UniqueTek "Tips" File #2:

Rev. 19; 04/2026

"15 Tips for Electronic Powder Scale Accuracy"

By Lee Love

Weighing powder charges requires as much care as throwing the charge. All your careful powder measure technique is useless if you can't weigh it accurately. I finally saved up and bought an electronic powder scale thinking it would solve all my frustrations with using a balance beam scale. Well, actually, it did solve most of them. It certainly is faster, but it also brought a few new problems to the table ... umm, make that reloading bench.

Tip #1: Stability & Vibration

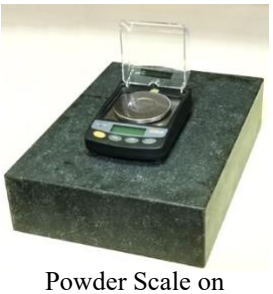
The scale must be on a rock steady table. A reloading bench that wiggles just isn't going to cut it. If your bench doesn't have adjustable feet, place shims under the legs. Remember to protect your scale by taking it off the bench before hammering any shims into place.

Even if the table doesn't wiggle, vibrations through the table can affect measurements. If possible, move the scale to a separate table that is isolated from the press vibrations. If that is not possible, make sure that you aren't doing anything else while weighing.

The press may not be the only source of vibrations. I've seen more than one or two reloading benches sharing a room with the clothes washer and dryer. The wife doing laundry while you are dialing in a powder weight is not a good idea. Just how you go about getting her cooperation on this is a whole other can of worms!

Analytical labs place their scales on heavy marble tables. The mass of the marble slab absorbs vibration. But these are too large and way too expensive for the average reloading room. I've also seen "Anti-Vibration" foam pads that you place under your scale to absorb vibrations. Before you buy one, just try an old mouse pad and see if it helps.

TIP: I took both concepts, combined them, and designed my own anti-vibration pad. I took a brick, set it on an old mouse pad and placed my scale on top. It works and cost practically nothing.



Powder Scale on 9"x12"x3" Granite Surface Plate

A customer sent me this link to WT Tool … an industrial supply outlet. They have granite "surface plates" at exceptionally low prices. The smallest one is 2"H x 9"W x 12"L and weighs 25.5lb. It is currently priced at just $35.00**. A 2" thick plate is difficult to find as Surface Plates are usually 3" thick. And this is a bit large for just a powder scale. But if you took it to a local granite countertop shop, you might be able to get them to cut it into two 2"H x 6"W x 9"L pieces. Keep one for yourself and sell the other to a reloading buddy to recover some of the expenses.

https://www.wttool.com/rdx-precision-black-granite-surface-plate

** Be prepared that the shipping may cost as much as the price of the granite due to the weight.

Tip #2: Leveling

I originally thought this would be the first and most critical Tip of this list. As it turns out, leveling is not as hyper critical as I would have thought with modern electronic powder scales. Most powder scales with 0.1gr accuracy don't even have adjustable leveling feet, just three or four fixed rubber or foam feet. So, if your bench is level enough that bullets aren't constantly rolling off the edge, it is probably okay. But if you needed to shim the feet of your bench to make the bench stop rocking in Tip #1, you may as well take the time to level it while you are there.

Bullseye Bubble Levels: If you do want to check that your scale is level, and it doesn't have a built-in bubble level, buy a small bullseye bubble level that you can place directly on the weighing pan. Make sure it is the right size to rest flat on the pan and that it doesn't weigh more than your scale's capacity. And don't forget to turn the scale off before leveling. You can easily find a lightweight, bullseye level on the web for under $10.

Benchtop Flatness: But leveling is only half of the problem. The flatness of your benchtop may be a much greater issue. If the scale is rocking, it will result in erratic measurements and even inability to hold zero with nothing on the weighing platform. Finding a location on your bench where the powder scale doesn't rock can be frustrating. And that location may not be the most convenient or desirable. So, a scale with leveling feet is desirable.

