



- Bios Quality, Service and Calibration



Bios

Driving a Higher Standard
in Flow MeasurementSM

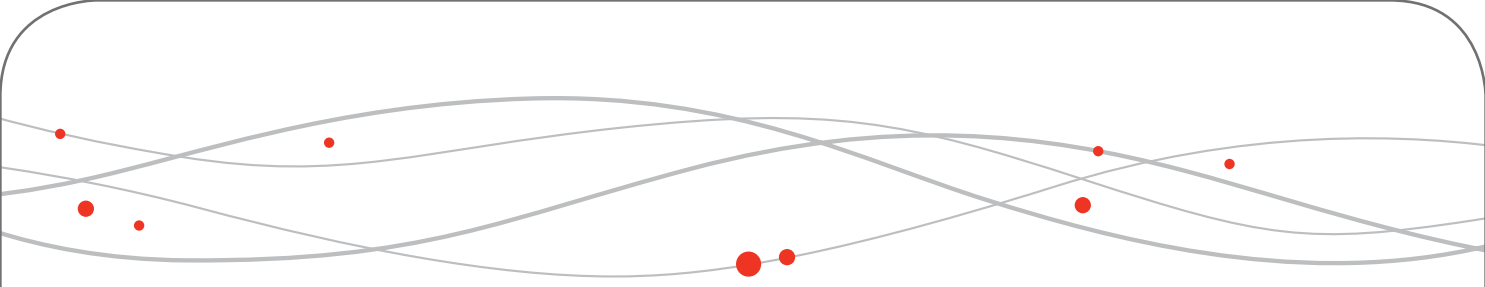


Table of Contents:

Welcome!	2
Quality begins with primary, Proven DryCal® Technology	3
Why service and calibrate a Bios primary standard?	3
Where to send your Bios product	3
Recertification of your Proven DryCal® Technology: a full service package	3
What we do	4
What it all means	4
As-Found and As-Left dynamic flow comparisons	4
Maintenance	5
Dimensional calibration (Met Lab® Series only)	5
Recertification warranty	6
Sending your product to Bios	6

- ▣ Accuracy
- ▣ Reliability
- ▣ Convenience



Welcome!

Thank you for using Bios products. Please spend a few moments reviewing our quality, service and calibration offerings. We're driving a higher standard in gas flow measurement, and we want you to be part of our commitment to quality.

Quality begins with primary, Proven DryCal[®] Technology



Gas flow measurement is elusive. While we can use a ruler to quickly and accurately measure the length of a desk, there's no comparable unit of measure we can apply directly to gas in order to determine its rate of flow.

The key to understanding gas flow measurement is in recognizing that there are seven SI base units (International System of Units) that have been quantified and refined worldwide and their precise values are unlikely to change. These SI base units are also called the "primary units of measure" and include length, time, mass, electric current, thermodynamic temperature, amount of substance and luminous intensity.

Since there's no SI base unit for the direct measurement of gas flow, flow is best determined by measuring the time it takes to positively displace a known volume of gas. Volumetric piston provers, such as Bios products featuring Proven DryCal Technology, are based on a century-old platform that's still considered by many, including national labs, to be the most desirable method of measuring gas flow, since the results are directly traceable to the SI base units. And unlike other piston provers, Bios gas flow standards do it without water and soap bubbles, oil, or hazardous mercury.

Our patented Proven DryCal Technology is truly primary because its accuracy is based upon the SI base units of length and time in order to derive volume: The interior diameter of our glass flow cell; the length of piston travel within this cell; and the time it takes the piston to travel this known distance. With Proven DryCal Technology products, customers receive accurate, directly traceable primary flow measurements that are fully supported by our leading ISO 17025 laboratory accreditation.



Why service and calibrate a Bios primary standard?

Bios primary gas flow standards are precision measuring tools designed to provide highly-accurate flow measurements each time they're used, in any number of applications. Whether you're protecting the lives of workers, monitoring our ever-changing environment, or verifying the process control producing new and better technologies, our primary flow standards are a critical link in the chain. As such, they require a certain degree of care and maintenance.

While some believe it's not necessary to periodically verify a primary standard's performance, since it exhibits the highest metrological qualities (unlike a secondary standard, such as a thermal flow element, which is subject to drift), Bios believes it's important to verify that your primary standard hasn't been compromised by inadvertent damage, environmental factors, or time and use – and that a NIST-traceable, secure audit trail should always support your hard work.

For these reasons, we recommend annual service and calibration of your Bios primary gas flow standard as a periodic quality assurance measure, as well as to provide you and your organization with a defensible audit trail of premier quality. Your Bios product is the benchmark, and as such it should receive the expert service and quality calibration that befits a precision measuring tool.

Where to send your Bios product

The Bios facility in Butler, New Jersey is the only authorized service center for Bios products. Quality is our biggest concern, and as the manufacturer of precision gas flow standards we believe that our products – and our customers depending on them – deserve only expert service, backed by NIST-traceable calibrations that hold up under the toughest scrutiny.

