diode         DT-670-SD         1.4 K to 290 K         Not recommended           3468         Silicon Diode         DT-670-SD         1.4 K to 500 K         T ≥ 60 K & B ≤ 3 T           3ilicon Diode         DT-670E-BR         30 K to 500 K         T ≥ 60 K & B ≤ 3 T         Silicon Diode         DT-421         1.4 K to 375 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-472         1.4 K to 375 K         T ≥ 60 K & B ≤ 3 T         Silicon Diode         DT-470-SD         1.4 K to 500 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-470-SD         1.4 K to 500 K         T ≥ 60 K & B ≤ 3 T         Silicon Diode         DT-470-SD         1.4 K to 500 K         T ≥ 60 K & B ≤ 3 T           GaAlAS Diode         TG-120-PL         1.4 K to 325 K         T > 4.2 K & B ≤ 5 T         GaAlAS Diode         TG-120-PL         1.4 K to 325 K         T > 4.2 K & B ≤ 5 T           Optitive Temperature         Coefficient RTDs         100 Ω Platinum         PT-102/3         14 K to 800 K         T > 40 K & B ≤ 2.5 T           3468         Cernox <sup>™</sup> <thcx-1010< th="">         2 K to</thcx-1010<>	Thermocouples	Туре К	9006-006	3.2 K to 1505 K	Not recommended	
Chromel- AuFe 0.07%         9006-002         1.2 K to 610 K         Not recommended           3465         CS-501         1.4 K to 290 K         Not recommended           3465         Silicon Diode         DT-670-SD         1.4 K to 500 K         T≥60 K & B ≤ 3 T           3468         Silicon Diode         DT-670E-BR         30 K to 500 K         T≥60 K & B ≤ 3 T           Silicon Diode         DT-670E-BR         30 K to 500 K         T≥60 K & B ≤ 3 T           Silicon Diode         DT-414         1.4 K to 375 K         T≥60 K & B ≤ 3 T           Silicon Diode         DT-470-SD         1.4 K to 325 K         T≥60 K & B ≤ 3 T           Silicon Diode         DT-471-SD         10 K to 500 K         T≥60 K & B ≤ 3 T           Silicon Diode         DT-471-SD         10 K to 500 K         T≥60 K & B ≤ 3 T           GaAlAs Diode         TG-120-P         1.4 K to 325 K         T > 42 K & B ≤ 5 T           GaAlAs Diode         TG-120-PL         1.4 K to 500 K         T > 42 K & B ≤ 2.5 T           GaAlAs Diode         TG-120-SD         1.4 K to 500 K         T > 42 K & B ≤ 2.5 T           GaAlAs Diode         TG-120-SD         1.4 K to 500 K         T > 42 K & B ≤ 2.5 T           GaAlAs Diode         TG-120-SD         1.4 K to 500 K         T > 42 K & B ≤ 2.5 T <th>3464</th> <th>Туре Е</th> <th>9006-004</th> <th>3.2 K to 934 K</th> <th>Not recommended</th>	3464	Туре Е	9006-004	3.2 K to 934 K	Not recommended	
AuFe 0.07%         CS-501         1.4 K to 290 K         Not recommended           3465         Silicon Diode         DT-670-SD         1.4 K to 500 K         T ≥ 60 K & B ≤ 3 T           3468         Silicon Diode         DT-670E-BR         30 K to 500 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-670E-BR         30 K to 500 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-414         1.4 K to 325 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-470-SD         1.4 K to 325 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-470-SD         1.4 K to 500 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-471-SD         10 K to 500 K         T ≥ 60 K & B ≤ 3 T           GaAlAs Diode         TG-120-P         1.4 K to 325 K         T > 42 K & B ≤ 5 T           GaAlAs Diode         TG-120-PL         1.4 K to 325 K         T > 42 K & B ≤ 5 T           GaAlAs Diode         TG-120-PL         1.4 K to 500 K         T > 40 K & B ≤ 2.5 T           GaAlAs Diode         TG-120-SD         1.4 K to 500 K         T > 40 K & B ≤ 2.5 T           GaAlAs Diode         TG-120-SD         1.4 K to 500 K         T > 40 K & B ≤ 2.5 T           Gaeficient RTDs         3468         Cernox ™         CX-1010		Chromel-	9006-002	1.2 K to 610 K	Not recommended	
Capacitance 3465         CS-501         1.4 K to 290 K         Not recommended           3468         Silicon Diode         DT-670-SD         1.4 K to 500 K $T \ge 60 K \& B \le 3 T$ 3468         Silicon Diode         DT-670E-BR         30 K to 500 K $T \ge 60 K \& B \le 3 T$ Silicon Diode         DT-4714         1.4 K to 375 K $T \ge 60 K \& B \le 3 T$ Silicon Diode         DT-4714         1.4 K to 375 K $T \ge 60 K \& B \le 3 T$ Silicon Diode         DT-471-SD         1.4 K to 500 K $T \ge 60 K \& B \le 3 T$ Silicon Diode         DT-471-SD         1.4 K to 500 K $T \ge 60 K \& B \le 3 T$ Silicon Diode         DT-471-SD         1.4 K to 500 K $T \ge 60 K \& B \le 3 T$ Silicon Diode         DT-471-SD         10 K to 500 K $T \ge 60 K \& B \le 3 T$ Silicon Diode         DT-471-SD         10 K to 500 K $T \ge 60 K \& B \le 3 T$ GaAlAs Diode         TG-120-P         1.4 K to 325 K $T > 4.2 K \& B \le 5 T$ GaAlAs Diode         TG-120-SD         1.4 K to 500 K $T > 4.2 K \& B \le 5 T$ GaAlAs Diode         TG-120-SD         1.4 K to 500 K $T > 4.2 K \& B \le 5 T$ Sid68         Rhodium-Iron         RF-800-4		AuFe 0.07%				
Diodes 3468         Silicon Diode         DT-670-SD         1.4 K to 500 K         T ≥ 60 K & B ≤ 3 T           3468         Silicon Diode         DT-670E-BR         30 K to 500 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-414         1.4 K to 375 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-414         1.4 K to 375 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-421         1.4 K to 325 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-470-SD         1.4 K to 300 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-471-SD         10 K to 500 K         T ≥ 60 K & B ≤ 3 T           GaAlAs Diode         TG-120-P         1.4 K to 325 K         T > 42 K & B ≤ 5 T           GaAlAs Diode         TG-120-PL         1.4 K to 325 K         T > 42 K & B ≤ 5 T           GaAlAs Diode         TG-120-SD         1.4 K to 500 K         T > 40 K & B ≤ 2.5 T           GaAlAs Diode         TG-120-SD         1.4 K to 500 K         T > 40 K & B ≤ 2.5 T           GaAlAs Diode         TG-120-SD         1.4 K to 500 K         T > 40 K & B ≤ 2.5 T           GaAlAs Diode         TG-120-SD         1.4 K to 500 K         T > 40 K & B ≤ 2.5 T           Gaeficient RTDs         Af68         Cermox <sup>TM</sup> CX-1010	Capacitance 3465		CS-501	1.4 K to 290 K	Not recommended	
