

HANDHELD THERMOMETERS

Thermometry



Handheld Thermometers

Models 1521 and 1522

Read PRTs/RTDs to $\pm 0.025^{\circ}\text{C}$ and thermistors to $\pm 0.005^{\circ}\text{C}$

Model 1522 stores multiple data sets totaling 10,000 readings

INFO-CON connector allows interchangeable use of calibrated probes

INFO-CON eliminates errors from programming probe data

With the Super-Thermometer, *Black Stack*, and Tweener thermometers, Hart established itself as the clear product leader for thermometer readouts. Our pattern of offering more power and more versatility for less money is indisputable. Now we underline that fact by introducing the two most powerful handheld thermometers in the world.

The Models 1521 and 1522 are the first standards thermometers to fit into a battery-powered handheld package. They're as accurate as $\pm 0.005^{\circ}\text{C}$! You'll only find this level of accuracy in large desktop units that cost three times more. It's no wonder we call the 1521 the Little Lord Kelvin of thermometry.

Fitting easily into your hand and weighing only 1 pound (0.4 kg), these thermometers can go anywhere. And when they get there, you can have total confidence in the accuracy of your measurements. The 1522 has the power of a full data logger, with memory to hold 10,000 readings.

Probes

The 1521 and 1522 read both Pt-25 and Pt-100 RTDs as well as thermistors.

PRTs and RTDs, with their wide temperature ranges and stabilities, have long been favored as temperature standards. From -200°C to 100°C , the 1521 reads PRTs accurately to $\pm 0.025^{\circ}\text{C}$. Even at

800°C these are high-precision readouts, accurate to $\pm 0.1^{\circ}\text{C}$.

Ultra-stable thermistors offer excellent stability and even greater accuracies over a more narrow range—typically from about -10°C to 110°C . At temperatures below 50°C , these Handheld Thermometers read thermistors to $\pm 0.005^{\circ}\text{C}$. Accuracy at 100°C is $\pm 0.02^{\circ}\text{C}$.

While a small number of handheld thermometers on the market offer 0.01° resolution, they fail to provide the accuracy necessary for the last digit to be meaningful. Hart's Handheld Thermometers let you select resolution from 0.1° to 0.001° and offer the accuracy to support even 0.001° resolution.

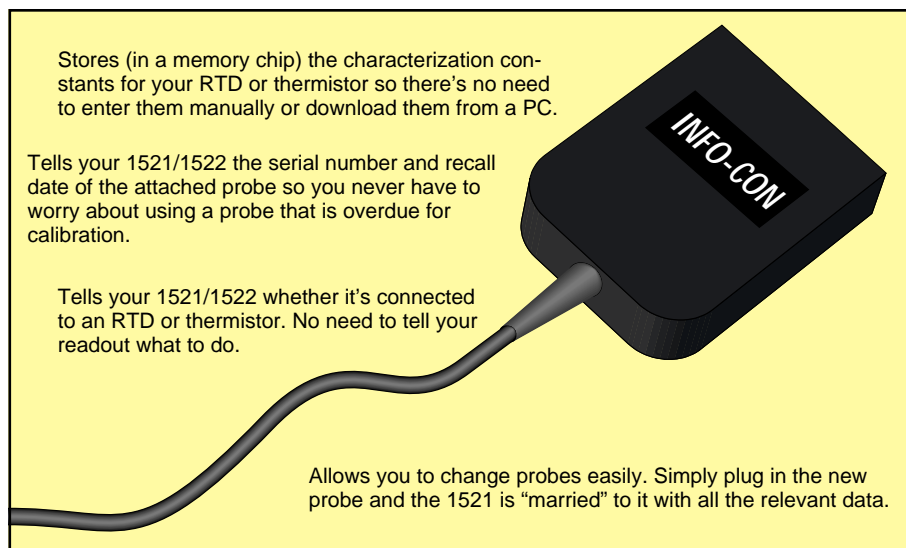
Of course, the 1521 and 1522 let you match the exact resistance versus temperature characteristics of an individually calibrated probe. This is true standards thermometry. Hart's Handheld Thermometers read ITS-90, Callendar-Van Dusen, or Steinhart-Hart coefficients for maximum system accuracy.

