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random NEWS

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HART SCIENTIFIC

Jim Triplett,
CEO and Chip Head

Prepare Now for Y3K!

By Jim Triplett, Chairman and CEO

Well, it's a new year. It's now Y2K plus 1. The world didn't blow up last year as predicted. However, too many people still continue to be very irritating.

I guess we really don't have anything to worry about until Y3K comes along. But we probably should get a head start on the problem by testing all the software we can now to see if everything will function properly in the year 3000. "Start early" is one lesson we should have learned from Y2K.

Of course, most of the software we are now using will be somewhat obsolete by the year 3000, and the majority of people who wrote the code will be dead. Believe it or not, some people are still using DOS, and in the year 3000, if these people are still alive, they will be calling us to support their DOS programs. Some folks just never give it up!

Even though I was calm and levelheaded during the Y2K crisis (you can still read our unofficial Y2K article until April at hartscientific.com), there is a year 3000 scenario that does worry me.

see JIM on back page

Hart Cal Lab Gains NVLAP Accreditation

By Bernard Morris, Vice President of Metrology Products

On November 8, 2000, Hart Scientific's temperature calibration laboratory received NVLAP accreditation for a variety of temperature calibrations as well as resistance and voltage readout devices and DC resistance (NVLAP lab code 200348-0). Hart's accredited uncertainties for temperature calibration are the lowest in the U.S. outside of NIST. They are also lower than most commercial accredited labs anywhere in the world, including all labs accredited by UKAS (United Kingdom) and DKD (Germany). Hart's scope of accreditation includes calibrations of

- fixed-point cells
- SPRTs by fixed point
- SPRTs and PRTs by comparison
- thermistors by comparison
- thermocouples by fixed point
- DC resistance
- digital thermometers (readouts)

(See page 3 for a more detailed view of Hart's scope, and go to Hart's web site at www.hartscientific.com for a complete report.)

So why should you care? Since Hart's calibration processes, quality system, and uncertainty calculations have been reviewed by NVLAP and its team of assessors (including the temperature group at NIST), you can have the highest confidence in calibrations performed in our lab.

Those who have selected Hart as their calibration vendor in the past have often sent auditors to review our lab. This has been time-consuming and expensive for our customers and us. This is no longer required since NVLAP (a department of NIST) has already done it and will continue to monitor Hart's lab.

Hart's customers outside the U.S. can now take advantage of Hart's accredited services by receiving lower uncertainties than are available through local accredited labs. This is possible through international cooperation and mutual recognition of accreditation bodies.

The "International Arrangement to Enhance Trade" became effective January 31, 2001. This arrangement was signed at a meeting of the International Laboratory Accreditation Cooperation (ILAC) by accrediting bodies in 28 economies and means mutual recognition for calibrations virtually anywhere in the world. Signatories include NATA (Australia), INMETRO (Brazil), SCC (Canada), CNACL (China), PTB (Germany), COFRAC (France), SIT (Italy), JCSS (Japan), UKAS (UK), and NVLAP.

Why did we do it? The market for calibration services is competitive, and customers—in the U.S. and around the world—are demanding accreditation from their suppliers with increasing frequency. Our accreditation places us in the world's top tier of temperature calibration suppliers.

Additionally, the accreditation process was an excellent opportunity for Tom Wiandt (Hart's cal lab manager) and his team to have their processes and systems critiqued by top-level temperature metrologists. Having NIST test our primary standards and review our uncertainty analysis was invaluable. Our confidence in our lab has never been higher.

For the Scope of Accreditation under NVLAP Lab Code 200348-0

As the advantages of accreditation become better understood and larger numbers of quality systems require it of their suppliers, it will become a competitive necessity. Even today, accredited labs are required to have their own standards calibrated by national labs or other accredited labs. Claiming traceability to a national lab won't be sufficient in the future.

In the U.S., NVLAP and A2LA are the primary accrediting bodies. NVLAP can be contacted through NIST's web site at ts.nist.gov / nvlap. A2LA can be reached at www.a2la.org. If you're considering accreditation for your lab, talk to us at Hart. We can tell you about our experience and help you work through the process. Tom Wiandt, Rose Heaton, and Bernard Morris can all be reached at 801-763-1600 or through our web site at www.hartscientific.com. *End*

The following accrediting bodies are signatories to a new international arrangement, or "mutual recognition arrangement" (MRA), effective January 31, 2001. All are members of the International Laboratory Accreditation Cooperation (ILAC). The arrangement means that signatories will accept goods tested in other countries by labs that are accredited by other signatories. For more details contact the ILAC Secretariat at ilac@nata.asn.au.