3468         Silicon Diode         DT-670E-BR         30 K to 500 K         T≥60 K & B ≤ 3 T           Silicon Diode         DT-414         1.4 K to 375 K         T≥60 K & B ≤ 3 T           Silicon Diode         DT-421         1.4 K to 375 K         T≥60 K & B ≤ 3 T           Silicon Diode         DT-470-SD         1.4 K to 325 K         T≥60 K & B ≤ 3 T           Silicon Diode         DT-470-SD         1.4 K to 500 K         T≥60 K & B ≤ 3 T           Silicon Diode         DT-471-SD         10 K to 500 K         T≥60 K & B ≤ 3 T           GalAs Diode         TG-120-P         1.4 K to 325 K         T>4.2 K & B ≤ 5 T           GalAs Diode         TG-120-PL         1.4 K to 325 K         T>4.2 K & B ≤ 5 T           GalAs Diode         TG-120-SD         1.4 K to 300 K         T>4.2 K & B ≤ 5 T           GalAs Diode         TG-120-SD         1.4 K to 500 K         T>4.2 K & B ≤ 5 T           GalAs Diode         TG-120-SD         1.4 K to 500 K         T>4.0 K & B ≤ 2.5 T           Bode         DP1-111         14 K to 500 K         T>40 K & B ≤ 2.5 T           S468         Rhodium-Iron         RF-800-4         1.4 K to 500 K         T>77 K & B ≤ 8T           Rhodium-Iron         RF-100T/U         1.4 K to 325 K T         T>77 K & B ≤ 8T <td< th=""><th>Diodes</th><th>Silicon Diode</th><th>DT-670-SD</th><th>1.4 K to 500 K</th><th><math display="block">T \geq 60 \ K \ \&amp; \ B \leq 3 \ T</math></th></td<>	Diodes	Silicon Diode	DT-670-SD	1.4 K to 500 K	$T \geq 60 \ K \ \& \ B \leq 3 \ T$	
Silicon Diode         DT-414         1.4 K to 375 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-421         1.4 K to 325 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-470-SD         1.4 K to 325 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-470-SD         1.4 K to 500 K         T ≥ 60 K & B ≤ 3 T           Silicon Diode         DT-471-SD         10 K to 500 K         T ≥ 60 K & B ≤ 3 T           GaAlAs Diode         TG-120-P         1.4 K to 325 K         T > 4.2 K & B ≤ 5 T           GaAlAs Diode         TG-120-PL         1.4 K to 325 K         T > 4.2 K & B ≤ 5 T           GaAlAs Diode         TG-120-PL         1.4 K to 300 K         T > 4.2 K & B ≤ 5 T           GaAlAs Diode         TG-120-SD         1.4 K to 500 K         T > 4.2 K & B ≤ 5 T           GaeMas         Dio Ω Platinum         PT-102/3         14 K to 800 K         T > 40 K & B ≤ 2.5 T           3468         Rhodium-Iron         RF-800-4         1.4 K to 500 K         T > 77 K & B ≤ 8 T           Rhodium-Iron         RF-100T/U         1.4 K to 325 K         T > 77 K & B ≤ 8 T           Cernox™         CX-1030-HT         3.5 K to 420 K <sup>3.6</sup> T > 2 K & B ≤ 19 T           Goefficient RTDs <sup>2</sup> Gernox™         CX-1030-HT         3.5 K to 4	3468	Silicon Diode	DT-670E-BR	30 K to 500 K	$T \geq 60 \ K \ \& \ B \leq 3 \ T$	
Silicon Diode         DT-421         1.4 K to 325 K $T \ge 60 K \& B \le 3T$ Silicon Diode         DT-470-SD         1.4 K to 500 K $T \ge 60 K \& B \le 3T$ Silicon Diode         DT-471-SD         10 K to 500 K $T \ge 60 K \& B \le 3T$ GaAlAs Diode         TG-120-P         1.4 K to 325 K $T \ge 4.2 K \& B \le 5T$ GaAlAs Diode         TG-120-PL         1.4 K to 325 K $T > 4.2 K \& B \le 5T$ GaAlAs Diode         TG-120-PL         1.4 K to 325 K $T > 4.2 K \& B \le 5T$ GaAlAs Diode         TG-120-SD         1.4 K to 500 K $T > 4.2 K \& B \le 5T$ GaAlAs Diode         TG-120-SD         1.4 K to 500 K $T > 4.2 K \& B \le 5T$ Fositive Temperature         100 $\Omega$ Platinum         PT-102/3         14 K to 500 K $T > 40 K \& B < 2.5 T$ 3468         Rhodium-Iron         RF-800-4         1.4 K to 500 K $T > 77 K \& B < 8T$ Rhodium-Iron         RF-100T/U         1.4 K to 325 K $T > 27 K \& B < 19 T$ Cernox <sup>TM</sup> CX-1030-HT         3.5 K to 420 K <sup>3.6</sup> $T > 2 K \& B < 19 T$ Geefficient RTDs <sup>2</sup> Gernox T <sup>M</sup> CX-1070-HT         15 K to 420 K <sup>3.6</sup> $T > 2 K \& B < 19 T$ Geefficient RTDs <sup>2</sup> </th <th></th> <th>Silicon Diode</th> <th>DT-414</th> <th>1.4 K to 375 K</th> <th><math display="block">T \geq 60 \text{ K \&amp; B} \leq 3 \text{ T}</math></th>		Silicon Diode	DT-414	1.4 K to 375 K	$T \geq 60 \text{ K \& B} \leq 3 \text{ T}$	
Silicon Diode         DT-470-SD         1.4 K to 500 K $T \ge 60 K \& B \le 3 T$ Silicon Diode         DT-471-SD         10 K to 500 K $T \ge 60 K \& B \le 3 T$ GaAlAs Diode         TG-120-P         1.4 K to 325 K $T > 4.2 K \& B \le 5 T$ GaAlAs Diode         TG-120-PL         1.4 K to 325 K $T > 4.2 K \& B \le 5 T$ GaAlAs Diode         TG-120-PL         1.4 K to 325 K $T > 4.2 K \& B \le 5 T$ GaAlAs Diode         TG-120-PL         1.4 K to 500 K $T > 4.2 K \& B \le 5 T$ Positive Temperature         100 $\Omega$ Platinum         PT-102/3         14 K to 500 K $T > 40 K \& B \le 2.5 T$ 3468         Negative         Thodium-Iron         RF-800-4         1.4 K to 500 K $T > 77 K \& B \le 8 T$ Rhodium-Iron         RF-100T/U         1.4 K to 500 K $T > 77 K \& B \le 8 T$ $T > 2 K \& B \le 19 T$ Cernox <sup>TM</sup> CX-1010         2 K to 325 K <sup>5</sup> $T > 2 K \& B \le 19 T$ Cernox <sup>TM</sup> CX-1030-HT         3.5 K to 420 K <sup>3.6</sup> $T > 2 K \& B \le 19 T$ Germanium         GR-300-AA         1.2 K to 100 K <sup>4</sup> Not recommended           Germanium         GR-300-AA         1.2 K to 100 K <sup>4</sup> Not recommended           Ge		Silicon Diode	DT-421	1.4 K to 325 K	$T \ge 60 \text{ K \& B} \le 3 \text{ T}$	