Leveling Feet: If your scale does have leveling feet, start with all the feet fully screwed into the scale. The further they are screwed out, the more they may tend to wobble. The image at right shows a typical leveling foot that is screwed out farther than needed. For corner-to-corner leveling, adjust both leveling feet an equal amount rather than making all the adjustment on just one leveling foot.

Typical Leveling Foot

TIP: Even with the leveling feet screwed out the minimum turns needed to level the scale; they can still be a bit wobbly. The best fix I've found for this is to simply put a few wraps of Teflon® tape on the threads of each leveling foot. The Teflon® tape takes up the tolerance in the fit of the threads.

No Leveling Feet? No Problem! In November 2025, UniqueTek launched sales of a Scale Leveling Platform. It is a smooth, flat, glass plate with four leveling feet and a built-in bullseye bubble level. Just place any powder scale that doesn't have leveling feet on it, adjust its leveling feet and it will not only level the scale but also prevent any wobbling due to a benchtop that isn't perfectly smooth and flat. As of the writing of this revision of this Tips file (11/25), it is the only product of its kind and available exclusively at UniqueTek.com.

Scale Leveling Platform

Tip #3: Batteries and AC Power

Battery Types: Never substitute rechargeable batteries (NiCd or NiMH), "Heavy-Duty" (carbon-zinc) batteries, or Lithium batteries if the recommended battery is Alkaline. This could actually damage the scale's electronics if not designed for it. Additionally, the low battery indicator circuit is calibrated for the specific battery type. It may not warn you when the battery is low, or give you a false low battery indication, if you use something other than the recommended battery. Check the instruction manual for the recommended battery type. If nothing is mentioned, you should use the same type of battery that it came with. If batteries were not included, it is generally safe to assume Alkaline batteries. Of course, you can always call the manufacturer and ask them what battery type(s) they recommend.

Low Battery: A low battery can make an electronic powder scale give erroneous readings long before it goes dead or gives a low battery warning. If you frequently run your scale on batteries instead of external power, I recommend installing fresh batteries frequently. Some scales only display a "Low" warning. Many newer scales have an icon, similar to the one at right, that continuously indicates the battery charge status. I make it a practice to replace the batteries when the indicator drops below half full. On scales that only display a "Low" warning, you'll need to determine the best frequency of battery changes by trial and error. So as not to be wasteful, the old batteries can be uses for some other less critical application.

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AC Power Adapters: If your scale can run on external power, by all means use it. It will allow you to leave the scale on for extended periods without worrying about the batteries going dead in the middle of a reloading session. Scales typically disconnect the batteries when plugged into external power. So, if you only use external power, the batteries can be removed. In fact, removing the batteries is recommended as a safeguard against scale damage due to battery leakage.

Power Strips: Power Strips are often poorly made and can, themselves, put noise on the power line. So, you should avoid plugging your scale into a power strip versus plugging it directly into a wall outlet. Obviously, this isn't always possible. Strangely enough, power strips with more "features" are more likely to be "noisy". A power strip with a Surge Suppressor, USB Charging Ports, Pilot Light and even just an On/Off switch, are more likely to be "noisy" compared to a "dumb" power strip that has none of these features. It is a case of "less is more"! Also keep in mind that anything you plug into the power strip may feed noise backward into the power strip. In particular, fans (or anything else with a motor) are notorious for introducing EMI (Electromagnetic Interference) into electrical circuits.

A "Dumb" Power Strip

Eliminating Power Line "Noise": You should be aware that inexpensive "wall wart" power adapters are not "regulated" and can pass line voltage fluctuations or power line "noise" on to your scale, resulting in instability. If your scale is acting unstable and you are using a power adapter, try running off batteries (use fresh batteries please) and see if it improves.
You can also try clamping a "ferrite bead" around the DC output line from the AC Power Adapter. Ferrite beads attenuate high-frequency electromagnetic interference (EMI). If there is room, wrap the wire multiple passes before clamping it shut. Some AC Power Adapters already have a ferrite bead installed on the output line (like the one in the photo at the bottom of the previous page).