Country	Organization
Australia	NATA
Belgium	BELTEST BKO/OBE
Brazil	INMETRO
Canada	SCC
People's Republic of China	CNACL
Czech Republic	CAI
Denmark	DANAK
Finland	FINAS
France	COFRAC
Germany	PTB (DKD) DAP DACH DATech
Hong Kong, China	HKAS
India	NABL
Ireland	NAB
Italy	SINAL SIT
Japan	JAB JCSS JNLA
Republic of Korea	KOLAS
The Netherlands	RvA
New Zealand	IANZ
Norway	NA
Singapore	SAC
South Africa	SANAS
Spain	ENAC
Sweden	SWEDAC
Switzerland	SAS
Chinese Taipei	CNLA
United Kingdom	UKAS
United States of America	A2LA NVLAP ICBO-ES
Vietnam	VILAS/STAMEQ

Summary of Hart's NVLAP Accreditation Scope

Following is a summary listing of Hart's Scope of Accreditation from NVLAP (lab code 200348-0). The complete scope may be found at Hart's web site (www.hartscientific.com) as well as NVLAP's site (ts.nist.gov/ts/htdocs/210/214/214.htm). Questions about Hart's accreditation may be directed to Bernard Morris at Hart (801-763-1600 or bernard_morris@hartscientific.com). Information about the international acceptance of NVLAP accreditations can be found at www.ilac.org or referred to Bernard.

Fixed-Point Cells

Direct Comp. to Reference Cells

TPHg	±0.20 mK
TPW	±0.07 mK
MPGa	±0.08 mK
FPIn	±0.50 mK
FPSn	±0.60 mK
FPZn	±0.80 mK
FPAl	±1.50 mK
FPAg	±3.50 mK

Direct Comp. to Working Cells

TPHg	±0.25 mK
TPW	±0.10 mK
MPGa	±0.10 mK
FPIn	±0.70 mK
FPSn	±0.80 mK
FPZn	±1.00 mK
FPAl	±1.80 mK
FPAg	±4.50 mK

Precision Thermistors

–20°C to 100°C	±1.5 mK
100°C to 150°C	±3.0 mK

Thermistors

–50°C to –20°C	±5.0 mK
–20°C to 120°C	±4.0 mK
120°C to 150°C	±6.0 mK

Resistance Thermometery

Using Fixed-Point Cells

–197°C (LN2)	±0.5 mK
–38.8344°C	±0.4 mK
0.01°C	±0.2 mK
29.7646°C	±0.4 mK
156.5985°C	±0.9 mK
231.928°C	±0.9 mK
419.527°C	±1.1 mK
660.323°C	±2.1 mK
961.78°C	±10.0 mK

*Using Comparison Method I**

–200°C	±10 mK
–100°C to –50°C	±10 mK
–50°C to 0°C	±8 mK
0.01°C	±5 mK
0°C to 200°C	±8 mK
200°C to 300°C	±9 mK
300°C to 400°C	±10 mK
400°C to 550°C	±11 mK
550°C to 660°C	±15 mK

*Using Comparison Method II***

–197°C (LN2)	±2 mK
–100.000°C	±2 mK
–38.8344°C	±2 mK
0.01°C	±2 mK
29.7646°C	±2 mK
156.5985°C	±3 mK
231.928°C	±4 mK
419.527°C	±6 mK
500.000°C	±7 mK
660.323°C	±8 mK

DC Resistance

1Ω to 10Ω	±0.35 ppm
10Ω to 100Ω	±0.45 ppm
100Ω to 1000Ω	±0.60 ppm
1000Ω to 10000Ω	±0.70 ppm

Digital Thermometers

Readouts that Measure Resistance

0.25 to 4.0 (ratio)	±0.2 ppm
1Ω	±5 ppm
10Ω	±4 ppm
100Ω	±1 ppm
10000Ω	±2 ppm
0Ω to 400Ω	±4 ppm
400Ω to 10 KΩ	±8 ppm
10 KΩ to 100 KΩ	±8 ppm
100 KΩ to 1 MΩ	±25 ppm

Readouts that Measure Voltage

0 mV to 50 mV	±0.45 mV
50 mV to 100 mV	±0.75 mV

Internal Reference Junction Comp.

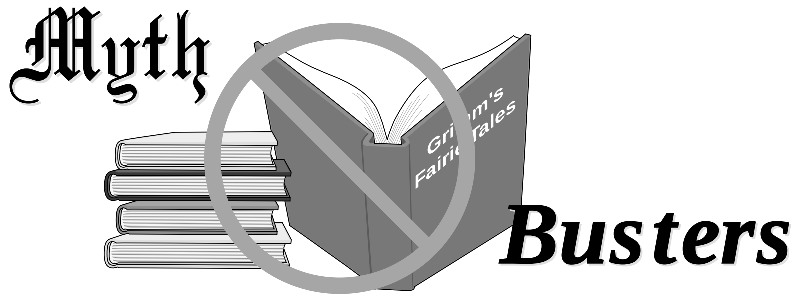
0°C to 25°C	±10 mK

TCs by Fixed Point

Type S and Type R	±100 mK
Au/Pt	±20 mK
(Range: 0°C to 1085°C)	

*Comparison Method I (sometimes called "indirect" comparison) is typically used for calibrating PRTs and is perhaps the most traditionally common method of comparison calibration. The comparison is made by measuring the resistance of the PRT under test at a set of temperatures as determined by a reference thermometer (SPRT).