Silicon Diode         DT-471-SD         10 K to 500 K $T \ge 60 K \& B \le 3 T$ GaAlAs Diode         TG-120-P         1.4 K to 325 K $T > 4.2 K \& B \le 5 T$ GaAlAs Diode         TG-120-PL         1.4 K to 325 K $T > 4.2 K \& B \le 5 T$ GaAlAs Diode         TG-120-PL         1.4 K to 325 K $T > 4.2 K \& B \le 5 T$ Positive Temperature Coefficient RTDs         100 $\Omega$ Platinum         PT-102/3         14 K to 500 K $T > 40 K \& B \le 2.5 T$ 3468         Rhodium-Iron         RF-800-4         1.4 K to 500 K $T > 70 K \& B \le 8 T$ Rhodium-Iron         RF-100T/U         1.4 K to 500 K $T > 77 K \& B \le 8 T$ Rhodium-Iron         RF-100T/U         1.4 K to 325 K $T > 77 K \& B \le 8 T$ Rhodium-Iron         RF-100T/U         1.4 K to 325 K $T > 77 K \& B \le 8 T$ Cernox <sup>TM</sup> CX-1010         2 K to 325 K <sup>5</sup> $T > 2 K \& B \le 19 T$ Cernox <sup>TM</sup> CX-1030-HT         3.5 K to 420 K <sup>3.6</sup> $T > 2 K \& B \le 19 T$ Geefficient RTDs <sup>2</sup> Gernox T <sup>M</sup> CX-1070-HT         15 K to 420 K <sup>3.6</sup> $T > 2 K \& B \le 19 T$ Geefficient RTDs <sup>2</sup> Gernox T <sup>M</sup> CX-1030-HT         3.5 K to 420 K <sup>3.6</sup> $T > 2 K \& B \le $		Silicon Diode	DT-470-SD	1.4 K to 500 K	$T \geq 60 \text{ K \& B} \leq 3 \text{ T}$	
GaAlAs Diode         TG-120-P         1.4 K to 325 K         T > 4.2 K & B $\leq$ 5 T           GaAlAs Diode         TG-120-PL         1.4 K to 325 K         T > 4.2 K & B $\leq$ 5 T           GaAlAs Diode         TG-120-PL         1.4 K to 325 K         T > 4.2 K & B $\leq$ 5 T           Positive Temperature Coefficient RTDs         100 $\Omega$ Platinum         PT-102/3         14 K to 500 K         T > 40 K & B $\leq$ 2.5 T           100 $\Omega$ Platinum         PT-111         14 K to 673 K         T > 40 K & B $\leq$ 2.5 T           8468         Rhodium-Iron         RF-800-4         1.4 K to 500 K         T > 77 K & B $\leq$ 8 T           Negative Temperature Coefficient RTDs <sup>2</sup> Cernox T <sup>m</sup> CX-1010         2 K to 325 K         T > 2 K & B $\leq$ 19 T           Cernox T <sup>m</sup> CX-1030-HT         3.5 K to 420 K <sup>3.6</sup> T > 2 K & B $\leq$ 19 T           Cernox T <sup>m</sup> CX-1030-HT         4 K to 420 K <sup>3.6</sup> T > 2 K & B $\leq$ 19 T           Cernox T <sup>m</sup> CX-1070-HT         15 K to 420 K <sup>3.6</sup> T > 2 K & B $\leq$ 19 T           Germanium         GR-300-AA         1.2 K to 100 K <sup>4</sup> Not recommended           Germanium         GR-300-AA         1.2 K to 100 K <sup>4</sup> Not recommended           Germanium         GR-1400-AA         4 K to 325 K <sup>6</sup> T > 2 K & B $\leq$ 19 T <tr< th=""><th></th><th>Silicon Diode</th><th>DT-471-SD</th><th>10 K to 500 K</th><th><math display="block">T \ge 60 \text{ K \&amp; B} \le 3 \text{ T}</math></th></tr<>		Silicon Diode	DT-471-SD	10 K to 500 K	$T \ge 60 \text{ K \& B} \le 3 \text{ T}$	
GaAlAs Diode         TG-120-PL         1.4 K to 325 K         T > 4.2 K & B $\leq$ 5 T           Positive Temperature         Coefficient RTDs         100 $\Omega$ Platinum         PT-102/3         14 K to 500 K         T > 4.2 K & B $\leq$ 5 T           3468         Diode         PT-102/3         14 K to 800 K         T > 40 K & B $\leq$ 2.5 T           Negative         Rhodium-Iron         RF-800-4         1.4 K to 500 K         T > 77 K & B $\leq$ 8 T           Regative         Cernox T <sup>M</sup> CX-1010         2 K to 325 K         T > 77 K & B $\leq$ 8 T           Coefficient RTDs <sup>2</sup> Cernox T <sup>M</sup> CX-1010         2 K to 325 K         T > 2 K & B $\leq$ 19 T           Cernox T <sup>M</sup> CX-1030-HT         3.5 K to 420 K <sup>3.6</sup> T > 2 K & B $\leq$ 19 T           Cernox T <sup>M</sup> CX-1030-HT         4 K to 420 K <sup>3.6</sup> T > 2 K & B $\leq$ 19 T           Germanum         GR-300-AA         1.2 K to 140 K <sup>4</sup> Not recommended           Germanium         GR-1400-AA         4 K to 325 K <sup>5</sup> T > 2 K & B $\leq$ 19 T           Germanium         GR-1400-AA         4 K to 100 K <sup>4</sup> Not recommended           Germanium         GR-1400-AA         4 K to 325 K <sup>5</sup> T > 2 K & B $\leq$ 19 T           Carbon-Glass         CGR-1-500 <th k<="" th=""><th></th><th>GaAIAs Diode</th><th>TG-120-P</th><th>1.4 K to 325 K</th><th><math>T &gt; 4.2 \text{ K \&amp; B} \le 5 \text{ T}</math></th></th>	<th></th> <th>GaAIAs Diode</th> <th>TG-120-P</th> <th>1.4 K to 325 K</th> <th><math>T &gt; 4.2 \text{ K \&amp; B} \le 5 \text{ T}</math></th>		GaAIAs Diode	TG-120-P	1.4 K to 325 K	$T > 4.2 \text{ K \& B} \le 5 \text{ T}$
GaAlAs Diode         TG-120-SD         1.4 K to 500 K         T > 4.2 K & B $\leq$ 5 T           Positive Temperature Coefficient RTDs         100 $\Omega$ Platinum         PT-102/3         14 K to 800 K         T > 40 K & B $\leq$ 2.5 T           3468         Rhodium-Iron         RF-800-4         1.4 K to 500 K         T > 77 K & B $\leq$ 8 T           Negative Temperature Coefficient RTDs <sup>2</sup> Cernox <sup>TM</sup> CX-1010         2 K to 325 K         T > 77 K & B $\leq$ 8 T           Cernox <sup>TM</sup> CX-1010         2 K to 325 K         T > 2 K & B $\leq$ 19 T           Cernox <sup>TM</sup> CX-1030-HT         3.5 K to 420 K <sup>3.6</sup> T > 2 K & B $\leq$ 19 T           Cernox <sup>TM</sup> CX-1070-HT         15 K to 420 K <sup>3.6</sup> T > 2 K & B $\leq$ 19 T           Germanum         GR-300-AA         1.2 K to 100 K <sup>4</sup> Not recommended           Germanium         GR-300-AA         1.2 K to 100 K <sup>4</sup> Not recommended           Germanium         GR-1400-AA         4 K to 325 K <sup>5</sup> T > 2 K & B $\leq$ 19 T           Carbon-Glass         CGR-1-500         4 K to 325 K <sup>5</sup> T > 2 K & B $\leq$ 19 T           Carbon-Glass         CGR-1-500         4 K to 325 K <sup>5</sup> T > 2 K & B $\leq$ 19 T           Carbon-Glass         CGR-1-2000         6 K to 325 K <sup>5</sup> <thent cols<="" th=""><th></th><th>GaAlAs Diode</th><th>TG-120-PL</th><th>1.4 K to 325 K</th><th><math>T &gt; 4.2 \text{ K \&amp; B} \le 5 \text{ T}</math></th></thent>		GaAlAs Diode	TG-120-PL	1.4 K to 325 K	$T > 4.2 \text{ K \& B} \le 5 \text{ T}$	
