TECHNICAL DATA

1560 Black Stack Thermometer Readout

Key features

- Accurate, expandable and configurable readout
- Can read SPRTs, RTDs, thermistors, and thermocouples, and can be configured with up to eight modules.
- Serves as a high-accuracy reference thermometer, with accuracy up to ±0.0013°C.
- Automates precision data acquisition, enhancing efficiency and accuracy.

* Simple and straightforward, only including necessary functions.

Product overview: 1560 Black Stack Thermometer Readout

The 1560 Black Stack thermometer readout can be any kind of thermometer you want it to be, and it works in three distinctive ways.

It's a reference thermometer with an accredited calibration; it's an automated calibration system reading your reference probe and sensors you're testing; or it's a high-accuracy data acquisition system. And it does each of these functions better than any other thermometer currently on the market.

The Stack consists of up to eight different modules that fit together to do any type of thermometry you choose. You can buy all of them, or any combination of them, and change the Stack and its functions anytime you want. Each module stacks behind the preceding one, and when you add a module, the Stack's software automatically reconfigures itself to include all of the new functions supplied by that module. There's nothing to take apart. No boards need to be installed. There's no software to load, and nothing has to be calibrated. Just stack a new module onto the back of the previous modules and you're ready to use the Black Stack and all of its remarkable features.

Fluke Calibration's new Model 9935 Multi Channel Log*Ware* makes the Black Stack an even more powerful data acquisition tool. Log*Ware* provides graphical and statistical analysis of each channel you're measuring (up to 96 with the Black Stack). And with alarms that can be customized, delayed start times, and selectable logging intervals, Log*Ware* turns the Black Stack into the most powerful temperature data acquisition tool on the market.

The Base Unit

The Stack starts with a base module. It consists of two parts: a display with the main processor and a power supply. The base module supplies power, communication management, and software coordination for all of the other modules. It has the display, control buttons, and RS-232 port built-in.

Each base module can handle eight thermometer modules stacked behind it with a maximum of 96 sensor inputs. The base module never needs calibration and performs its own diagnostic self-test each time it powers up. The thermometer characteristics of each base module are defined by the thermometry modules stacked behind it.

The Modules

There are nine thermometry modules: an SPRT module, a high-temp PRT module, a PRT scanner module, a standards thermistor module, two 1000-ohm PRT modules, a thermistor scanner module, a precision thermocouple module, and a thermocouple scanner module.

Each module has its own processor and connects to the stack on a proprietary digital bus. Each retains its own calibration data and performs all analog measurement functions within the module.

SPRT Module 2560

The SPRT module reads 25-ohm and 100-ohm four-wire RTDs, PRTs, and SPRTs with very high accuracy. It turns the Stack into a first-rate reference thermometer with an accuracy to ±0.005°C.

It has two input channels so you can collect data with two reference sensors, or you can do comparison calibrations of

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one sensor against a calibrated reference sensor.

Temperature conversion features include direct resistance measurement, ITS-90, W(T90), IPTS-68, Callendar-Van Dusen, or an RTD polynomial conversion. The user-changeable default values for the CVD conversion fit the 100-ohm, 0.00385 ALPHA sensor described by IEC-751.

The SPRT modules can be used one at a time or combined together in any combination for reading up to 16 different reference thermometers. If you stack an SPRT module with a scanner module, you can test multiple sensors against your reference. Unlike other competitive instruments, our PRT Scanner Module operates with or without the two-channel SPRT module. If you can think of a way to use a reference thermometer, you can do it with the Stack.

High-Temp PRT Module 2561

This module reads 2.5-ohm and 0.25-ohm four-wire HTPRTs and RTDs. The complete resistance range covers up to 5-ohm sensors with applications as high as 1200°C. The temperature conversion features are the same as for the SPRT module, and like the SPRT module, the connectors are gold plated.

PRT Scanner 2562

This module reads eight channels of two-, three- or four-wire 100-ohm PRTs or RTDs. The accuracy is ±0.01°C at 0°C for calibration of industrial sensors. The common industrial RTD can be read with the default values in the CVD temperature conversion for fast setup of industrial applications, or you can enter individual probe constants for higher accuracy data acquisition.

1000-Ohm PRT Modules 2567 and 2568

For 1000-ohm PRTs, these modules provide all the same great features as the 2560 and 2562 Modules. The two-channel 2567 Module has a resistance range of 0 to 4000 ohms and is accurate to ±0.006°C at 0°C. The 2568 Module reads up to eight 1000-ohm PRTs and at 0°C is accurate to ±0.01°C. Don't use an ohmmeter or multimeter to read your 1000-ohm PRTs when you can use a Black Stack loaded with convenient temperature functions.