Ferrite Bead

USB Power: Now days, many scales are designed to run on USB power (5.0VDC). And since most households have a whole drawerful of old USB power adapters, these scales are typically shipped with only a USB charging cable. Most scales will specify how much current (mA) they require. The USB power adapter must be rated for at least that much. If the power requirement isn't stated on the scale or in the manual, contact the manufacturer.

TIP: An AC Power Adapter that has to run full time at near 100% of its rated output current is never a good idea as they are likely to run too hot. I always plan on a significant safety margin. For instance, if the scale needs 200 mA, I'll look for a power adapter rated for about double that output. And higher output isn't a problem as the scale (or any USB device) will only draw as much current as it needs. So, it is also safe to use USB power adapters that support "fast charge" technologies (e.g., PD, QC, AFC, SFC, SuperVOOC, etc.) … as well as the new high power output GaN (Gallium Nitride) AC Power Adapters.

Tip #4: Warm-up time

Warm-up time can affect the scale's stability. Some scales can take as long as 30 minutes to warm up to a stable internal temperature, especially if the room is unusually cold. With an AC powered scale, you can just leave it on while you are making other preparations.

Auto-Off Timer: If your scale has an Auto-Off timer, you should disable it or set it for the maximum time possible. Scales powered only by batteries may not allow long warm-up periods to preserve the batteries. In that case, allow at least 60 seconds warm up time, keep the room temperature as stable as possible before starting a reloading session and use the Zero/Tare button before every weight measurement.

When using the AC Power Adapter, set the "Auto Off" feature so the scale will stay on indefinitely until you manually turn off the power. On some scales, plugging in the AC Power Adapter automatically deactivates the "Auto Off" feature. Check the User Manual for your scale to see if it has this feature.

TIP: I had a PACT BBK scale that had a fixed auto-off time delay of 5min 30sec. Yet the user manual said to let the scale warm up 10 to 15 minutes before calibrating. So, I set a timer on my cell phone to alarm after 5min. When the alarm went off I'd place a bullet on and immediately off the scale to reset the auto-off timer. But I've seen some scales with a fixed time delay as short as 60 seconds … which I consider unacceptable for reloading.

Tip #5: Calibration

This section ended up being much longer than I expected. But that is because calibration is so critical to the accurate functioning of your scale, and there is a lot to cover.

Those check weights that come with most scales aren't just for looks. Use them! I check my scale calibration every time I set up for a reloading session. It is a good way to tell if your scale has warmed up and is ready to use. You should also check calibration if the scale has been moved (like to your shooting buddy's house), is being operating at a significantly different temperature than when it was last calibrated, and after you install fresh batteries.

New Scales: If you just bought a new scale, checking the calibration is the first thing you should do before using the scale. Perform the calibration procedure as described in the owner's manual only if the calibration is off. But before deciding to perform calibration, make absolutely certain the scale has had a chance to warm up and the readings are stable. You may find that, after sufficient warm up time, calibration may not be needed.

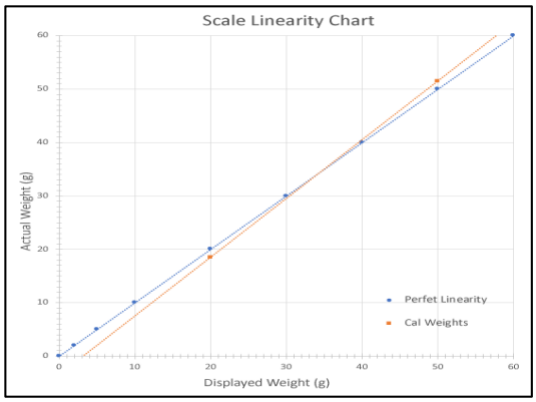
TIP: If the scale is new or just moved from another location, I like to allow it to equilibrate to the room environment for 24 hours before using it.