These are real algorithms, not approximating conversion methods or electronic look-up tables. If you want to use common industrial curves, RTDs can be read using the common DIN 43760 (IEC 751) curve and thermistors can be read using the YSI 400 curve.

INFO-CON Connectors

Probes attach to the 1521 and 1522 using Hart's new "INFO-CON" connector. The INFO-CON (partially based on U.S. Patent 5,857,777) allows you to change the probes you use without requiring you to reprogram your readout. A memory chip in the INFO-CON stores all the critical information about your probe, including its serial number, recall date, and calibration constants.

When you connect your probe, the 1521 automatically recognizes whether you're using an RTD or thermistor and downloads the calibration constants and type of conversion specific to your probe. It also checks the recall date stored in the INFO-CON to verify it has not expired. To dedicate a single probe to your readout, disable the password-pro-



Stores (in a memory chip) the characterization constants for your RTD or thermistor so there's no need to enter them manually or download them from a PC.

Tells your 1521/1522 the serial number and recall date of the attached probe so you never have to worry about using a probe that is overdue for calibration.

Tells your 1521/1522 whether it's connected to an RTD or thermistor. No need to tell your readout what to do.

Allows you to change probes easily. Simply plug in the new probe and the 1521 is "married" to it with all the relevant data.

tected interchangeability function and your thermometer will read only the probe you specify.

Forget entering calibration constants yourself, and don't worry about the mistakes that can so easily occur during that process. You don't even need to select your sensor type. It's all stored in the INFO-CON. Simply plug in your probe

and you're ready to take readings. It doesn't get any easier.

Information is loaded into the memory of the INFO-CON by Hart when you purchase a probe or have a probe recalibrated by Hart. Alternatively, you may load your own information into an INFO-CON through the Handheld Thermometer or from the serial port of your PC with the optional download adapter. The adapter includes Model 9972 software, which provides an easy-to-use Windows interface to guide you through the loading process.

If you'd like to use a Hart Handheld Thermometer with probes you already own, no problem! Spare connectors are available. They connect easily to your probes, and you can program them yourself.

Model 1521 LLK

The 1521 uses a menu system for convenient access to all functions. Calibration and sensor programming functions are password protected to help prevent unauthorized access.

"Min" and "Max" functions store the lowest and highest readings since the last reset. The "Hold" function freezes and stores the current reading (up to six may be stored) for later recall. And the "Delta" function computes the difference between the current reading and a



Model 1521 and 1522 Handheld Thermometers make excellent reference thermometers for field calibrations.

HANDHELD THERMOMETERS



LogWare software can be used to graphically and statistically analyze data logged to the Model 1522 LLL. LogWare can also turn either Handheld Thermometer into a real-time datalogger.

reference value, which may be recorded at any time.

Each thermometer comes complete with rechargeable nickel-metal-hydride batteries, an AC adapter/charger, an RS-232 cable for connecting to your PC, and a spare INFO-CON connector. Every unit also includes a NIST-traceable calibration with actual resistance measurements for your individual meter at 10 points—4 representing typical RTD values and 6 representing typical thermistor values.

A wide variety of standards-quality probes are available from Hart in many different shapes, sizes, and price ranges. On pages 64 to 75 you'll find PRTs as accurate as $\pm 0.010^{\circ}\text{C}$ and thermistors as accurate as $\pm 0.001^{\circ}\text{C}$. The uncertainty of your probe should be added to the uncertainty of the meter to compute total system uncertainty.

Model 1522 LLL

The Model 1522 has all the power and great features of the 1521 plus the ability to log data. Two data acquisition modes are included.

In "Auto Logging" mode, the 1522 can store up to 10,000 measurements at user-selected intervals, including the value, unit of measure, date, and time of each measurement. If you need more than one data set, stop recording anytime and record as many sets as you like up to a total of 10,000 values. Once the 10,000 value limit is reached, recording stops, so data is never lost unless you tell the 1522 to clear its log.

The 1522 also holds as many as 25 data labels in its memory so that each set of data can be uniquely tagged. Simply select one of the 25 labels you've created

before recording data. This label is then recorded with each measurement.

In "Demand Logging" mode, up to 100 individual measurements can be recorded, each one tagged with one of the 25 data labels. Whether you need a lot of measurements from one source or single measurements from many sources, the 1522 is a powerful data recording tool.