Standards Thermistor Module 2563

Special low-drift thermistors are becoming increasingly popular as reference probes in applications with modest temperature ranges up to 100°C. This module has a temperature accuracy of ±0.0013°C at 0°C with a resolution of 0.0001°C.

The 2563 Thermistor Module has two input channels. It displays direct resistance in ohms or converts directly to a temperature readout using either the Steinhart-Hart equation or a higher-order polynomial.

Thermistor Scanner Module 2564

This module is usable with any type of thermistor but has eight channels instead of the two channels found on the Standards Thermistor Module and operates with or without the Standards Thermistor Module. This module's accuracy is ±0.0025°C at 0°C for all eight channels.

The eight channels make the 2564 module an excellent data acquisition tool. It can be used in research work or for verification of biomedical equipment such as DNA sequencing apparatus.

Precision Thermocouple Module 2565

This precision thermocouple module reads any type of thermocouple, including type S platinum thermocouples and the new gold-platinum thermocouples for standards work. This two-channel module has internal cold junction compensation, or you can use an external source for even greater accuracy.

All the standard ANSI thermocouple types are preprogrammed; however, you can choose a conversion method and then enter the probe characteristics of your sensor, creating a system-calibrated channel. The 2565 module accepts up to three calibration points for error adjustment in the individual sensor. A polynomial interpolation function calculates the points between your measurements.

Type R, type S, and gold-platinum conversions accept complete polynomial calibration coefficients. Additionally, a thermocouple conversion function calculates temperature by interpolating from a table. You enter the temperature in degrees C and the corresponding voltage for your specific sensor from 1 to 10 temperatures. Interpolation is performed between the entered points.

Thermocouple Scanner Module 2566

This module has 12 channels and reads K, J, T, S, R, B, E, and N thermocouples. Each channel can be set to read a different type of thermocouple. All temperature readings are performed in exactly the same manner as with the 2565 module.

The connectors on the scanner module are special dual connectors that accept both the common miniature and standard thermocouple connectors. If you want to use screw terminals, use the appropriately-sized connector with the hood removed.

Features Common to All Modules

The 1560 Black Stack is an incredible thermometer. You buy only the modules you need for the work you are doing. If your work changes, simply order the modules with the functions you need and slip them onto the back of the Stack. Your thermometer changes its software, display, and method of operation to match the new functions you've added.

Remember, you never have to open the case to add modules. There's no software to load. It's all automatic.

Each module stores its own calibration internally, so you can add or change modules without recalibrating the whole stack. Module calibration is digital and is performed manually through the base's front panel or over the RS-232 link. If your lab has the capability, you can calibrate modules yourself. If not, send them to us with or without your base unit and we'll recalibrate them.

The LCD screen has multiple methods of displaying data, including a graphical strip chart recorder. The graphical capability of the Black Stack makes testing temperature stability easier than ever. Vertical scaling and graph resolution are automatic.

The Stack has high-accuracy, two-channel capability or multi-channel functionality if you need it. Its memory stores the most recent 1000 readings, or you can send your data to your PC through the RS-232 port. Each data point is time and date stamped. An IEEE-488 port is optional.

With the Black Stack you can read data almost anyway you like—in ohms, millivolts, or temperature, according to your application and preference.

Remember, this thermometer's calibration is traceable to NIST. Its accuracy is as high as ±0.0013°C, depending on the module and sensor you're using.

Hey! Why did you make it look like that?!

We get asked this question more than any other question. There are several reasons for the shape of the Black Stack.

When we started the design process on the Black Stack, we wanted a unique instrument that was a true technological leap in thermometry. Incremental improvements are okay sometimes, but if you're going to lead the industry, you might as well go out and lead it.

Here are some of the design criteria we started with. The new thermometer had to be capable of transforming itself into any kind of thermometry instrument the customer wanted, and it had to do this without having to open the box, replace boards or set up anything. All connections must be easily accessible from the front of the instrument, with no connectors on the front panel. The front panel had to be easy to read, all features including programming should be done on the front panel and the programming should take advantage of the graphical capability of the display. The software had to be as creative and as versatile as the instrument. It had to be easy to use and, if at all possible, even fun to use. And finally, it had to be very accurate.

The shape of the Black Stack facilitates the function and usability of the instrument. And it is unbelievably functional and fun to use.

The only way you'll truly understand what we're talking about is to get one and try it. Hundreds of customers, including many national standards labs, already have it!