Always use the calibration weight(s) that came with your scale. Depending on the resolution of the scale, the "class" of calibration weight(s) that come with it will vary. Lower resolution scales (e.g., 0.1 gr) may only come with ASTM Class 6 (between OIML class M1 and M2) calibration weights. A 50 g Class 6 calibration weight can vary by as much as ±7 mg (±0.007 g / ±0.108 gr) and a 100 g calibration weight can vary by as much as ±10 mg (±0.010 g / ±0.154 gr). That doesn't sound like much but if you use these weights to calibrate a scale with higher resolution (e.g., 0.02 gr or 0.01 gr) it can make a significant difference.

Scales with higher resolution require calibration weights with tighter specifications. For instance, the MyWeigh® Gempro 250, which has a resolution of 0.02 gr (0.001 g), comes with a Class F2 20 g calibration weight. For a 20 g F2 calibration weight, the allowable tolerance is only 0.8 mg (0.0008 g / 0.0123 gr) compared to a Class 6 tolerance of 3.0 mg (0.003 g / 0.046 gr). By using a 20 g weight from a lower resolution scale (e.g., a 0.1 gr scale), the calibration could be off.

For a scale that requires two calibration weights for calibration, the worst-case scenario is if one calibration weight is off in the opposite direction compared to the other (e.g., the lower weight is heavy and the higher weight is light). This skews the "linearity" of the scale calibration.

Linearity: The chart at right shows how the linearity of the scale can be off if calibration weights of a lower class are used. In this example, the 20 g weight was too light, and the 50 g weight was too heavy. The result is that the linearity is skewed such that only place that the scale is perfectly accurate is where the two lines cross (at 35.0 g).



Notes:
1) Calibration Weight errors greatly exaggerated to better see the effect on Linearity.
2) The small size of this chart makes it difficult to see. So, I placed a full-page version at the end of this document (see page 15).

Many scales come with just one calibration weight. The logic is that once Linearity is set during manufacture, it should be good for the life of the scale. And that is probably acceptable for 0.1 gr scales, but higher resolution scales (0.02 gr and 0.01 gr) often come with two calibration weights so that Linearity can be recalibrated if needed. The MyWeigh® Gempro 250 came with just a 20 g F2 calibration weight to do "Basic" calibration. But it was possible to lose Linearity. So, I purchased the 50 g F2 calibration weight that was required to calibrate Linearity. And I have needed to use it … mostly on the occasions when the scale's load cell needed to be cleaned.

TIP: When calibrating a scale, it is considered "best practice" to use a single calibration weight of the required weight value rather than using two or three calibration weights that add up to the required weight value. This can result in calibration errors due to "tolerance stacking", as some weights may be on the plus side of their indicated weight and others on the minus side of their indicated weight. It follows that when performing Linearity calibration, it is best to use individual calibration weights for both the low weight and the high weight.

Calibration Weight Class: Scale calibration should be done using weights with a class tolerance factor greater than the readability of the balance. For example, a balance with readability of 0.001 g should be calibrated with a weight having a known tolerance of at least 0.0009 g.[2] So why not just buy a calibration weight set made to tighter tolerances? In short, cost! I was given a set of calibration weights made by Ohaus. They are Class 6 brass weights ranging from 20 mg to 50 g, and the entire set sold for only about $40.00 (at that time). The cost of calibration weight sets with tighter tolerance increases significantly … especially if you want a set that comes with a certificate documenting the exact value of each calibration weight! But you don't really need a full set of weights and can save a lot of money by purchasing just the individual calibration weights you need.

Here are some examples of prices for weight sets similar to the Ohaus set I was given:

- Class 6 brass = $40.00 / $139.00 with Certificate
- Class 4 stainless steel = $320.00 / $815.00 with Certificate
- Class 1 stainless steel = $600.00 / $1225.00 with Certificate

Ohaus
Class F1 20 g
Stainless Steel
$145.00 to $175.00

In the United States, three classifications are used.