**Comparison Method II (sometimes called "direct" comparison) is typically used for calibrating SPRTs. It is done by measuring the temperature of the reference SPRT and the resistance ratio between the SPRT under test and the reference SPRT at a set of temperatures. Comparison Method II requires more complex measurements and a readout device capable of measuring true ratios but yields lower uncertainties.



Myth: All Traceability Statements Are Equal

By J. Randall Owen, President

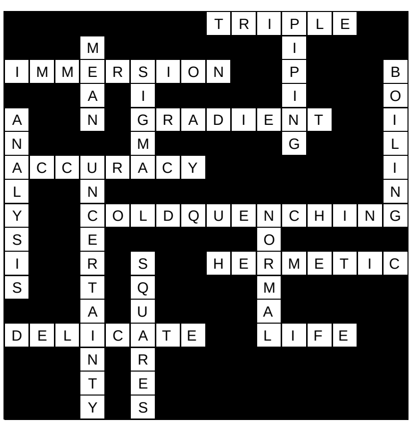
Traditionally, if you bought a thermometer that was advertised as “traceable” to a national laboratory (NIST, NPL, PTB, NRC, etc.), you assumed it was calibrated against a standard that was itself calibrated against a better standard that was in turn calibrated against an even better standard and so on until the first instrument in this direct line was calibrated against standards maintained by the national lab. This unbroken chain of calibrations is often referred to as “traceability.”

However, many people assume that a thermometer “traceable” to a national lab has the best possible calibration and its accuracy need not be questioned. Some even assume the national lab sanctioned the calibration of the device. Some manufacturers may even advertise their thermometers as “NIST-calibrated” or “NPL-calibrated” when in fact the thermometer has never been to a national lab.

While it may be important to know that a thermometer’s calibration is traceable to NIST, such a statement may not mean much about the actual calibration and accuracy of that thermometer. In fact, it may not mean that its calibration is traceable at all.

According to ISO, traceability is the “property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties.” Unfortunately, the traceability claim is often misused—even in misleading ways. So let’s look at some things the “national lab-traceable” claim does NOT mean:

1. The national lab only calibrated the first instrument in the chain. Their report only applies to their calibration of that first instrument in the chain. Traceability does not mean the national lab approved the calibration of the thermometer finally in question—nor any of the calibrations below its own on the chain.
2. Some in the U.S. believe the presence of a NIST Test Report Number on the calibration certificate makes the thermometer’s calibration valid. However, NIST Test Report Numbers do not prove traceability. ISO and ANSI standards do not require their use to establish traceability. NCSL recommends against their use “as proof of adequacy or traceability of a test or measurement” (NCSL Position Statement 96-1).
3. Application of the term “traceable” is no guarantee that a thermometer has been calibrated correctly, even if the measurements involved in the



Solution to previous Random News crossword puzzle.

calibration are indeed traceable. Traceability statements are generally not controlled or regulated, so users are left to themselves to determine the credibility of a traceability claim. Users could go by the reputation of the company or they could audit the company. This means checking the following:

a. Was the technician performing the calibration properly trained?

b. Does the organization have carefully prepared, written procedures?

c. Are those procedures followed? Who checks that and how often?

d. Are the calibration standards themselves recalibrated at correct intervals? (We've seen cases of gross neglect in this area.)

e. Were correct estimations of uncertainty applied? Were the uncertainties of the standards sufficiently low to justify the final uncertainty claimed by the unit being calibrated?

f. Were all elements of uncertainty considered in developing the uncertainty statement?

g. Does the lab utilize an adequate document control system?

h. Were correct procedures used to ensure the proper calibration of standards? What methodology is used to verify the performance of these standards between calibrations?

i. Does the lab have an approved quality control system for calibrations and standards?

The bottom line is this: How do you really know that a so-called "traceable" thermometer is really calibrated correctly and that its calibration is indeed traceable? For years we've seen critical industries send out auditors to certify the competence of calibration vendors. Not only is this expensive and time-consuming, those audits may not be adequate to prove traceability to a national lab or international standards.