Positive Temperature Coefficient RTDs         100 Ω Platinum         PT-102/3         14 K to 800 K         T > 40 K & B ≤ 2.5 T           3468         100 Ω Platinum         PT-111         14 K to 673 K         T > 40 K & B ≤ 2.5 T           Rhodium-Iron         RF-800-4         1.4 K to 500 K         T > 77 K & B ≤ 8 T           Rhodium-Iron         RF-100T/U         1.4 K to 500 K         T > 77 K & B ≤ 8 T           Negative         Cernox <sup>TM</sup> CX-1010         2 K to 325 K         T > 77 K & B ≤ 8 T           Temperature         Cernox <sup>TM</sup> CX-1030-HT         3.5 K to 420 K <sup>3.6</sup> T > 2 K & B ≤ 19 T           Ceenox <sup>TM</sup> CX-1050-HT         4 K to 420 K <sup>3.6</sup> T > 2 K & B ≤ 19 T         Cernox <sup>TM</sup> Germax <sup>TM</sup> CX-1070-HT         15 K to 420 K <sup>3.6</sup> T > 2 K & B ≤ 19 T         Cernox <sup>TM</sup> Germanium         GR-300-AA         1.2 K to 100 K <sup>4</sup> Not recommended           Germanium         GR-1400-AA         4 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-500         4 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-500         4 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-2000         6 K to 325 K <sup>5</sup> T > 2 K & B		GaAlAs Diode	TG-120-SD	1.4 K to 500 K	$T > 4.2 \text{ K \& B} \le 5 \text{ T}$	
Coefficient RTDs         100 Ω Platinum         PT-111         14 K to 673 K         T > 40 K & B ≤ 2.5 T           3468         Rhodium-Iron         RF-800-4         1.4 K to 500 K         T > 77 K & B ≤ 8 T           Negative         Rhodium-Iron         RF-100T/U         1.4 K to 325 K         T > 77 K & B ≤ 8 T           Temperature         Cernox <sup>™</sup> CX-1010         2 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Coefficient RTDs <sup>2</sup> Cernox <sup>™</sup> CX-1030-HT         3.5 K to 420 K <sup>3,6</sup> T > 2 K & B ≤ 19 T           Gernox <sup>™</sup> CX-1030-HT         3.5 K to 420 K <sup>3,6</sup> T > 2 K & B ≤ 19 T         Cernox <sup>™</sup> Cernox <sup>™</sup> CX-1050-HT         4 K to 420 K <sup>3,6</sup> T > 2 K & B ≤ 19 T         Cernox <sup>™</sup> Gernox <sup>™</sup> CX-1070-HT         15 K to 420 K <sup>3</sup> T > 2 K & B ≤ 19 T         Cernox <sup>™</sup> Gernox <sup>™</sup> CX-1080-HT         50 K to 420 K <sup>3</sup> T > 2 K & B ≤ 19 T         Gernox <sup>™</sup> Gernon-Glass         CGR-1-500         4 K to 100 K <sup>4</sup> Not recommended           Gernon-Glass         CGR-1-500         4 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-500         4 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-	Positive Temperature	<b>100</b> $\Omega$ <b>Platinum</b>	PT-102/3	14 K to 800 K	$T > 40 K \& B \le 2.5 T$	
S400         Rhodium-Iron         RF-800-4         1.4 K to 500 K         T > 77 K & B ≤ 8 T           Negative         Rhodium-Iron         RF-100T/U         1.4 K to 325 K         T > 77 K & B ≤ 8 T           Negative         Cernox™         CX-1010         2 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Temperature         Cernox™         CX-1030-HT         3.5 K to 420 K <sup>3,6</sup> T > 2 K & B ≤ 19 T           Coefficient RTDs <sup>2</sup> Cernox™         CX-1050-HT         4 K to 420 K <sup>3,6</sup> T > 2 K & B ≤ 19 T           Gernox™         CX-1070-HT         15 K to 420 K <sup>3,6</sup> T > 2 K & B ≤ 19 T         Cernox™           Gernox™         CX-1070-HT         15 K to 420 K <sup>3,6</sup> T > 2 K & B ≤ 19 T         Cernox™           Gernox™         CX-1080-HT         50 K to 420 K <sup>3</sup> T > 2 K & B ≤ 19 T         Gernox™           Gernonum         GR-300-AA         1.2 K to 100 K <sup>4</sup> Not recommended           Germanium         GR-1400-AA         4 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-500         4 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-500         4 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-2000         5 K to 325 K <sup>5</sup>	Coefficient RTDs	<b>100</b> $\Omega$ <b>Platinum</b>	PT-111	14 K to 673 K	I > 40 K & B ≤ 2.5 T	
Rhodium-Iron         RF-100T/U         1.4 K to 325 K         T > 77 K & B ≤ 8 T           Negative         Cernox™         CX-1010         2 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Temperature         Cernox™         CX-1030-HT         3.5 K to 420 K <sup>3,6</sup> T > 2 K & B ≤ 19 T           Coefficient RTDs <sup>2</sup> Cernox™         CX-1050-HT         4 K to 420 K <sup>3,6</sup> T > 2 K & B ≤ 19 T           Gernox™         CX-1070-HT         15 K to 420 K <sup>3,6</sup> T > 2 K & B ≤ 19 T         Cernox™           Gernox™         CX-1070-HT         15 K to 420 K <sup>3,6</sup> T > 2 K & B ≤ 19 T         Cernox™           Gernox™         CX-1080-HT         50 K to 420 K <sup>3</sup> T > 2 K & B ≤ 19 T         Cernox™           Gernanium         GR-300-AA         1.2 K to 100 K <sup>4</sup> Not recommended           Germanium         GR-1400-AA         4 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-500         4 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-500         4 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-2000         6 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Bax™         Rx.102A         1 4 K to 40 K <sup>5</sup> T > 2 K & B ≤ 19 T	3408	Rhodium-Iron	RF-800-4	1.4 K to 500 K	$T > 77 K \& B \le 8 T$	