Specifications: 1560 Black Stack Thermometer Readout

Specifications	
Model 1560 Base Unit	Power: 100 to 240 VAC, 50 or 60 Hz, nominal; Aachable Modules: up to 8; Display: 4.25" x 2.25" LCD graphics, LED backlight, adjustable coast and brightness; Automatic Input Sequencing: 1 to 96 channels; Communications: RS-232; Non-volatile Memory: channel sequence, probe coefficients; Minimum Sample Time: 2 seconds.
Extended Communication Module 3560	The Extended Communication Module adds additional communication interface capability to the system. This module includes a GPIB (IEEE-488) interface, Ceonics printer interface, and analog output. The GPIB interface connects the 1560 to a GPIB bus. GPIB can be used to cool any function of the 1560 and read measurement data. The printer interface allows the 1560 to send measurement data directly to a printer. The analog output sources a DC signal (±1.25 VDC) corresponding to the value of a measurement.

Resistance Modules								
	Input Channels	**Resistance Range**	**Basic Resistance Accuracy**	**Resistance Resolution**	**Temp. Range**	**Equivalent Temperature Accuracy[†]**	**Temp. Resolution**	**Excitation Current**
SPRT Module 2560	2	0Ω to 400Ω	±20 ppm of reading (0.0005Ω at 25Ω, 0.002Ω at 100Ω)	0.0001Ω	−260°C to 962°C	±0.005°C at 0°C ±0.007°C at 100°C	0.0001°C	1.0 mA, 1.4 mA

	Input Channels	Resistance Range	Resistance Accuracy	Resistance Resolution	Temperature Range	Temperature Accuracy	Temperature Resolution	Excitation Current
High-Temp PRT Module 2561	2	0Ω to 25Ω	±50 ppm of reading (0.00013Ω at 2.5Ω)	0.00001Ω	0°C to 1200°C	±0.013°C at 0°C ±0.018°C at 100°C	0.001°C	3.0 mA, 5.0 mA
PRT Scanner 2562	8	0Ω to 400Ω	±40 ppm of reading (0.004Ω at 100Ω)	0.0001Ω	–200°C to 850°C	±0.01°C at 0°C ±0.014°C at 100°C	0.0001°C	1.0 mA, 1.4 mA
Standards Thermistor Module 2563	2	0Ω to 1 MΩ	±50 ppm of reading (0.5Ω at 10 KΩ)	0.1Ω	–60°C to 260°C	±0.0013°C at 0°C ±0.0015°C at 75°C	0.0001°C	2 µA, 10 µA
Thermistor Scanner 2564	8	0Ω to 1 MΩ	±100 ppm of reading (1Ω at 10 KΩ)	0.1Ω	–60°C to 260°C	±0.0025°C at 0°C ±0.003°C at 75°C	0.0001°C	2 µA, 10 µA
1000Ω PRT Module 2567	2	0Ω to 4 KΩ	±25 ppm of reading (0.025 at 1 KΩ)	0.001Ω	–260°C to 962°C	±0.006°C at 0°C ±0.009°C at 100°C	0.0001°C	0.1 mA, 0.05 mA
1000Ω PRT Scanner 2568	8	0Ω to 4 KΩ	±40 ppm of reading (0.04 at 1 KΩ)	0.001Ω	–200°C to 850°C	±0.01°C at 0°C ±0.014°C at 100°C	0.0001°C	0.1 mA, 0.05 mA

Thermocouple Modules							
	Input Channels	Millivolt Range	Millivolt Accuracy	Millivolt Resolution	Temperature Accuracy,[†] Ext. CJC	Temperature Accuracy,[†] Int. CJC	Temperature Resolution
Precision Thermo-couple Module 2565	2	–10 to 100 mV	±0.002 mV	0.0001 mV	±0.05°C	±0.1°C	0.001°C[††]
Thermo-couple Scanner 2566	12	–10 to 100 mV	±0.004 mV	0.0001 mV	±0.1°C	±0.3°C	0.01°C

[†]Temperature accuracy depends on probe type and temperature
[††]Actual temperature resolution may vary depending on measurement noise, thermocouple sensitivity, and input average

Ordering information

1560

Black Stack Readout Base Unit

2560

SPRT Module, 25 Ω and 100 Ω, 2-channel

2561

High-Temp PRT Module, 0.25 Ω to 5Ω, 2-channel

2562

PRT Scanner Module, 8-channel

2563

Standards Thermistor Module, 2-channel

2564

Thermistor Scanner Module, 8-channel

2565

Precision Thermocouple Module, 2-channel

2566

Thermocouple Scanner Module, 12-channel

2567

SPRT Module, 1000 Ω, 2-channel

2568

PRT Scanner Module, 8-channel, 1000 Ω

3560
Extended Communications Module

5610-6-X
Thermistor Probe, 3.2 mm dia x 152.4 mm (0.125 in x 6 in), 0 °C to 100 °C, Lead wire length (Cable) 6 ft

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(Calibration traceable to NIST standards included)

X = termination. Specify "A" (INFO-CON for 914X), "B" (bare wire), "D" (5-pin DIN for Tweener Thermometers), "G" (gold pins), "J" (banana plugs), "L" (mini spade lugs), "M" (mini banana plugs), "P" (INFO-CON for 1523 or 1524), or "S" (spade lugs).