A cal lab with a current accreditation demonstrates that each of the issues listed above has been audited for compliance with international standards. Further, the lab is accredited to perform calibrations within the boundaries of a specific scope of capabilities. These boundaries consider the facility, equipment, and personnel of the cal lab. The accreditation applies to specific temperature ranges and types of thermometers and gives specific uncertainty limits.

When you purchase a calibration from an accredited lab, you can be confident that the lab has the competence, equipment, and quality system necessary to deliver the uncertainty level it claims. You can also be confident that its uncertainties have been scrutinized through the entire traceability chain to a national lab or intrinsic standard.

If your business provides calibration services, accreditation becomes a competitive edge. Accreditation provides a widely accepted third party assessment of your capabilities. Those labs that respond quickly and offer the best menu of accredited services will capture this fast-growing segment of the calibration market.

We'd be happy to discuss the process with you ourselves. Call Bernard Morris, Rose Heaton, or Tom Wiandt. All of them are willing to share our experience and discuss the preparation you'll need before accreditation.

End

Hart's new Model 2031 Immersion Freezer "Quick Stick" makes the formation of ice mantles in triple point of water cells easy. Just fill the reservoir with dry ice and alcohol (or liquid nitrogen) and come back in an hour to find a thick, evenly formed ice mantle. No baby-sitting required.

You Call That a Reference Thermometer?

By Tom Fisher, Vice President of Industrial Products

Some dry-block manufacturers provide built-in readouts for reference RTDs used in comparison calibrations. The RTD is inserted into the temperature well, and its temperature reading is displayed on the mounted panel meter readout or on a multi-line LCD display.

These reference probes are uncalibrated, high-quality industrial RTDs conforming to DIN Class A tolerances and are intended to provide accurate verification of the block's temperature. The panel meters typically used have linearization accuracy of 0.25% of reading + least significant digit + 0.1%.

The table below shows Class A tolerances (excluding effects from drift or shock), panel meter uncertainties (excluding drift and lead-wire errors introduced by measuring three-wire RTDs), and combined uncertainties. Most manufacturers don't like to provide these figures for obvious reasons. The table shows that a good dry-well's own calibrated display outperforms a built-in panel meter system by a large margin. In fact, with a typical 4:1 coverage ratio, not many temperature systems can be supported by such a readout system (1.37°C x 4 = 5.48°C at 300°C).

The lowest uncertainties in dry-well comparison calibrations do indeed require a reference thermometer. But here we're talking about a real reference thermometer: a calibrated PRT and a precision readout that accepts the linearization of individually calibrated PRTs. The table below shows what is possible with one such inexpensive system from Hart.

Temp	Class A Uncert. [1]	Panel Meter Uncert. (90 days) [2]	Combined Meter and Class A (RSS)	Dry-Block Display Accuracy [3]	Hart 5614 Calibrated PRT [4]	Hart 1521 Handheld Thermometer [5]	Combined Hart 1521 and PRT (RSS)
–25°C	±0.20°C	±0.18°C	±0.27°C	±0.10°C	±0.050°C	±0.025°C	±0.06°C
0°C	±0.15°C	±0.10°C	±0.18°C	±0.10°C	±0.050°C	±0.025°C	±0.06°C
100°C	±0.35°C	±0.45°C	±0.57°C	±0.10°C	±0.050°C	±0.025°C	±0.06°C
300°C	±0.75°C	±1.15°C	±1.37°C	±0.10°C	±0.051°C	±0.050°C	±0.07°C
500°C	±1.15°C	±1.85°C	±2.18°C	±0.30°C	±0.055°C	±0.100°C	±0.12°C

[1] Class A uncertainty taken directly from DIN EN 60751 table: dt = ±(0.15 + (0.002*|t|))°C.
[2] Uncertainties calculated using Eurotherm model 2216 panel mount temperature controller.
[3] Based on Hart model 9107 and 9127 dry-wells.
[4] Includes calibration uncertainty and short-term stability.
[5] Includes one-year drift.

So why doesn't Hart offer built-in readout devices for reference thermometers on our dry-wells? We could provide built-in panel meters like some competitors, but frankly, we would be too embarrassed to publish the combined uncertainty. Our competitors not only use off-the-shelf readouts, they use off-the-shelf controllers. At Hart, we've invested in our own controller and readout technology. The controllers in our dry-wells provide far better accuracy than panel meters and our external thermometer readouts are even more accurate. By leaving them separate from the dry-wells, we allow users to take them anywhere an accurate measurement is needed, not just inside a single metal block. *End*

New Product Announcements

Model 7312 TPW Maintenance Bath

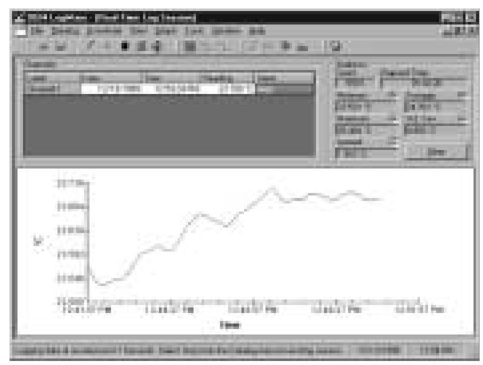
Hart's new Model 7312 TPW Maintenance Bath maintains triple point of water cells safely, conveniently, and inexpensively. With a depth of 19.5" (496 mm), the 7312 holds one or two of any common size triple point of water cell. Stability is ±1 mK or better, so ice mantles can last from six to eight weeks or longer.