Negative         Cernox <sup>™</sup> CX-1010         2 K to 325 K <sup>3</sup> 1 > 2 K & B ≤ 19 T           Temperature         Cernox <sup>™</sup> CX-1030-HT         3.5 K to 420 K <sup>3.6</sup> T > 2 K & B ≤ 19 T           Geefficient RTDs <sup>2</sup> Cernox <sup>™</sup> CX-1050-HT         4 K to 420 K <sup>3.6</sup> T > 2 K & B ≤ 19 T           Gernox <sup>™</sup> CX-1070-HT         15 K to 420 K <sup>3.6</sup> T > 2 K & B ≤ 19 T           Cernox <sup>™</sup> CX-1070-HT         15 K to 420 K <sup>3.6</sup> T > 2 K & B ≤ 19 T           Gernox <sup>™</sup> CX-1080-HT         50 K to 420 K <sup>3.6</sup> T > 2 K & B ≤ 19 T           Germanium         GR-300-AA         1.2 K to 100 K <sup>4</sup> Not recommended           Germanium         GR-1400-AA         4 K to 100 K <sup>4</sup> Not recommended           Carbon-Glass         CGR-1-500         4 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-2000         5 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Bax <sup>™</sup> BX.102A         1 4 K to 40 K <sup>5</sup> T > 2 K & B ≤ 19 T		Rhodium-Iron	RF-1001/U	1.4 K to 325 K	I > // K & B ≤ 8 I	
Temperature         Cernox <sup>™</sup> CX-1030-H1         3.5 K to 420 K <sup>3.6</sup> T > 2 K & B ≤ 19 T           Geefficient RTDs <sup>2</sup> Cernox <sup>™</sup> CX-1050-HT         4 K to 420 K <sup>3.6</sup> T > 2 K & B ≤ 19 T           3468         Cernox <sup>™</sup> CX-1070-HT         15 K to 420 K <sup>3.6</sup> T > 2 K & B ≤ 19 T           Cernox <sup>™</sup> CX-1070-HT         15 K to 420 K <sup>3.6</sup> T > 2 K & B ≤ 19 T           Cernox <sup>™</sup> CX-1080-HT         50 K to 420 K <sup>3</sup> T > 2 K & B ≤ 19 T           Germanium         GR-300-AA         1.2 K to 100 K <sup>4</sup> Not recommended           Germanium         GR-1400-AA         4 K to 100 K <sup>4</sup> Not recommended           Carbon-Glass         CGR-1-500         4 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-2000         6 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Box <sup>™</sup> RX.102A         1 4 K to 40 K <sup>5</sup> T > 2 K & B ≤ 19 T <th>Negative</th> <th>Cernox'"</th> <th>CX-1010</th> <th>2 K to 325 K<sup>3</sup></th> <th><math>I &gt; 2 K \&amp; B \le 19 I</math></th>	Negative	Cernox'"	CX-1010	2 K to 325 K <sup>3</sup>	$I > 2 K \& B \le 19 I$	
3468         Cernox <sup>™</sup> CX-1050-H1         4 K to 420 K <sup>3,0</sup> 1 > 2 K & B ≤ 19 T           3468         Cernox <sup>™</sup> CX-1070-HT         15 K to 420 K <sup>3</sup> T > 2 K & B ≤ 19 T           Cernox <sup>™</sup> CX-1080-HT         50 K to 420 K <sup>3</sup> T > 2 K & B ≤ 19 T           Germanium         GR-300-AA         1.2 K to 100 K <sup>4</sup> Not recommended           Germanium         GR-1400-AA         4 K to 100 K <sup>4</sup> Not recommended           Carbon-Glass         CGR-1-500         4 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-1000         5 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-2000         6 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Box <sup>™</sup> BX.102A         1.4 K to 40 K <sup>5</sup> T > 2 K & B ≤ 10 T	Coefficient PTDs <sup>2</sup>	Cernox	UX-1030-H1	3.5 K to 420 K <sup>3,6</sup>	I > 2K & B ≤ 19	
Cernox <sup>™</sup> CX-1070-H1         15 K to 420 K³         1 > 2 K & B ≤ 19 I           Cernox <sup>™</sup> CX-1080-HT         50 K to 420 K³         T > 2 K & B ≤ 19 T           Germanium         GR-300-AA         1.2 K to 100 K <sup>4</sup> Not recommended           Germanium         GR-1400-AA         4 K to 100 K <sup>4</sup> Not recommended           Carbon-Glass         CGR-1-500         4 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-1000         5 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-2000         6 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Box <sup>™</sup> BX.102A         1 4 K to 40 K <sup>5</sup> T > 2 K & B ≤ 10 T	3468	Cernox "	UX-1050-H1	4 K to 420 K <sup>3,6</sup>	I > 2K & B ≤ 19	
Cerniox         CA-1080-H1         SUK to 420 K° $1 > 2 K \& B \le 19 T$ Germanium         GR-300-AA         1.2 K to 100 K <sup>4</sup> Not recommended           Germanium         GR-1400-AA         4 K to 100 K <sup>4</sup> Not recommended           Carbon-Glass         CGR-1-500         4 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-1000         5 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-2000         6 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Box <sup>TM</sup> BX-102A         1 4 K to 40 K <sup>5</sup> T > 2 K & B ≤ 10 T	0.00		UX-10/U-H1	15 K to 420 K <sup>3</sup>	I>2K&B≤191	
Germanium         GR-300-AA         1.2 K to 100 K*         Not recommended           Germanium         GR-1400-AA         4 K to 100 K*         Not recommended           Carbon-Glass         CGR-1-500         4 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-1000         5 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-2000         6 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Box <sup>TM</sup> BX-102A         1 4 K to 40 K <sup>5</sup> T > 2 K & B < 10 T		Cormonium		20 K to 420 K <sup>3</sup>	$I \ge Z \land Q \land D \le I \ni I$	
GR-1400-AA         4 K to 100 K <sup>*</sup> Not recommended           Carbon-Glass         CGR-1-500         4 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-1000         5 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-2000         6 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-2000         6 K to 325 K <sup>5</sup> T > 2 K & B ≤ 19 T           Box™         BX-102A         1 4 K to 40 K <sup>5</sup> T > 2 K & B < 10 T		Gormonium			Not recommended	
Carbon-Glass         CGR-1-2000         4 K to 320 K²         T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-1000         5 K to 325 K⁵         T > 2 K & B ≤ 19 T           Carbon-Glass         CGR-1-2000         6 K to 325 K⁵         T > 2 K & B ≤ 19 T           Box™         BX-1020         1 4 K to 40 K⁵         T > 2 K & B ≤ 10 T		Carbon Close	CCD 1 500	4 N 10 100 N <sup>-4</sup>		
Carbon-Glass         CGR-1-2000         5 K to 325 K°         T > 2 K & B ≤ 19 T           Box™         RX-1020         6 K to 325 K°         T > 2 K & B ≤ 19 T		Carbon-Glass		4 N 10 323 N°	$T \sim 2K \& R > 10T$	
Valuation         Odit=1-2000         O K to 320 K <sup>-1</sup> 1 ≥ 2 K & B ≤ 19 T           Roy™         RX_102Δ         1 / K to /0 K <sup>5</sup> T > 2 K & R < 10 T		Carbon-Glass	CGR_1 2000	6 K to 205 K5	T > 2K & R < 10T	
		Rox™	RX-1020	1 4 K to 20 K	T > 2 K & R < 10 T	