As an ISO 17025-, ANSI Z-540- and NIST Handbook 150-accredited calibration laboratory, our ability to maintain and assure the performance of our products is of the highest order. In our lab, we use only specialized Bios technicians to evaluate, test, refurbish and calibrate your Bios product. Our calibrations are supported by an outstanding $\pm 0.071\%$ Scope of Accreditation by NVLAP of NIST that's second to none, giving you peace of mind in an ever-demanding workplace and an increasingly litigious business environment.

Recertification of your Proven DryCal® Technology: a full service package

Your Bios primary gas flow standard is a precision measuring tool called upon to deliver accurate, defensible results – which is why we recommend annual factory service and calibration as an elective quality measure. Bios Recertification is a full product refurbishment package, helping to assure top performance within specification, increase product life, upgrade your Bios product with the latest improvements and provide a defensible audit trail.

While we recommend annual Recertification, your frequency may depend on your organization's internal quality control requirements, the environmental conditions of use, the amount of use, or the calibration requirements of regulatory agencies. For your convenience, we suggest that you provide us with your preferred Recertification interval. We'll print this to your Bios product's calibration label and certificate, and use it to generate future calibration reminders.



What we do

Recertification of your Proven DryCal Technology product is comprised of several elements:

1. **As-Found (pre) dynamic flow comparisons; three or more flow points, model-dependent**
2. **Maintenance**
3. **Dimensional calibration (performed for the Bios Met Lab® Series only)**
4. **As-Left (post) dynamic flow comparisons; three or more flow points, model-dependent**
5. **NIST-traceable calibration certificates**

What it all means

As-Found and As-Left dynamic flow comparisons

A dynamic flow comparison is the comparison of your Bios product to our lab standard – a Proven DryCal Technology device of at least 4x greater accuracy – under the same application conditions to make sure that your product is performing within tolerance. We perform one series of comparisons when we receive your product, and one series before it is return-shipped.

As a calibration laboratory accredited to ISO 17025, ANSI Z-540 and NIST Handbook 150, Bios follows best metrological practices. The 4:1 comparison ratio between our lab standard's accuracy and your Bios product's accuracy is the comparison "rule of thumb" recommended by the ISO Guide to the Expression of Uncertainty in Measurements (GUM) and adopted by not only Bios, but NIST and other national labs within their own organizations. Our dynamic flow comparisons are performed by trained Bios personnel following controlled test methods and procedures.

Our custom gas flow source runs from high-purity bottled nitrogen, is triple-regulated for a high level of stability and uses precision flow restrictors for flows from 1 to 50,000 sccm. The values of both your Proven DryCal Technology product and our laboratory standard are recorded in our calibration database, automatically calculated against the accepted tolerances and stored. As applicable, your Bios product's calibration results are printed to As-Found (pre) and As-Left (post) calibration certificates.

We call this process a dynamic flow comparison, but it may also be referred to as a calibration. While calibration often refers to an adjustment that restores an instrument to its original tolerance, gas flow measurement science refers to calibration as a set of operations that establish, under specified conditions, the relationship between the values of a quantity indicated by the Device Under Test (DUT) and the corresponding values of a standard. In this sense, calibration is different than a dimensional calibration, which is explained later.



Maintenance

Maintenance of your Proven DryCal® Technology product is actually a full product refurbishment.

We continually strive to improve our products wherever possible, and over the years we've made various hardware and firmware enhancements. We've introduced these enhancements through new product revision levels, and the maintenance portion of our Recertification service includes these upgrades whenever applicable, free-of-charge. Your Bios product's current revision level is located on its serial number label, and this revision level might change upon return-shipment after Recertification.

As a routine part of maintenance, your product is disassembled to its core components. We inspect each component for wear, defect, contaminants and damage and then clean, repair or replace as necessary. At the same time, we upgrade hardware that was improved since you last purchased or serviced your Bios product. As needed, we thoroughly clean the graphite piston and the interior of the glass flow measuring cell, test and adjust the valve mechanism and replace the inlet filter. As applicable, we recertify the crystal timing device. If your Bios product has temperature sensors or a pressure transducer, these are calibrated. For the battery capacity test, we use a custom load resistor to fully discharge your battery in order to determine if it meets our voltage requirement. Then, we either reinstall and charge your battery, or replace it at no additional cost.

Once your Bios product is reassembled, it's ready for its As-Left (post) dynamic flow comparison. If your product fails any points in this test, it must be disassembled again and the maintenance process continued until your Bios product passes our As-Left calibration.

Dimensional calibration (Met Lab® Series only)

Our Met Labs are high-precision primary piston provers. Due to the exceptional accuracy of Met Labs, the recommended 4:1 comparison ratio between the accuracy of the Device Under Test (DUT) and the laboratory standard is not achievable (see "**As-Found and As-Left dynamic flow comparisons**"). We still perform As-Found and As-Left dynamic flow comparisons for a general idea as to the working performance of your Met Lab, we go a significant step further and perform a full dimensional calibration of your precision Bios product.