An independent safety circuit helps protect against cell damage during fault conditions by shutting down the bath's refrigeration system if the system controller fails. A line voltage regulator also helps safeguard the 7312's compressor during low-voltage or brownout conditions.

Each bath includes a Model 2031 "Quick Stick" (see page 5) for simple, hands-free freezing of TPW cells. Just fill the 2031's condensing reservoir with dry ice and alcohol and set it in your cell. In about 60 minutes the cell can go into the bath for calibrations at 0.01°C. A cell-holding fixture and RS-232 interface are also included.

Model 9934 Log*Ware*

Any single-channel Hart thermometer readout can be turned into a powerful data acquisition tool with new Log*Ware* software from Hart.



Log*Ware* is a Windows-based program that stores, analyzes, and graphically presents temperature data. It can be used in real time with Tweener Thermometers (1502, 1503, 1504) or Handheld Thermometers (1521, 1522) connected to a PC through their RS-232 link. It can also be used to download and analyze data previously stored in the memory of the 1522 LLL Handheld Thermometer.

Log*Ware* calculates statistics and allows users to customize graphs. Users may also set delayed start times for data acquisition, select acquisition intervals from 1 second to 24 hours, and log data for a fixed number of readings or length of time. Users may also set both high and low alarm conditions and select the type of alarm notification. Log*Ware* is available with either single-user or multi-user license agreements.

Model 9127 High-Speed Precision Dry-Well

The Model 9127 High-Speed Dry-Well offers an unmatched combination of precision, speed, and capacity for temperature calibration work from 50°C to 600°C (122°F to 1112°F).

With excellent stability (±0.02°C at 300°C) and uniformity (±0.03°C at 300°C), the 9127 offers low uncertainties for comparison calibrations. Display accuracy ranges from ±0.1°C at 100°C to ±0.5°C at 600°C. 600°C is reached in just 25 minutes with stabilization time of 7 minutes.

Any of three standard multi-hole inserts can be used in the 9127, accommodating temperature sensors from 1/16" (1.6 mm) to 1/2" (12.7 mm) in diameter. Each standard insert has either six or eight drilled wells. Custom inserts are also available.

Each unit includes a NIST-traceable calibration, an RS-232 serial port, and Interface-*it* software. Interface-*it* lets users change temperatures, set ramp-and-soak routines, and monitor the 9127 from a PC. *End*

Q and A

Question: The calibration report for my Hart thermometer readout gives me data in ohms. Why not in °C? Can I convert it?

By Steve Iman, Product Support Manager

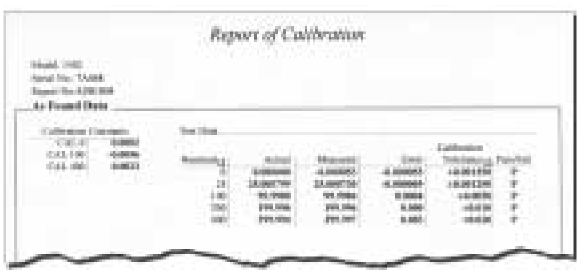
Ironically, thermometer readout devices don't measure temperature. In fact, no thermometer or readout measures temperature directly!

Thermocouples, for example, produce a voltage that changes with temperature. The devices that read thermocouples, therefore, read voltage. Likewise, infrared thermometers sense radiation, acoustic thermometers measure the speed of sound, and liquid-in-glass thermometers really indicate changes in volume.

Hart Scientific makes thermometer readouts for thermocouples, thermistors, and PRTs (including SPRTs). The electrical resistance in the sensing elements of resistance thermometers changes with temperature. Readouts like Hart's Tweener or *Black Stack* measure this resistance. Hence they are really ohmmeters providing thermometric functions.

The conversion from resistance to temperature is done mathematically inside the readout, allowing it to display temperature in °C, °F, or K. In Hart readouts this conversion is based on validated mathematical functions—rather than lookup tables—and contains no significant error.