**Silicon diodes** are the best choice for general cryogenic use from 1.4 K to above room temperature. Diodes are economical to use because they follow a standard curve and are interchangeable in many applications. They are not suitable for use in ionizing radiation or magnetic fields.

**Cernox™** thin-film RTDs offer high sensitivity and low magnetic field-induced errors over the 0.3 K to 420 K temperature range. Cernox sensors require calibration.

**Platinum RTDs** offer high uniform sensitivity from 30 K to over 800 K. With excellent reproducibility, they are useful as thermometry standards. They follow a standard curve above 70 K and are interchangeable in many applications.

 $^{\rm 6}$  Low temperature specified with self-heating error:  $\leq$  12 mK

<sup>&</sup>lt;sup>2</sup> Single excitation current may limit the low temperature range of NTC resistors

<sup>&</sup>lt;sup>3</sup> Non-HT version maximum temperature: 325 K

<sup>&</sup>lt;sup>4</sup> Low temperature limited by input resistance range

 $<sup>^{\</sup>rm 5}$  Low temperature specified with self-heating error:  $\leq 5~\text{mK}$ 

# Sensor Selection

**Typical Sensor Performance** – see Appendix F for sample calculations of typical sensor performance

	Example Lake Shore sensor	Temp	Nominal resistance/ voltage	Typical sensor sensitivity <sup>7</sup>	Measurement resolution: temperature equivalents	Electronic accuracy: temperature equivalents	Temperature accuracy including electronic accuracy, CalCurve™, and	Electronic control stability <sup>s</sup> : temperature equivalents
340/3462						- 1	calibrated sensor	
Silicon Diode	DT-670-CO-13 with 1.4H calibration	1.4 K 77 K 300 K 500 K	1.664 V 1.028 V 0.5597 V 0.0907 V	-12.49 mV/K -1.73 mV/K -2.3 mV/K -2.12 mV/K	0.8 mK 5.8 mK 4.4 mK 4.8 mK	±13 mK ±76 mK ±47 mK ±40 mK	±25 mK ±98 mK ±79 mK ±90 mK	±1.6 mK ±11.6 mK ±8.8 mK ±9.6 mK
Silicon Diode	DT-470-SD-13 with 1.4H calibration	1.4 K 77 K 300 K 475 K	1.6981 V 1.0203 V 0.5189 V 0.0906 V	-13.1 mV/K -1.92 mV/K -2.4 mV/K -2.22 mV/K	0.8 mK 5.2 mK 4.2 mK 4.5 mK	±13 mK ±69 mK ±45 mK ±38 mK	±25 mK ±91 mK ±77 mK ±88 mK	±1.6 mK ±10.4 mK ±8.4 mK ±9 mK
GaAIAs Diode	TG-120-SD with 1.4H calibration	1.4 K 77 K 300 K 475 K	5.391 V 1.422 V 0.8978 V 0.3778 V	-97.5 mV/K -1.24 mV/K -2.85 mV/K -3.15 mV/K	0.1 mK 8.1 mK 3.6 mK 3.2 mK	±7 mK ±180 mK ±60 mK ±38 mK	±19 mK ±202 mK ±92 mK ±88 mK	±0.2 mK ±16.2 mK ±7.2 mK ±6.4 mK
<b>100</b> $\Omega$ Platinum RTD <b>500</b> $\Omega$ Full Scale	PT-103 with 14J calibration	30 K 77 K 300 K 500 K	3.660 Ω 20.38 Ω 110.35 Ω 185.668 Ω	0.191 Ω/K 0.423 Ω/K 0.387 Ω/K 0.378 Ω/K	5.3 mK 2.4 mK 2.6 mK 2.7 mK	±13 mK ±10 mK ±34 mK ±55 mK	±23 mK ±22 mK ±57 mK ±101 mK	±10.6 mK ±4.8 mK ±5.2 mK ±5.4 mK
Cernox™	CX-1010-SD with 0.3L calibration	0.3 K 0.5 K 4.2 K 300 K	2322.4 Ω 1248.2 Ω 277.32 Ω 30.392 Ω	-10785 Ω/K -2665.2 Ω/K -32.209 Ω/K -0.0654 Ω/K	3 μK 12 μK 94 μK 15 mK	±0.2 mK ±0.5 mK ±6.2 mK ±540 mK	±3.7 mK ±5 mK ±11.2 mK ±580 mK	±6 μK ±24 μK ±188 μK ±30 mK
Cernox™	CX-1050-SD-HT <sup>®</sup> with 1.4M calibration	1.4 K 4.2 K 77 K 420 K	26566 Ω 3507.2 Ω 205.67 Ω 45.03 Ω	-48449 kΩ/K -1120.8 kΩ/K -2.4116 Ω/K -0.0829 Ω/K	6 μK 90 μK 1.3 mK 12 mK	±0.4 mK ±3.4 mK ±68 mK ±520 mK	±5.4 mK ±8.4 mK ±84 mK ±585 mK	±12 μK ±180 μK ±2.6 mK ±24 mK
Germanium	GR-50-AA with 0.05A calibration	0.1 K 0.3 K 1 K 5 K	2317 Ω 164 Ω 34 Ω 13 Ω	-71858 Ω/K -964 Ω/K -31.3 Ω/K -0.624 Ω/K	4 μK 31 μK 32 μK 481 μK	±41 μK ±0.2 mK ±1.2 mK ±20 mK	±4.2 mK ±4.4 mK ±6.2 mK ±43 mK	±8 μK ±62 μK ±64 μK ±962 μK
Germanium	GR-300-AA with 0.3D calibration	0.3 K 1.4 K 4.2 K 100 K	35184 Ω 449 Ω 94 Ω 2.7 Ω	-512156 Ω/K -581 Ω/K -26.6 Ω/K -0.024 Ω/K	6 μK 17 μK 38 μK 12.6 mK	±73 μK ±0.7 mK ±2.5 mK ±309 mK	±4.3 mK ±4.9 mK ±7.5 mK ±332 mK	±12 μK ±34 μK ±75 μK ±25 mK
Germanium	GR-1400-AA with 1.4D calibration	1.4 K 4.2 K 10 K 100 K	35889 Ω 1689 Ω 253 Ω 2.8 Ω	-94794 Ω/K -862 Ω/K -62.0 Ω/K -0.021 Ω/K	32 μΚ 35 μΚ 48 μΚ 14.4 mK	±0.4 mK ±1.7 mK ±3.0 mK ±356 mK	±4.6 mK ±5.9 mK ±8.0 mK ±379 mK	±63 μK ±70 μK ±97 μK ±29 mK
Carbon-Glass	CGR-1-500 with 1.4L calibration	1.4 K 4.2 K 77 K 300 K	103900 Ω 584.6 Ω 14.33 Ω 8.55 Ω	-520000 Ω/K -422.3 Ω/K -0.098 Ω/K -0.0094 Ω/K	58 μK 24 μK 3.1 mK 32 mK	±0.6 mK ±1.2 mK ±140 mK ±1.1 K	±4.6 mK ±5.2 mK ±165 mK ±1.2 K	±116 μK ±48 μK ±6.2 mK ±64 mK
Rox™	RX-102A-AA with 0.3B calibration	0.5 K 1.4 K 4.2 K 40 K	3701 Ω 2005 Ω 1370 Ω 1049 Ω	-5478 Ω/Κ -667 Ω/Κ -80.3 Ω/Κ -1.06 Ω/Κ	19 μK 45 μK 375 μK 29 mK	±0.7 mK ±2.4 mK ±16 mK ±1.1 K	±5.2 mK ±7.4 mK ±32 mK ±1.2 K	±38 μK ±90 μK ±750 μK ±58 mK
Thermocouple 50 mV 3464	Туре К	75 K 300 K 600 K 1505 K	-5862.9 μV 1075.3 μV 13325 μV 49998.3 μV	15.6 μV/K 40.6 μV/K 41.7 μV/K 36.006 μV/K	26 mK 10 mK 10 mK 12 mK	$\pm 0.25 \text{ K}^{10}$ $\pm 0.038 \text{ K}^{10}$ $\pm 0.184 \text{ K}^{10}$ $\pm 0.73 \text{ K}^{10}$	Calibration not available from Lake Shore	±52 mK ±20 mK ±20 mK ±24 mK
Capacitance 150 nF <i>3465</i>	CS-501GR	4.2 K 77 K 200 K	6 nF 9.1 nF 19.2 nF	27 pF/K 52 pF/K 174 pF/K	7.4 mK 3.9 mK 1 mK	±2.08 K ±1.14 K ±0.4 K	Calibration not available from Lake Shore	±14.8 mK ±7.8 mK ±2 mK

<sup>7</sup> Typical sensor sensitivities were taken from representative calibrations for the sensor listed

<sup>8</sup> Control stability of the electronics only, in an ideal thermal system

<sup>9</sup> Non-HT version maximum temperature: 325 K

<sup>10</sup> Accuracy specification does not include errors from room temperature compensation

