

Force and Torque Calibration Quarterly



A Message from the President

Welcome to our fourth Morehouse Instrument Company newsletter. I am heading down to Tampa this month in hopes the ASTM E28 committee will consider adding a recommendation to report how an instrument was calibrated to both the ASTM E74 and ASTM E2428 Standards. In our first three newsletters we discussed, bottom thread loading, six versus four wire cables and unbolting load cells. These all have a significant impact on the measurement results.

Morehouse feels it is necessary to report how any M&TE (Measuring and Test Equipment) is calibrated so the end user can best reproduce how the M&TE was calibrated. We follow ISO/IEC 17025, 5.4.1 which states "The laboratory shall use the appropriate methods and procedures for all tests and/or calibrations within its scope." - The calibration must be performed and agreed upon calibration method or procedure (Contract Review). In this

newsletter we will provide our 7 step load cell troubleshooting process, we will discuss pin sizes on tension links, meet our lab supervisor Barry Cook and announce our new training schedule. We have several new training workshops including: ISO/IEC 17025, SPC, FORCE FUNDAMENTALS and a new TORQUE FUNDAMENTALS course that will be taught by either Dilip Shah and/or Henry Zumbrun.

INSIDE THIS ISSUE:

| | |
|------------------|---|
| Load Cell Guide | 1 |
| Tension Links | 2 |
| Lab Supervisor | 3 |
| Upcoming Classes | 4 |
| Giveaways | 4 |

Morehouse 7 Step Load Cell Troubleshooting Guide

We were inefficient at troubleshooting load cells. In an effort to provide better customer service and shorten our calibration lead time (most calibrations are performed in 5-7 business days) we have developed a process to troubleshoot non-working load cells. This article is our way of trying to help others save countless hours trying to diagnose common problems. We call this the Morehouse 7 Step Process for Troubleshooting a Load Cell.

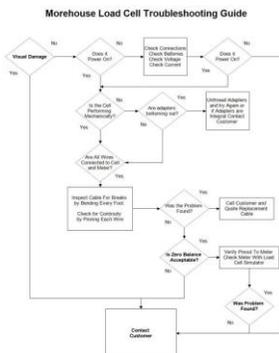
1. Visual inspection for noticeable damage
2. Power the system up

making sure all connections are made. Verify that batteries have enough voltage and are installed

3. If everything appears to be working, but the output does not make sense, check for mechanical issues. Some load cells have internal stops that may cause the output to plateau. Make sure any adapters threaded into the transducer are not bottoming out.
4. Check and make sure the leads (all wires) are properly connected to the load cell and meter. Inspect the cable for breaks - With everything

hooked up proceed to test the cable making a physical bend every foot

5. Check for continuity of the cable (pin each individual connection) – If the cable is common to the system, check another load cell and verify the other cell is working properly.
6. Use a load cell tester or another meter to check the zero resistance of the load cell – If you do not have a load cell tester you can check the bridge resistance with a common multi-meter
7. Check voltage and current on the power supply



(A flow diagram of our load cell troubleshooting guide. A more detailed explanation can be found on our blog <http://blog.mhforce.com/2015/11/01/archive.html>)

Tension Links Good Measurement Practice:

Using correctly sized pins is critical.

Do not use pins that are worn or bent.

If links are damaged, highly used, or worn, decrease the time between calibrations.

The same size and style of shackle and pin used during operation should be used for calibration.

Potential Measurement Error

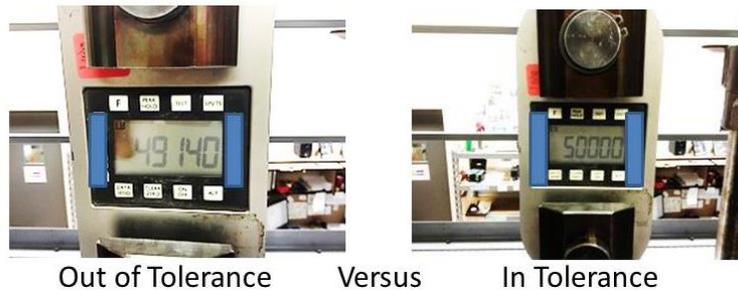
TENSION LINKS - ARE YOUR MEASUREMENTS ACCURATE?