- ASTM E 617-23, Classes 000 through 7
- OIML R111, Classes: E1, E2, F1, F2, M1, M2, M3.[1]
- NIST HB 105-1, Class F; (Only used for commercial/industrial weights & measures testing)

If you want to read a complete table comparing these weight classes, see Calibration_Weight_Tolerances.pdf.

NOTE: The weight Class is never marked on the individual calibration weights (a fact that I find particularly discomforting). So, it is critical to keep track of them! Keep them in their original container and make sure the container is labeled appropriately.

Calibration Weight Storage: Store your scale's calibration weights where they will be safe and protected. Scales that come with a storage box often have cutouts in the foam lining, just for the calibration weight(s) that come with the scale. When you buy individual calibration weights of higher-Class rating, they come in a protective container similar to the one shown at right. This protects the weight from accidental bumps as well as from contamination. Always return calibration weights to storage when not being used!

Calibration Weight Protective Container

2-Piece Calibration Weights: Some inexpensive (aka lower Class) calibration weights are 2-piece assemblies. They are hollow and have either a plug in the bottom or a handle (see photo at right) that is screwed on top. These are purposely manufactured a bit heavy and then metal is shaved off the handle or inside the bottom to calibrate it to the correct mass. If the plug falls out or the handle comes unscrewed, your calibration weight will be compromised. I recommend avoiding 2-piece weights!

A 2-piece Cal Weight

NOTE: The Ohaus Class F1 20 g calibration weight shown on page 5, is an example of a 1-piece weight.

Buying Calibration Weights: Fortunately, you can buy individual calibration weights on the Internet. I recommend that you first contact your scale manufacturer and determine the correct weight and tolerance classification of calibration weight(s) for your scale. You may also be able to buy replacement calibration weights directly from the scale manufacturer. Of course, it is OK to use a higher-class calibration weight than specified, but it is never OK to use a lower-class calibration weight. A few of the best-known manufacturers of quality calibration weights are Mettler Toledo, Ohaus, Rice Lake, Sartorius® and Troemner. Beware of cheap weight sets from companies like ACCT, Bekith, DZ, Fuzion, HFS, Manchap, QP, Romedam , Seunmuk, UCEC, Zydiwo and many, many others advertising on Amazon, eBay, Temu, etc. Regardless of the source, if the weight Class is not clearly stated, don't buy it!!!

Handling Calibration Weights: Never touch calibration weights with your bare fingers. This will contaminate the weight with finger oils and acids that will cause corrosion ... especially with brass weights. You should either use tweezers or wear gloves (e.g., nitrile). The tweezers must be plastic or have plastic tips to prevent scratching the calibration weights.

Cal Weight Tweezers with Plastic Tips

NOTE: Do not use Polyethylene or Vinyl gloves as these plastics tend to hold a static charge. They also tend to be very slippery!

Cleaning Calibration Weights: If a calibration weight ever does become contaminated (e.g., skin oil) , it is recommended to gently clean it with isopropyl alcohol and a very soft lint-free cloth (I recommend a microfiber lens cleaning cloth). Let it dry for at least 1 hour (for Class F2 to M4) to ensure that the alcohol has completely evaporated ... including the molecules of alcohol that are adsorbed on the metal surface.[1] Longer in a cold room.

Tip #6: Air Currents

Some electronic scales come with a cover. On some of these, the cover isn't just to keep dust off when not in use. Some covers are designed to be used during measurements and provide a valuable function by blocking air currents that can affect accuracy (the owner's manual will tell you if your cover is intended to be closed during measurements). You can sometimes identify covers that are designed to be closed during measurement as they may have a hole in the top. The hole allows you to add powder with the cover already down. As you can imagine, closing or opening the cover after placing a pan of powder on the scale will likely upset the measurement.

Draft Ring: A few scales come with a "draft ring", which is usually a glass ring that fits around the weighing pan to protect it from air currents. Make certain it is in place for all measurements. Other scales may have complete acrylic boxes with sliding doors to provide a draft-free environment. But these can be difficult to use with a trickler.