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# Specifications

	Sensor temperature coefficient	Input range	Excitation current	Display resolution	Measurement resolution	Electronic accuracy offset	Electronic control stability <sup>11</sup>
Diode	negative	0 V to 2.5 V	10 μA ±0.05% <sup>12,13</sup>	10 <i>µ</i> V	10 μV	$\pm 80 \mu V \pm 0.005\%$ of rdg	20 μV
340/3462	negative	0 V to 7.5 V	$10 \mu\text{A} \pm 0.05\%^{12,13}$	10 µV	10 µV	$\pm 80 \mu V \pm 0.01\%$ of rdg	20 µV
PTC RTD	positive	0 $\Omega$ to 250 $\Omega$	1 mA <sup>14</sup>	1 mΩ	1 mΩ	$\pm 0.002 \Omega \pm 0.01\%$ of rdg	2 mΩ
340/3462	positive	0 $\Omega$ to 500 $\Omega$	1 mA <sup>14</sup>	1 mΩ	1 mΩ	$\pm 0.002 \Omega \pm 0.01\%$ of rdg	2 mΩ
	positive	0 $\Omega$ to 2500 $\Omega$	0.1 mA <sup>14</sup>	10 mΩ	10 mΩ	$\pm 0.03 \ \Omega \ \pm 0.02\%$ of rdg	20 mΩ
NTC RTD	negative	0 $\Omega$ to 10 $\Omega$	100 µA <sup>14</sup>	$100 \mu\Omega$	1 mΩ	$\pm 0.02\%$ rng $\pm 0.1\%$ rdg	2 mΩ
1 mV	negative	0 $\Omega$ to 30 $\Omega$	30 µA <sup>14</sup>	$100 \mu\Omega$	3 mΩ	±0.02% rng ±0.1% rdg	6 mΩ
340/3462	negative	0 $\Omega$ to 100 $\Omega$	10 µA <sup>14</sup>	1 mΩ	10 mΩ	$\pm 0.02\%$ rng $\pm 0.1\%$ rdg	20 mΩ
	negative	0 $\Omega$ to 300 $\Omega$	3 µA <sup>14</sup>	1 mΩ	30 mΩ	$\pm 0.02\%$ rng $\pm 0.1\%$ rdg	60 mΩ
	negative	0 $\Omega$ to 1 k $\Omega$	$1 \mu A^{14}$	10 mΩ	0.1 Ω	$\pm 0.02\%$ rng $\pm 0.1\%$ rdg	0.2 Ω
	negative	0 $\Omega$ to 3 k $\Omega$	300 nA <sup>14</sup>	10 mΩ	0.3 Ω	$\pm 0.02\%$ rng $\pm 0.1\%$ rdg	0.6 Ω
	negative	0 $\Omega$ to 10 k $\Omega$	100 nA <sup>14</sup>	0.1 Ω	1Ω	$\pm 0.02\%$ rng $\pm 0.1\%$ rdg	2 Ω
	negative	0 $\Omega$ to 30 k $\Omega$	30 nA <sup>14</sup>	0.1 Ω	3Ω	$\pm 0.02\%$ rng $\pm 0.1\%$ rdg	6 Ω
NTC RTD	negative	0 $\Omega$ to 30 $\Omega$	300 µA <sup>14</sup>	$100 \mu\Omega$	$300 \mu\Omega$	$\pm 0.02\%$ rng $\pm 0.05\%$ rdg	$600 \mu\Omega$
10 mV	negative	0 $\Omega$ to 100 $\Omega$	100 µA <sup>14</sup>	1 mΩ	1 mΩ	$\pm 0.02\%$ rng $\pm 0.05\%$ rdg	2 mΩ
340/3462	negative	0 $\Omega$ to 300 $\Omega$	30 µA <sup>14</sup>	1 mΩ	3 mΩ	$\pm 0.02\%$ rng $\pm 0.05\%$ rdg	6 mΩ
	negative	0 $\Omega$ to 1 k $\Omega$	10 µA <sup>14</sup>	10 mΩ	10 mΩ	$\pm 0.02\%$ rng $\pm 0.05\%$ rdg	20 mΩ
	negative	0 $\Omega$ to 3 k $\Omega$	3 µA <sup>14</sup>	10 mΩ	30 mΩ	$\pm 0.02\%$ rng $\pm 0.05\%$ rdg	60 mΩ
	negative	0 $\Omega$ to 10 k $\Omega$	1 μA <sup>14</sup>	0.1 Ω	0.1 Ω	$\pm 0.02\%$ rng $\pm 0.05\%$ rdg	0.2 Ω
	negative	0 $\Omega$ to 30 k $\Omega$	300 nA <sup>14</sup>	0.1 Ω	0.3 Ω	$\pm 0.02\%$ rng $\pm 0.05\%$ rdg	0.6 Ω
	negative	0 $\Omega$ to 100 k $\Omega$	100 nA <sup>14</sup>	1Ω	3Ω	$\pm 0.02\%$ rng $\pm 0.05\%$ rdg	6 Ω
	negative	0 $\Omega$ to 300 k $\Omega$	30 nA <sup>14</sup>	1Ω	<b>30</b> Ω	$\pm 0.02\%$ rng $\pm 0.25\%$ rdg	60 Ω
Thermocouple	positive	±25 mV	NA	0.1 <i>μ</i> V	0.2 μV	$\pm 1 \mu\text{V} \pm 0.05\%$ of rdg <sup>15</sup>	0.4 μV
0404	positive	±50 mV	NA	0.1 <i>μ</i> V	0.4 μV	$\pm 1 \mu V \pm 0.05\%$ of rdg <sup>15</sup>	0.8 µV
Capacitance 3465	positive or negative	0 nF to 150 nF	4.88 kHz 1 V square wave	10 pF	2.0 pF	$\pm 50 \text{ pF} \pm 0.1\%$ of rdg	4.0 pF
	positive or negative	0 nF to 15 nF	4.88 kHz 1 V square wave	1 pF	0.2 pF	$\pm 50 \text{ pF} \pm 0.1\%$ of rdg	0.4 pF
Diode	negative	0 V to 2.5 V	$10 \mu\text{A} \pm 0.05\%^{12,13}$	100 µV	20 µV	$\pm 160 \mu V \pm 0.01\%$ of rdg	40 µV
3468	negative	0 V to 7.5 V	$10 \mu\text{A} \pm 0.05\%^{12,13}$	100 µV	20 µV	$\pm 160 \mu V \pm 0.02\%$ of rdg	40 µV
PTC RTD	positive	0 $\Omega$ to 250 $\Omega$	1 mA ±0.3% <sup>14</sup>	10 mΩ	2 mΩ	$\pm 0.004 \ \Omega \pm 0.02\%$ of rdg	4 mΩ
3468	positive	0 $\Omega$ to 500 $\Omega$	1 mA ±0.3% <sup>14</sup>	10 mΩ	2 mΩ	$\pm 0.004 \ \Omega \pm 0.02\%$ of rdg	4 mΩ
	positive	0 $\Omega$ to 5000 $\Omega$	1 mA ±0.3% <sup>14</sup>	100 mΩ	20 mΩ	$\pm 0.06 \ \Omega \ \pm 0.04\%$ of rdg	40 mΩ
NTC RTD 3468	negative	0 $\Omega$ to 7500 $\Omega$	10 μA ±0.05% <sup>14</sup>	100 mΩ	50 mΩ	$\pm 0.1 \Omega \pm 0.04\%$ of rdg	0.1 Ω

<sup>11</sup> Control stability of the electronics only, in an ideal thermal system

<sup>12</sup> Current source error has negligible effect on measurement accuracy

<sup>13</sup> Diode input excitation current can be set to 1 mA –

refer to the Model 331 user manual for details

<sup>14</sup> Current source error is removed during calibration

<sup>15</sup> Accuracy specification does not include errors from room temperature compensation

# Thermometry

Number of inputs	2 included (additional inputs optional)
Input configuration	Each input is factory configured as diode/RTD. Thermocouple
	and capacitance are optional and sold as additional input cards.
Isolation	Sensor inputs optically isolated from other circuits but not from
	each other
A/D resolution	24-bit analog-to-digital
Input accuracy	Sensor dependent – refer to Input Specifications table
Measurement resolution	Sensor dependent – refer to Input Specifications table
Maximum update rate	Up to 20 readings per s on an input, 40 readings per s on all inputs
Autorange	Automatically selects appropriate NTC RTD range
User curves	Forty 200-point CalCurves™, or user curves
SoftCal™	Improves accuracy of DT-470 diode or platinum RTD sensors
Math	Maximum and minimum of input readings and linear equation
Filter	Averages input readings to quiet display, settable time constant

# Sensor Input Configuration

	Diode/RTD	Thermocouple	Capacitance
Measurement type	4-lead differential	2-lead, room temperature compensated	4-lead
Excitation	Constant current with current reversal for RTDs	NA	4.88 kHz, 1 V square wave
Supported sensors	Diodes: Silicon, GaAlAs RTDs: 100 Ω Platinum, 1000 Ω Platinum, Germanium, Carbon-Glass, Cernox™, and Rox™	Most thermocouple types	CS-501GR
Standard curves	DT-470, DT-500D, DT-670, PT-100, PT-1000, RX-102A, RX-202A	Type E, Type K, Type T AuFe 0.07% vs. Cr, AuFe 0.03% vs. Cr,	None
Input connector	6-pin DIN	Ceramic isothermal block	6-pin DIN

# Model 340 Temperature Controller

Control Control loops	2
Control type	Closed-loop digital PID with manual heater power
Tuning	Autotune (one loop at a time), manual PID, zones
Control stability	Sensor dependent – to $2 \times$ measurement resolution (in an ideal thermal system)
PID control settings	
Proportional (gain)	0 to 1000 with 0.1 setting resolution
Integral (reset)	1 to 1000 with 0.1 setting resolution
Derivative (rate)	1 to 1000 s with 1 s resolution
Manual output	0 to 100% with 0.01% setting resolution
Zone control	10 temperature zones with P, I, D, manual heater power out, and heater range
Setpoint ramping	0.1 K per min to 100 K per min
Safety limits	Setpoint limit, curve temp limits, heater output, slope limit, heater range limit, power up heater off, and short-circuit protection