You are out in the field with a tension link, load link, or some type of digital dynamometer to use for a weighing application. You need pins to engage into the unit. What can you use? Slings? Maybe one size pin with one diameter on one end and another pin with a different diameter on the other end. As long as the fixtures are safe to hold the load it shouldn't matter, should it?

Here at Morehouse, we have done testing with this issue in mind. Forged pins, for example, can differ by small amounts in diameter from pin to pin. Depending on the Scale manufacturer, we have seen differences up to 1.7 % between different sets of pins (Picture below demonstrates this). **If your instrument has an accuracy of 0.1 %, your error could be 17 times greater by substituting pins.**

Tension Links Improper Vs Proper Pin Diameter

Difference of **860 LBF or 1.72 % error** at 50,000 LBF from not using the proper size load pins.



Note: Tension links of this design seem to exhibit similar problems. If you are unsure, TEST!

Calibration should be performed with the same load pins the end user is using with the device. Some links exhibit very high errors when substituting different types of pins.

The following calibration forces were applied to the above identified instrument, "As Received". Adjustments were made and an "As Returned" calibration was performed. Note: The calibration was performed using nominal 2.15 inch diameter pins. This calibration is in conformance with the requirements of Morehouse QAM Rev. 12.1, dated 05/02/14, ISO/IEC 17025, ANSI/NCSL Z540.3.

Picture Above is an example of what Morehouse notes on the COC (certificate of Calibration)

It is important to position any forged loading pins through the shackles the same way that we had the pins positioned during our calibration. There can be variation in the surface of the pins from one pin to the next. *This variation may affect your ability to reproduce the calibration results.* We have a standard practice to label the pins. Standard practice is to label the TOP PIN, BOTTOM PIN and mark the direction of each pin with an up arrow at the 12:00 position. This helps the end user eliminate as much variation as possible, allowing for reproducible measurements.

Written by Barry Cook (Lead Force Calibration Technician)

Meet Our Staff – Barry Cook, Lab Supervisor

I remember my first day like it was yesterday. Twenty nine years ago, my first day consisted of sitting in the Chief Engineer's office. He explained to me what a proving ring is and what I would need to do in order to perform a calibration. He explained to me how to measure the deflection by "flicking" the reed and listening for the contact between the reed and the ball. I went home that night and told my wife, "I have no idea what he was talking about. I think I may have made a mistake taking this job". Now looking back, I made the right decision by sticking it out.

I have calibrated about any type of force measuring device you can think of. When I first started in the calibration field, load cell calibration was in its infancy. Proving rings were the norm as calibration standards. I cut my teeth on proving rings. Two to three proving rings were a daily norm in the Calibration Laboratory. Twenty Nine years later, proving rings are less dominant and most of the calibration work is comprised of strain gauge devices. We have calibrated some of the smallest instruments (button load cells the size of a dime), to some so large (1400 LB 2,000,000 LBF Capacity Shear Web Cells), you wonder how they are being used in the field.

The Morehouse Calibration Lab has evolved from one lab technician in a tiny sixteen by nineteen foot room, to four technicians in a large twenty five by twenty five foot lab. Our force lab consists of five

primary standard dead weight machines all with Calibrations and Measurement Capabilities (CMC) better than 0.002 % of applied or 20 parts per million (ppm). Our dead weight machines have capacities ranging from 120 LBF through 120,000 LBF. We have secondary standards accurate to better than 0.01 % of applied force up to 2,250,000 LBF (10 MN).

Many things have changed over 29 years. I still have hand written notes on setups and calibration instructions on instruments that I calibrated back in the 80's (not that I have used those a lot since then). Now, all our notes are electronic. I used to beg load cell and indicator manufacturer's to fax me directions. Today, I go to their website and download the PDFs of the calibration procedure. We have myriads of manuals, procedures, setups, pictures, and diagrams of the instruments that we have calibrated. I am proud to say we have an extremely large database that grows every single day.