Hart readouts also include a variety of conversion methods so that users may match the coefficients derived for their thermometer during its last calibration to the corresponding conversion method. For example, a PRT given an ITS-90 calibration has ITS-90 coefficients and should be read using an ITS-90 conversion. Likewise, a thermistor with Steinhart-Hart coefficients should be read using a Steinhart-Hart conversion.


Report of Calibration

Because resistance-thermometer readouts measure resistance, they are calibrated in ohms using standard resistors. All data is gathered and reported in ohms, which helps isolate the uncertainty contribution of the readout from the uncertainty of the probe or thermometer.

The data on these reports can indeed be converted to temperature, but the conversion depends on the type of thermometer being read by the readout and cannot therefore be reported with certainty. To convert the uncertainty or tolerance statements, for example, use the formula

$$U_T = \frac{U_R}{S}$$

where U_T is the uncertainty of the readout in temperature, U_R is the uncertainty of the readout in ohms (from the calibration report), and S is the sensitivity of the thermometer (its change in ohms per °C) at the resistance level in question.

For example, if a thermometer readout reports an uncertainty at 200Ω of ±0.004Ω and it is being used with a PRT whose resistance changes by 0.368Ω/°C at 200Ω, the uncertainty contribution from the readout (only!) is 0.004/0.368, or 0.011°C. The sensitivity of the probe is most easily found in the temperature-resistance table accompanying its report. *End*

To the Point

News on fixed points and primary standards development

Hart Introduces User-Friendly X Cells

Three new fixed-point cells from Hart Scientific significantly reduce the cost of fixed-point ownership and make fixed-point calibrations possible in industrial environments. Dubbed "X Cells," these new water, gallium, and indium cells offer true primary standards–level uncertainties.

Just one inch in diameter and five inches long, X cells reduce ownership costs in three ways. First, because they're small, the gallium and indium cells use a smaller sample of pure metal, thus reducing their price far below that of traditional cells.

Second, X Cells are made from stainless steel rather than quartz and graphite, so they're less susceptible to damage from mishandling. They can also be shipped, so they don't have to be hand carried.

And third, X Cells don't require expensive, specialized maintenance devices, as do traditional fixed-point cells. Dry-well calibrators, Micro-Baths, and metrology baths can all be fitted with baskets to hold these standard cells.

X Cells provide three inches of immersion depth. The uncertainty of the water (0.01°C) and gallium (29.7646°C) cells is ±0.001°C; the uncertainty of the indium cell (156.5985°C) is ±0.002°C.

New System Automates Gallium Cells

At 29.7646°C, the melting point of gallium provides a critical temperature for thermometers used in life science and environmental monitoring applications. It is also used as an SPRT check standard for ITS-90 compliance and can be used to verify SPRT linearity between calibrations.

Now the use of a gallium cell can be fully automated. Hart's new Model 9230 Gallium Cell Maintenance Device works with the Model 5943 Stainless Steel Gallium Cell (not to be confused with the smaller X Cell) to automate gallium melts that last for a week or more.

The 9230 controls internal Peltier modules and an attached immersion heater to initiate the melting cycle—including the inner melt. Users need only enter the melt command through the front panel and remove the immersion heater after about ten minutes. When finished, users may initiate a freezing cycle, which automatically completes the melt, refreezes the cell from the bottom up, and sets the cell's temperature just below the melting point so it is ready to go again.

Melting curves can last from five to ten days. Immersion in the central well is more than six inches. And expanded uncertainty of the Model 5943 Gallium Cell is ±0.08 mK. *End*

Beamex MC5 Multifunction Calibrator.

Connecting a Dry-Well to a Multifunction Calibrator

Multifunction process calibrators are some of the most commonly used process tools for calibrating multiple measurement variables including temperature, pressure, electrical parameters, and frequency on the factory floor. These sophisticated devices are all-in-one calibration tools for calibrating temperature and pressure transmitters, indicators, limit switches, and other process devices. They even document as-found and as-left data for your calibration database.

Beamex has now written drivers for their MC5 Multifunction Calibrator to communicate with Hart Scientific dry-wells and Micro-Baths. The MC5 communicates temperature set-points to the dry-well and reads the block temperature for comparison with the thermometer under test. Multiple test points can be programmed by the MC5 via an RS-232 link to automate the calibration of a temperature sensor.

Instead of disconnecting the RTD or thermocouple from the transmitter for calibration, quality technicians can test the sensor and transmitter together using an actual heat source. Testing the system as a system will result in a more accurate calibration that can now be documented to your process calibrator.