DIY Draft Shield: Even if your scale has a draft ring or a cover designed for use during measurements, make sure it is located away from air currents in the room. Or, better yet, make a draft shield on three sides. I made one out of matboard (the stuff on which artists mount photographs). It is rigid, easy to cut with a utility or X-ACTO® knife, finished on both sides and available in lots of interesting colors. Matboard is cheap and easily found at art & craft stores or office supply stores. Make it tall enough to extend at least 3 inches above the weighing pan.

NOTE: Do not use "Foam Core" as the polystyrene foam will hold a static charge.

Adding a draft shield may not be enough. I had an air conditioning wall register that blew in the direction of the reloading bench and the draft shield I made just didn't help enough … so I redirected the airflow.

Adjustable Blade Register: You can find a register that itself has individually adjustable blades. Or you may find that your existing register already has adjustable blades. To replace it is not cheap, so I decided to first try a deflector as it was less expensive.

Deflector: I found a clear plastic deflector at the local hardware store that magnetically attached to the face of the wall register and deflected the airflow away from the reloading bench. Simple, elegant, easy to install, inexpensive ... and it worked!

Tip #7: Static Electricity & Magnetic Fields

Static electricity near an electronic scale can affect measurement accuracy just as much as a stray air current. Keep any plastic materials away from the scale, including plastic loading blocks, die storage boxes, ammunition storage boxes, AkroBins and anything made of expanded polystyrene foam (EPS) or Vinyl. Keeping a clear space around the scale is generally a good practice anyway.

ESD

Don't forget the static on your body! Even though the days of the polyester leisure suit are (thankfully) long gone, you may have carpet in your reloading room. I'm sure we've all scuffed our shoes across a carpet and then zapped some poor unsuspecting soul with a big arc of static electricity. A static spark to an electronic powder scale is not only bad for accuracy, it can destroy the scale's circuits! Even if you don't build enough charge to cause a spark, it can be enough charge to affect your powder scale's accuracy. Fortunately, a little anti-static laundry spray (e.g., Static Guard®) applied to carpet periodically is very effective.

I talked on the phone with a customer, multiple times over several days, trying to help him diagnose the problem with his powder scale's instability. The scale was in a half-bath that was accessible from his reloading room. It had a Formica® countertop and tile floor, so static charge was the last thing he thought of being the problem. But the reloading room floor was carpeted. Even with him standing bare foot on the tile, he was still carrying a static charge that he'd built up on his body from the carpet. And the tile, being an electrical insulator, was not allowing the static on his body to bleed to ground. The clue was that the scale would be perfectly stable when he stood back three feet away from the scale. But when he reached out toward the scale, it would begin drifting when his hand got within an inch or two. I then had him reach over and touch the metal faucet (to bleed off any static on his body) before touching the scale … and the drift problem disappeared. The scale instability was simply due to static on his body. He never told me how many scales he had returned to the manufacturer before calling me.

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Static Grounding: Touching a grounded metal object (e.g., the screw on the wall plate of a light switch or electrical outlet, a metal water pipe or metal faucet) will remove any charge from your body.

TIP: If you replace the plastic cover plate with a metal one, you don't have to aim for the tiny screw … just touch anywhere on the metal plate. The photo at right shows a stainless-steel wall plate for an old-style toggle switch, but they are also made for "Decora" style switches as well as for outlets. Look for a "Gray Metal" or Stainless-Steel plate as they will not have any coating (e.g., clear lacquer) that will act as an electrical insulator.

TIP: My current reloading bench location doesn't have a light switch or electrical outlet close enough to conveniently touch without taking a few steps away from the bench. So, I found 0.0625" T x 0.5" W x 6' L Aluminum Flat Bar at Ace Hardware (SKU: 5194261 / $8.59), cut it to the exact width of my bench, and screwed it to the front edge of the benchtop. I then connected a wire from it to the ground screw of an electrical outlet located behind the bench. So, no matter where I'm standing at the bench, I have an easy-to-reach earth ground!