We recertify, or verify, every dimensional aspect of your Met Lab in order to provide you with a sure-fire, traceable calibration certificate and true validation of the dimensional integrity of your product. This process requires precision instruments and gauges, such as a laser micrometer, depth micrometer and temperature bath.

Dimensional testing includes 20 or more significant tests, including piston diameter measurement, stroke length measurement, temperature sensor calibration, pressure transducers calibration and other dimensional and performance tests.



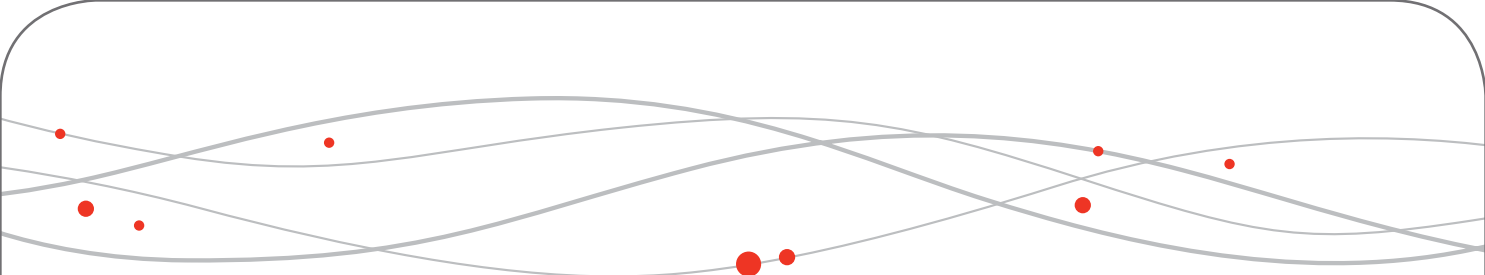
Recertification warranty

We warrant our service, labor and parts replacements against failure for a period of 90 days from the last date of Bios Recertification, provided your Bios product has been used under normal operating conditions and that the failure is directly related to labor performed or parts installed during the last Recertification.

Sending your product to Bios

Customer support and calibration quality are our top priorities, which is why we've established Recertification policies and procedures that protect you, Bios and your Bios product and help assure a smooth, reliable service process.

- Products sent to Bios must be authorized in advance via an RMA Number (Return Merchandise Authorization). Your RMA Number is also your service quotation. You may get your RMA Number through our website at www.biosint.com, by emailing service@drycal.com, or by calling (800) 663-4977 to speak with a Bios Customer Support Representative Monday through Friday, between 8:30 am and 5:00 pm Eastern Standard Time.
- Bios products received without an RMA Number may experience significant service delay and in some instances may be returned to sender.
- When requesting your RMA Number, please indicate the model, serial number and revision level of each Bios component (for example, a base unit and a flow cell). These may be found on the serial number label(s). Also indicate your full contact, billing and shipping information as well as the service you're requesting, including a detailed explanation of any application or other issues you've experienced.
- We require your advance written authorization and approval of your RMA Number's cost and contents before we proceed with the service outlined and quoted. This may be in the form of a purchase order (as approved by Bios), or by a credit card with an email authorization, a signed copy of our quotation, or a separate letter. Purchase orders are often difficult and timely to amend, so we recommend that your purchase order allows a predetermined, not to be exceeded dollar amount above our quoted service price.
- When shipping your product to Bios, please reference your RMA Number on the shipping label and within any paperwork. Please don't send accessories, unless requested by Bios. Bios isn't responsible for missing accessories, freight cost (except in certain warranty conditions), or for product damage in shipment.
- Once we've received your Bios product and your written authorization and/or approval, we'll evaluate your product. Your service cost might increase based upon our findings. If this occurs, we'll immediately revise your RMA Number and request your fresh written authorization and/or approval.
- We'll attempt to return-ship your Bios product as quickly as possible. Generally, Bios products spend 14 days in our facility, including Saturdays and Sundays. Your timely supply of requested items such as written authorization and approval, purchase order amendments and credit card, billing and shipping information is critical in helping Bios to provide as fast a turnaround as possible. We'll try our best to meet or exceed our time estimates, but we cannot guarantee return-shipment dates, and we're not responsible for expedited return-freight costs.
- For your convenience, Expedited service (48-hour turnaround) may be available for an additional fee of \$100 per Bios component (in this instance, one base unit and one flow cell are considered one component). When available, Expedited provides return-shipment of your Bios product on the third business day after it's arrived at Bios. For example, if we receive your product on Monday, we'll return-ship it on Wednesday; if we receive it on Friday, we'll return-ship it on Tuesday. Expedited is a courtesy service and cannot be guaranteed. If we can't meet our return-shipment date for internal reasons, we won't charge the Expedite fee, although you'll remain responsible for associated return shipping charges.



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