5610-9-X
Thermistor Probe, 3.2 mm dia x 228.6 mm (0.125 in x 9 in), 0 °C to 100 °C, Lead wire length (Cable) 6 ft

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(Calibration traceable to NIST standards included)

X = termination. Specify "A" (INFO-CON for 914X), "B" (bare wire), "D" (5-pin DIN for Tweener Thermometers), "G" (gold pins), "J" (banana plugs), "L" (mini spade lugs), "M" (mini banana plugs), "P" (INFO-CON for 1523 or 1524), or "S" (spade lugs).

5626-12-X

Secondary Standard PRT (0.25 in dia x 12 in), 100 Ω, –200 °C to 661 °C

(17025 accredited calibration included. Traceable to NIST standards.)

X = termination. Specify "A" (INFO-CON for 914X), "B" (bare wire), "D" (5-pin DIN for Tweener Thermometers), "G" (gold pins), "J" (banana plugs), "L" (mini spade lugs), "M" (mini banana plugs), "P" (INFO-CON for 1523 or 1524), or "S" (spade lugs).

5626-15-X
Secondary Standard PRT (0.25 in dia x 15 in), 100 Ω, –200 °C to 661 °C

(17025 accredited calibration included. Traceable to NIST standards.)

X = termination. Specify "A" (INFO-CON for 914X), "B" (bare wire), "D" (5-pin DIN for Tweener Thermometers), "G" (gold pins), "J" (banana plugs), "L" (mini spade lugs), "M" (mini banana plugs), "P" (INFO-CON for 1523 or 1524), or "S" (spade lugs).

5628-12-X
Secondary Standard PRT (0.25 in dia x 12 in), 25.5 Ω, –200 °C to 661 °C

(17025 accredited calibration included. Traceable to NIST standards.)

X = termination. Specify "A" (INFO-CON for 914X), "B" (bare wire), "D" (5-pin DIN for Tweener Thermometers), "G" (gold pins), "J" (banana plugs), "L" (mini spade lugs), "M" (mini banana plugs), "P" (INFO-CON for 1523 or 1524), or "S" (spade lugs).

5628-15-X
Secondary Standard PRT (0.25 in dia x 15 in), 25.5 Ω, –200 °C to 661 °C

(17025 accredited calibration included. Traceable to NIST standards.)

X = termination. Specify "A" (INFO-CON for 914X), "B" (bare wire), "D" (5-pin DIN for Tweener Thermometers), "G" (gold pins), "J" (banana plugs), "L" (mini spade lugs), "M" (mini banana plugs), "P" (INFO-CON for 1523 or 1524), or "S" (spade lugs).

5642-X
Standards Thermistor Probe

(Calibration traceable to NIST standards included)

X = termination. Specify "A" (INFO-CON for 914X), "B" (bare wire), "D" (5-pin DIN for Tweener Thermometers), "G" (gold pins), "J" (banana plugs), "L" (mini spade lugs), "M" (mini banana plugs), "P" (INFO-CON for 1523 or 1524), or "S" (spade lugs).

1929-2

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System Verification, PRT with Readout, Accredited.

Choose two temperature points, extra points at additional cost. Available temperature points are –197 °C, -80 °C , –39 °C, 0.01°C, 30 °C, 157 °C, 232 °C, 300 °C, 420 °C, 500 °C, 660 °C.

1929-5

System Verification, Thermistor with Readout, Accredited.

Choose two temperature points; extra points at additional cost. Available temperature points are -30 °C, -20 °C, -10 °C, 0 °C, 10 °C, 20 °C, 30 °C, 40 °C, 50 °C, 60 °C, 70 °C, 80 °C, 90 °C, 100 °C.

1930

System Calibration, PRT with Readout, Accredited

Choose PRT temperature range for the calibration. Available temperature ranges are –200 °C to 500 °C, –200 °C to 420 °C, –80 °C to 420 °C, –40 °C to 420 °C, –40 °C to 232 °C, 0 °C to 420 °C.

1935

System Calibration, Thermistor with Readout, NVLAP-accredited

Choose thermistor temperature range for the calibration. Available temperature ranges are 100 °C span (6 points over span), 60 °C span (7 points over span), 100 °C span (11 points over span).

9935-S
Log*Ware* II, Multi Channel, Single User

9938
MET/TEMP II temperature calibration software (includes CD-ROM, RS- 232 multiplexer box, AC adapter, and serial cable)

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