Note: I tried using an aluminum yard stick, but they are usually anodized or have a clear protective coating that is non-conductive.

EMI/RFI: Scales can also be strongly affected by magnetic fields and electrical interference generated by electronic devices. Don't use a scale in close proximity to electronic devices such as a computer, monitor, radio, cell phone or fluorescent lights.

A fluorescent light in the ceiling, due to distance from the scale and being on a completely separate electrical circuit, is much less likely to cause interference than a bench-mounted light fixture that is only 24 inches or so from the scale and sharing the same electrical circuit. It should also be noted that switching to an LED tube may not cure the problem as they have an AC to DC power supply that can also emit EMI.
Regardless, if you are experiencing a problem, test it with all nearby electronics and lights turned off.

Tip #8: Checking Zero

Use that "TARE" (or "ZERO") button ... frequently! I always Tare the scale immediately before every measurement. Here is why…

Clearing the "Counts" Register: One of the hidden functions of pressing "TARE" is that it clears the "counts" register. Digital scales are continuously reweighing … even with nothing on the pan. The strain gauge output may be 200 "counts" per 0.001 g (0.015 gr). And the software continuously adds and subtracts the counts to decide if it needs to increment the displayed weight up or down. Pressing "TARE" clears all the extraneous counts and resets the register back to zero. So, you get a clean start.

Some may feel this is overkill, but I feel it is worth the few extra seconds it takes to ensure the best measurement accuracy I can obtain from my scale for each and every measurement taken.

While we are discussing the "TARE" button, let's look at just how handy this feature can be. The most basic use is to "Tare" the weight of your empty powder pan, so the scale reads 0.0 gr with the pan in place. Thereafter, the scale will display the weight of just the powder charge. This same technique can also be used for sorting bullets, cartridge cases or even loaded cartridges.

Example 1: Let's say you want to sort a new batch of bullets by weight relative to a favorite bullet weight you know from previous test is ideal for your cartridge. If you are smart, you kept a sample bullet from that earlier

batch that is the ideal weight. Keep it wrapped in a piece of soft cloth and in a small bottle with a label on the outside noting the manufacture, type and weight and anything else you want to record.

1. Press TARE to zero the scale.
2. Place the example bullet on the scale and check that it weighs what you expect.
3. With the example bullet still on the scale, press TARE to zero the scale and then remove the example bullet.
4. Start weighing bullets from the new batch. Bullets that are an exact match will weigh 0.0 gr. Sort the bullets into weight groups depending on how close you need them to be to the example bullet weight.

Example 2: If you have a sneaking suspicion that you may have double-charged or not charged a cartridge, just tare the weight of a known good cartridge and then start weighing the suspect cartridges. All the good cartridges should weight 0.0 gr (or very close to it). So, all you need to do is look for one that weighs too much or too little by the weight of the powder charge. This greatly speeds up the inspection process!

Tip #9: Center the Load

Place the load (powder pan, bullet, calibration weight, etc.) at the center of the weighing platform. An off-center load may cause binding of the load cell resulting in error. Some powder scales have a cup shaped platform (e.g., Pact BBK and BBK II) that automatically centers the powder pan. But if you are weighing a bullet, loaded cartridge or some other odd-shaped object, try to center it as best as possible.

TIP: To keep round objects (e.g., a ball bearing) from rolling around, first place a simple gun cleaning patch on the scale, press "Tare" to zero the weight, then place the object on the patch.

Keep your scale clean. Dust and stray powder grains getting into the load cell can bind the mechanism. If your scale comes with a cover, keep it closed when you are not using the scale. If your scale came with a storage box, you should place it back in the box if it will not be used for an extended period of time.

Canned Air: I keep an "air duster" can at my reloading bench. It is handy for blowing stray powder grains off the powder scale … as well as off the press. And it doesn't blow with enough force to damage anything. Of course, they don't actually contain air … but propane, butane, difluoroethane or other CFCs.