Call Hart for more details on how this new type of connectivity can improve your field calibration uncertainties. We can also supply you with a list of other process calibrators that communicate with Hart Scientific dry-wells. *End*

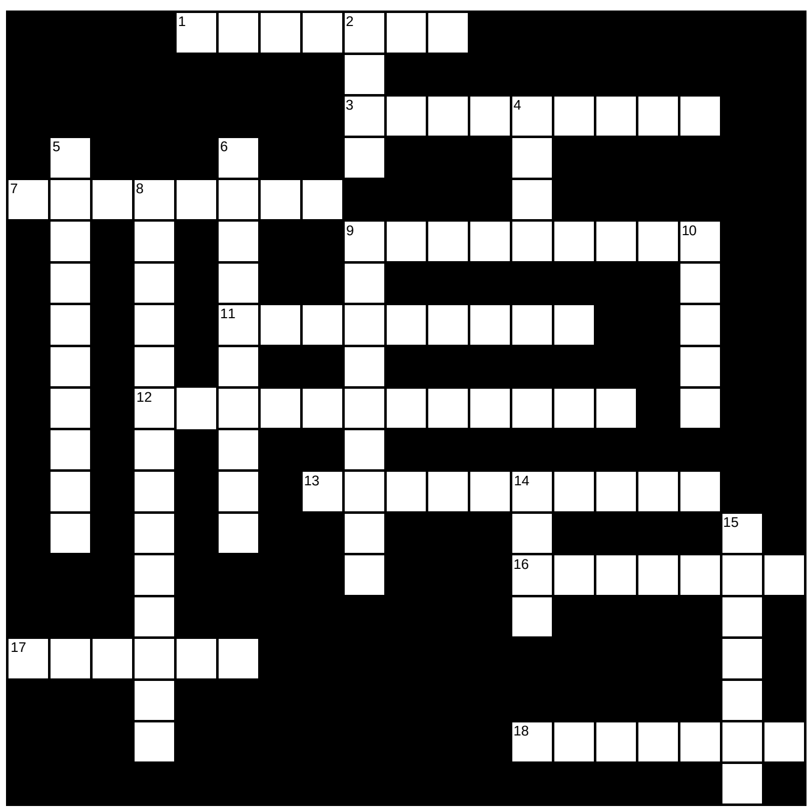
Crossword Puzzle

Across

1. –38.8344°C
3. Can partially reverse the effects from "9 Across."
7. Major temperature conference, June 2001 in Berlin
9. Form of SPRT contamination at high temperatures
11. The ITS-90 is divided into 11 of these
12. Metrological pedigree
13. Connecting these types of metals creates a thermocouple effect
16. Type of small SPRT used in cryogenics
17. Having only one dimension
18. Lab condition required on calibration report

Down

2. British accrediting service
4. Major U.S. accrediting body
5. Distinguishable level of detail (or made at New Year's)
6. Measured by an SPRT readout
8. Obsolete readout devices require adjustment of these
9. Readout spec: "% of range" or "% _______"
10. Major U.S. accrediting body
14. Common PRT insulation material
15. Another common PRT insulation material



New Product Training Courses

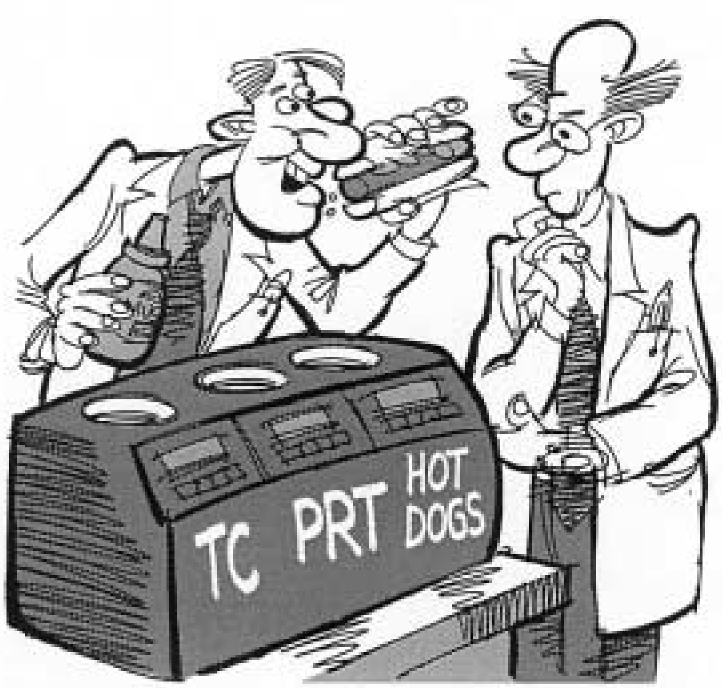
In addition to temperature calibration seminars, Hart Scientific now offers training in the applications and use of Hart products.

These post-seminar classes are broken into four half-day sessions covering thermometers, baths, dry-wells, and software. Product Training Sessions are held in our Temperature Calibration School in Utah during the same week as our seminars, so they provide the perfect follow-up to our regular seminar course work. The $400 enrollment fee includes all four of the half-day sessions.