### Heater Output Specifications

	Loop 1	Loop 2
Heater output type	Variable DC current source	Variable DC voltage
Heater output D/A resolution	18-bit	14-bit
Max heater power	100 W	1 W
Max heater output current	2 A	0.1 A
Heater output compliance	50 V	10 V
Heater source impedance	NA	0.01 Ω
Heater output ranges	5 decade steps in power	1
Heater load type	Resistive	Resistive
Heater load range	10 $\Omega$ to 100 $\Omega$ recommended	100 $\Omega$ minimum
Heater load for max power	25 Ω	<b>100</b> Ω
Heater noise (<1 kHz) RMS	$50 \mu\text{V} + 0.001\%$ of output voltage	<0.3 mV
Isolation	Optical isolation between output and other circuits	None
Heater connector	Dual banana	BNC

## Loop 1 Full Scale Heater Power at Typical Resistance

Heater	Heater	Maximum current			
resistance	range	2 A	1 A	0.5 A	0.25 A
	5	40 W	10 W	2.5 W	625 mW
	4	4 W	1 W	250 mW	62.5 mW
<b>10</b> Ω	3	0.4 W	100 mW	25 mW	6.25 mW
	2	40 mW	10 mW	2.5 mW	625 μW
	1	4 mW	1 mW	250 μW	62.5 μW
	5	100 W	25 W	6.25 W	1.56 W
<b>25</b> Ω	4	10 W	2.5 W	625 mW	156 mW
	3	1 W	250 mW	62.5 mW	15.6 mW
	2	100 mW	25 mW	6.25 mW	1.56 mW
	1	10 mW	2.5 mW	625 μW	156 μW
	5	50 W	50 W	12.5 W	3.12 W
	4	20 W	5 W	1.25 W	312 mW
<b>50</b> Ω	3	2 W	500 mW	125 mW	31.2 mW
	2	200 mW	50 mW	12.5 mW	3.12 mW
	1	20 mW	5 mW	1.25 mW	312 µW

# Front Panel

Display	Graphic LCD with fluorescent backlight
No. of reading displays	1 to 8
Display units	Temperature in K, °C, or sensor units
Temp display resolution	0.0001 K below 10 K, 0.001 K above 10 K
Sensor units	Sensor dependent, to 6 digits
display resolution	
Setpoint setting	Same as display resolution
resolution	(actual resolution is sensor dependent)
Heater output display	Numeric display in percent of full scale for power or current -
	bar graph display of heater output available
Heater output resolution	0.1% numeric or 2% graphical
Keypad	Numeric plus special function
Front panel features	Front panel curve entry, display brightness control,
	and keypad lock-out

#### Interfaces IEEE-488.2 interface

Features	SH1, AH1, T5, L4, SR1, RL1, PP0, DC1, DT0, C0, E1
Reading rate	To 20 readings per s
Software support	National Instruments LabVIEW™ driver
Serial interface	
Electrical format	0000
Liccurcarionnal Men hend vete	10 000 have
Max baud rate	19,200 baud
Connector	RJ-11
Reading rate	To 20 readings per s
Alarms	
Number	Two, high and low, for each installed input
Data source	Temperature, Sensor Units, and Linear Equation
Settings	Source High and Low Setpoint
oottingo	Latching or Non-Latching and Audible On/Off
Actuatora	Display appupaieter beaper and relays
Actuators	Display, annuncialui, beepei, anu relays
Relays	
Number	2
Contacts	Normally open (NO), normally closed (NC), and common
Contact Rating	30 VDC at 2 A
Operation	Activate relays on high or low alarms for any input, or manual off/on
Connector	Detachable terminal block
Analog voltage outputs	(when not used as control loop 2 output)
Number	2
Scale	Liser selected
Undete rete	20 readings per s
Opuale Tale	20 reduilings per 5
Data source	Temperature, Sensor Units, and Linear Equation
Settings	Input, Source, Top of Scale, Bottom of Scale, or Manual
Range	±10 V
Resolution	1.25 mV
Accuracy	±2.5 mV
Max output power	1 W
Min load resistance	100 $\Omega$ (short-circuit protected)
Source impedance	0.01.0
Digital I/O	5 inputs and 5 outputs – TTL voltage level compatible
Data card	PC card Type II clot used for curve transfer
Data caru	cotup storage, and data logging
	selup slorage, and dala-logging
Conoral	
Ambient terms result	20 °C to 20 °C (C0 °E to 26 °E) for appointed appuration
Amplent temp range	
	15 °C to 35 °C (59 °F to 95 °F) for reduced accuracy
Power requirements	100, 120, 220, 240 VAC (+5%, -10%), 50 or 60 Hz; 190 VA
Size	432 mm W $\times$ 89 mm H $\times$ 368 mm D
	$(17 \text{ in} \times 3.5 \text{ in} \times 14.5 \text{ in})$ , full rack
Weight	8 kg (17.6 lb) approx.
Approval	CE mark

# Extending Temperature Controller Heater Power

It is often necessary to extend the heater power of a cryogenic temperature controller to conduct experiments above room temperature. This diagram illustrates a practical way to increase the control output of the Model 340 to several hundred watts. A programming resistor,  $R_{pgm}$ , is placed across the controller's heater output current source. As the heater output current changes, a changing voltage is generated across  $R_{pgm}$ . That voltage is used to program a large external power supply.  $R_{pgm}$  should be chosen so that a low current range of the controller can be used. The control output of loop 2 on the Model 340 is a voltage, thus it can be connected directly to the external power supply without  $R_{pgm}$ .



# 3003 Heater Output Conditioner

The heater output conditioner is a passive filter which further reduces the already low Model 340 heater output noise. The typical insertion loss for the Model 3003 is 20 dB at or above line frequency, and >40 dB at or above double line frequency. A 144 mm W × 72 mm H × 165 mm D (5.7 in × 2.8 in × 6.5 in) panel mount enclosure houses this option, and it weighs 1.6 kg (3.5 lb).



# Ordering Information

Part number	Description
340	2 diode/resistor inputs temperature controller
Select a power configu VAC-100 VAC-120 VAC-120-ALL VAC-220 VAC-240 *Other country line cor	Instrument configured for 100 VAC with U.S. power cord Instrument configured for 120 VAC with U.S. power cord Instrument configured for 120 VAC with U.S. power cord and universal Euro line cord and fuses for 220/240 VAC setting Instrument configured for 220 VAC with universal Euro line cord Instrument configured for 240 VAC with universal Euro line cord Instrument configured for 240 VAC with universal Euro line cord ds available, consult Lake Shore
Accessories included 106-009 G-106-233 106-737 2001 2003	Heater output connector (dual banana jack) Sensor input mating connector (6-pin DIN plug); 2 included 6-pin terminal block used for relays connector – accepts up to 12 AWG wire 4-wire RJ11 cable assembly, 4.6 m (14 ft) long, used with RS-232C interface RJ11 to DE-9 adapter – adapts RJ11 receptacle to female DE-9 connector; connects Model 340 to customer computer rear RS-232C serial port
MAN-340	Model 340 user manual
Options and accessori 2002 2003 3003 3462 3464 3465 3468 3507-2SH 8001-340 8072 CAL-340-CERT CAL-3462-CERT CAL-3462-CERT CAL-3465-CERT CAL-3468-CERT HTR-25 HTR-50	es RJ11 to DB-25 adapter RJ11 to DE-9 adapter Heater output conditioner 2-channel card for additional standard sensors 2-channel card for thermocouple sensors 1-channel card for capacitance sensors 8-channel scanner card for silicon diodes, PTC and NTC RTD sensors Cable assembly for 2 sensors and 1 heater CalCurve <sup>TM</sup> , factory installed – the breakpoint table from a calibrated sensor stored in the instrument IEEE-488 computer interface interconnect cable assembly Instrument calibration with certificate 3462 card recalibration with certificate 3464 card recalibration with certificate 3468 card recalibration with certificate 3469 card recalibration with certificate 3468 card recalibration with certificate 3468 card recalibration with certificate 3469 card recalibration with certificate 3468 card recalibration with certificate 3468 card recalibration with certificate 3469 card recalibration with certificate 3460 card

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