With Hart's Model 9934 LogWare software (see page 85), data management is easy. Data sets gathered remotely through the 1522 can be easily downloaded to a PC either as a single file or as individual files for each data set. Link the LLL to your PC through a serial cable or its IrDA port either as ASCII or binary files. View the data, graph it, or apply alarms. With LogWare you can record data in real time either from a 1522 or 1521 Thermometer.

One company consistently delivers powerful metrology products that make your life easier. Ask other companies about their handheld thermometers. Ask them about their thermometers that are accurate to within a few millikelvin and that record data at the touch of a button. Then ask them to give it all to you in one package. Hart Scientific does—at a price you'll love. Call us today and get the most powerful handheld thermometers in the world.

Technical Tip

Calibrate PRTs over Their Useful Range

Most people use their platinum resistance thermometers over a temperature range that is smaller than the total operable range published by the instrument's manufacturer. When recalibrating a PRT, select the calibration range based on the intended use rather than on the manufacturer's maximum range specifications. This will

save you money because calibrations over a wider span usually require more temperature points and therefore cost more. It will also reduce the wear and tear on your probe and result in better measurements since PRTs are generally more stable when used over a narrow range.

Models 1521 and 1522

Thermometry

Ordering Information

1521	Handheld Thermometer
1522	Handheld Logging Thermometer
1522-KIT	Includes 1522 Thermometer, 9934-S LogWare, 2374 Dongle for IR Communication, and 9318 Case
9934-S	LogWare, Single Channel, Single User
9934-M	LogWare, Single Channel, Multi User
2370	Spare RS-232 Cable
2371	Spare INFO-CON Connector
2372	INFO-CON Download Adapter (with Model 9972 Software)
2373	Adapter, INFO-CON to spade lug
2374	Dongle for IR Communications
2375	Mini Thermal Printer, includes power supply, battery pack, paper, adapter, cable
2378	Paper, 2375 Printer
9321	Soft Carrying Case, 1521/1522
9318	Hard Carrying Case, fits 1521/1522 and a 12" probe
2601	Probe Carrying Case
2521	Battery Pack, 1521/1522

Specifications

Sensor Type	Pt 25 to Pt 100	Thermistor
Temperature Range	-200°C to 962°C	-50°C to 150°C
Resistance Range	0Ω to 400Ω	0Ω to 500 KΩ
Characterizations	ITS-90, IEC-751 (DIN "385"), Callendar-Van Dusen	Steinhart-Hart thermistor polynomial, YSI 400 (2252 ohms)
Temperature Accuracy (meter only)	-200°C to 100°C: ±0.025°C 100°C to 400°C: ±0.05°C 400°C to 800°C: ±0.1°C 800°C to 962°C: ±0.15°C	0°C to 50°C: ±0.005°C 50°C to 75°C: ±0.01°C 75°C to 100°C: ±0.02°C
Excitation Current	0.5 mA	5 μA
Operating Range	0°C to 40°C	
Temperature Resolution	0.001°	
Measurement Period	1 second	
Digital Filter	1- to 60-second exponential filter	
Probe Connection	INFO-CON Connector	
Communications	RS-232 (Model 1522 also includes infrared interface)	
Memory	Stores 6 readings in "Hold" mode	Logs 10,000 readings in "Auto Logging" mode; logs 100 readings in "Demand Logging" mode. Memory holds up to 25 data labels that may be attached to Demand Log readings or Auto Log data sets.
Display	6-digit, 7-segment LCD with 16x1 alphanumeric	
Power	Rechargeable nickel-metal-hydride batteries (AC adapter included)	
Size	7.75" H x 4.2" W x 1.5" D (20 x 11 x 4 cm)	
Weight	1 lb. (0.4 kg)	
Probes from Hart	Contact Hart for a wide variety of precision PRTs and thermistors	
Calibration	10-point, NIST-traceable resistance calibration provided	



See our calibration and data acquisition software packages on page 78.



The Model 9318 Hard Carrying Case protects your Handheld Thermometer, a probe, and all your accessories.



Randy still has his first chart recorder. It's a wind-up unit he got for Christmas when he was five.