What hasn't changed is Morehouse wanting the customer to be our priority. As I have evolved to my current position as Force Calibration Lab Manager, I now deal directly with the customer on a daily basis. By talking to customers more frequently, I now have a greater feel for what the customer needs, and a greater feel for the importance of replicating how they are using the device. We at Morehouse want to strive to calibrate the customers instrument the way it is being used. We may

have a particular procedure for calibrating certain types of instruments, but if the customer is using it in a different vein, the results may differ. I want to educate the customer about these differences and between the two of us; we can come up with a joint decision on the proper calibration procedure to replicate how the force measuring device is being used. Customer communication has greatly improved our calibration process. When we improve our measurements, the customer improves theirs.

I am proud of our Lab technicians. I get the most satisfaction from our techs when they solve difficult problems and improve our measurement process. In demonstrating the capability to solve complex issues, the technician substantiates my job of teaching them the proper calibration techniques and methods to ensure the correct calibration results. They will always have questions, and I am happy to help them solve complex problems.

When I want to decompress from calibration land, my wife Luann and I love to spend time in warmer climates. In the winter, I follow my beloved Hershey Bears through thick and thin.

What problems might you have? I am always up for the challenge to learn. I am not so full of myself to think that I know everything. I often find myself saying, "I am still learning" after a particular calibration. Make me say that again, after submitting your calibration concerns.



Barry Cook Circa 1988



Above: Photoshoot in 2004, highlighting our 120,000 LBF primary standard dead weight frame. Barry Cook is the technician in the picture. Below: 11 Years Later (Barry Cook, Justin Sharbaugh, Tony Ruppert, Jim Graham and Amber Pfeiffer)



NEW WEB PAGE ANNOUNCEMENT.



We have a new logo and have redesigned our website @ www.mhforce.com to make it more mobile friendly. Please click the above link and take a look.

Morehouse
Instrument Company
1742 Sixth Ave
York, PA 17403
Phone:
(717) 843-0081
E-Mail:
info@mhforce.com
We're on the Web!
Visit us at:
www.mhforce.com



Upcoming or Current Events

Implementing Metrology and SPC concepts with Microsoft Excel
December 7, 2015 / February 16, 2016 / June 13, 2016

Force Calibration Workshop December 8-9, 2015 / February 17-18, 2016 / June 14-15, 2016

ISO/IEC 17025 Training December 10-11, 2015 / June 16-17, 2016

All Classes are 8:30 AM – 4:30 PM with lunch and snacks provided.

[Click Here for details](#) (dates subject to change)

All three courses will be taught from December 7 – 11, 2015 at Morehouse Instrument Company.

Morehouse gave a webinar titled “Force Calibration: Common Errors Laboratories Make” This webinar can be viewed on the NASA techbriefs site @ <http://www.techbriefs.com/component/content/article/ntb/webcasts/on-demand-webinars/22991>

Thank You and Future Newsletters

If you've made it this far, I would like to express my gratitude for reading our fourth newsletter. We look forward to bringing you four more newsletters next year. We publish content on our blog frequently.

Do you have a topic you would like to see covered, or would you like to

submit a guest article for an upcoming newsletter? Please feel free to contact us with topic suggestions or article proposals. We are always looking to improve, so please feel free to contact us and provide any feedback.

Please email any correspondence to hzumbrun@mhforce.com

Web Page Links:

Load Cell Tester
<http://www.mhforce.com/morehouse-load-cell-tester>

Morehouse Blog
<http://blog.mhforce.com/search?updated-min=2015-01-01T00:00:00->



Sign up for our newsletter and closing comments.

LAST NEWSLETTER WE SAID WE WERE GOING TO GIVE AWAY SOME LOAD CELL TESTERS. THE THREE WINNERS OF THE LCT ARE GOING TO BE PICKED DURING OUR NEXT TRAINING CLASS IN DECEMBER. IF YOU ARE NOT SIGNED UP, [SIGN UP HERE](#) TO BE ENTERED IN OUR NEXT GIVEAWAY (SOMETIME NEXT YEAR)

20 % of the Morehouse staff is composed of veterans. Morehouse was founded by veterans. We currently have a Silver Star and Purple Heart recipient on staff. Thank you to our veterans whose willingness to sacrifice for our country has earned forever gratitude.