Product Training Sessions offer the perfect opportunity to learn to maximize the advantages you get from Hart instruments. You'll leave knowing exactly how to use your favorite temperature calibration products, how to decide which ones are best for your applications, and how to get the most productivity out of your calibration work. An experienced product group expert at Hart Scientific guides each Product Training Session.

Each session includes experience with a large number of products that represents Hart's entire line for that particular product group. In the thermometer session, for example, you'll get to work (and play) with a Little Lord Logger, a Chub-E4, a *Black Stack*, and a Super-Thermometer. Likewise for the other sessions.

To register, just visit our web site at www.hartscientific.com. Fill out the registration form for the seminar you'd like to attend, and check the box to include the post-seminar Product Training Sessions. Or call us at 1-800-438-4278 and we'll take care of it over the phone. Calibration seminars and product training courses scheduled for 2001 are listed at right. Watch our web site for exact dates and times of all our seminars and Product Training Sessions. *End*



"Boy, these new combo units are really nice!"

2001 Calibration Seminars

Industrial Temperature Calibration	June 11–13
Temperature Metrology	July 9–11
Realizing and Approximating ITS-90	Aug 13–15
Industrial Temperature Calibration	Oct 15–17
Temperature Metrology	Dec 3–5

2001 Product Training Courses

Hart Product Training	June 13–15
Hart Product Training	July 11–13
Hart Product Training	Aug 15–17
Hart Product Training	Oct 17–19
Hart Product Training	Dec 5–7

Register online at www.hartscientific.com or call 800-438-4278 (801-763-1600) and ask for Kay.

Calendar of Events

NCSL Region 8 Meeting
American Fork, UT
April 24

Quality Expo
Chicago, IL
April 24–26

Test and Sensors Expo
Nuremberg, Germany
May 8–10

ASTM Meetings
Salt Lake City, UT
May 20–25

Sensors Expo
Chicago, IL
June 5–7

TEMPMEKO
Berlin, Germany
June 19–21

NCSL Workshop and Symposium
Washington, DC
July 29–Aug 2

(See page 11 for Hart seminar schedule)

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JIM *continued from page 1*

Suppose on New Year's Day 3000, the information chip that's implanted just above your right eyebrow (the one with your entire life history and bank account information on it) has a software glitch that causes a malfunction when the date rolls over. Now imagine that because of the glitch, the chip sends out the message that you're dead, which of course you aren't. That would create confusion in the mainframe database that will be operated by our one-world government.

Since it's so expensive to fix the chip, there's only one practical, low-cost alternative. The government will have to send three emotionless employees over to your house to kill you in order for the reality of the situation to match up with the data in your chip. This would reconcile the database with the chip output. Everybody would be happy. Well, almost everybody! This is only one reason to start testing all software early.

Y2K plus 1 raises some other questions. What will all of those fools who quit their jobs and moved to the woods with their generators, corncobs, and rainwater tanks do now? Will they continue to live in the woods? (I can live with that.) Or will they sell their survival villas to other nut cases waiting for some other end-of-the-world scenario? Exactly how will their Realtors list their property? "Come see this very secluded home located in a practically impossible-to-get-to section of the woods. It comes with all necessary amenities to sustain life, including a lifetime supply of corncobs, shelves for stacking your ammo, and of course rifle portals built directly into the iron shutters covering the windows." Sound like something you've always wanted—well, maybe if the price is really right!

Of course another issue is what happened to the crazed Y2K administrators. I can imagine they all got jobs as Chief Privacy Officers. So now instead of getting 25-page forms threatening to never do business with us again if we don't swear on our lawyer's grave that we're Y2K compliant, we're going to get 25-page forms threatening to never do business with us again if we don't swear on our lawyer's grave that we have an ironclad privacy policy.

The one thing all of these new Chief Privacy Officers have in common is the belief that they must have clear authority to fold, spindle, staple, or mutilate anyone violating the company's ironclad privacy statement, which simply says that they absolutely will not under any circumstance (never ever—not even once) sell your information to someone unless, of course, it benefits their company substantially to do so. They are going to protect your rights to the semi-privacy illusion you already have. It's vital to the security of our country and to spam.

Hart's privacy statement is very simple. We won't under any circumstances give your name to any of our competitors for any reason. How stupid do you think we are?

Now, of course in the case of the Y3K chip malfunction example I gave you earlier, the Chief Privacy Officer's job is to make sure your privacy is protected by not telling anyone you are dead, who killed you, or why the chip malfunctioned in the first place. No, the one-world government will just correct the database and shut up. It's comforting to know that in the year 3000, you will still have rights to your semi-privacy illusions. A carry-over from the old days! *End*