Vacuum Cleaner: You may also want to consider one of those miniature battery-operated keyboard vacuum cleaners. Since a keyboard vacuum sucks up the powder grains, it has the added advantage of reducing the risk of blowing powder grains into the powder scale interior. And it won't generate enough vacuum force to damage anything. Look for one that has lots of small interchangeable tips and brushes that can reach into small spaces. You can even find some that are reversable … so it can blow as easily as vacuum.

TIP: I added an 18" length of clear PVC tubing that was the right diameter to hold the tips. That way, I don't have to hold the weight of the whole vacuum. I also feel that it gives me more control and makes it less likely that I'll apply too much force to any parts of the scale. It also helps me position the tips into hard-to-reach locations.

The weighing platform can be removed on some scales, allowing you to more easily clean underneath. A soft artist's paintbrush or a gentle puff of air is about all that should be needed to clean it. Just be certain to brush or blow in a direction that flushes particles off the scale and not down the hole under the weighting platform! You can turn your scale upside-down while cleaning, but do not shake it to dislodge dust and powder grains. Shaking could permanently damage the load cell!

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If powder grains (or other particles) do get into the interior of the scale, they can cause all sorts of instability problems including drifting off zero, drifting after displaying final weight, displaying wildly inaccurate weight, displaying a different weight each time, and inability to calibrate the scale. If you experience these symptoms with your scale, and you've already replaced the batteries, contamination in the load cell is the next most likely cause. Think of the strain gauge as a tuning fork. If dust or powder grains are clinging to it, it will change the pitch.

TIP: I always clean my scale over a sheet of white paper so I can see what, if anything, falls out.

Check with the scale manufacturer before attempting to open the scale up to clean out dust or powder grains that may have gotten inside. Messing around inside can cause permanent damage if you don't know what you are doing and may void the manufacturer's warranty. Indeed, scales from some manufacturers are snapped together or even glued to make them impossible to open.

Internals of Gempro 250 Scale

Calibrate After Cleaning: After cleaning, re-calibration will be needed. You may need to calibrate it several times to get it back to normal … especially if it was heavily contaminated or you tried calibrating it while it was contaminated. If your scale has both "Basic" (1 weight) and "Linearity" (2 weights) calibration, you should perform Linearity calibration.

Clean Your Powder Pan: Don't forget to clean your powder pan. Over time, a film of powder residue can build up on the powder pan. This can cause powder grains to stick to the pan, and not be transferred to the cartridge case. This is often misinterpreted as static cling and most frequently treated by rubbing the pan with an anti-static clothes drier sheet. But repeated use of drier sheets may also leave residue buildup. Residue buildup happens with both metal and plastic powder pans. The cure is simple. Just wash the powder pan with a drop of liquid dish soap, rinse thoroughly and let dry. Do not use abrasive soaps or scouring pads. The resulting scratches can cause powder grains to cling.

Tip #11: Powder Pans

The powder pan you use can make a difference too. If every grain of powder doesn't make it into the cartridge, then all your efforts to this point are in vain.

Metal Powder Pans: My favorite powder pans are the metal pans that commonly come with balance beam type scales (e.g., Dillon Eliminator, Redding No.2 and RS-1; RCBS® Models 502, 505 and 1010; LEE Safety Scale™; Lyman® Pro 500 and Pro 1000; etc.).


RCBS® Powder Pan
MSRP = $23.99

Metal powder pans have a few advantages over plastic pans.

1. They are electrically conductive so, don't generally hold a static charge.
2. They tend to need cleaning less frequently.
3. Powder grains tend to slide off quite easily.
4. They are usually a shiny gold or bare aluminum color, so you can easily see that all powder grains have been transferred to the cartridge case.

The gold or silver color also makes inspecting powder grain structure easy. Plastic pans are usually black and inspecting dull gray particles against a black background is difficult.

As of this revision (Rev 19), UniqueTek is working on a new powder pan that is polished stainless steel with a chrome plating that has a much lower coefficient of friction than either bare aluminum or anodized aluminum pans. UniqueTek is also experimenting with a super slippery coating on top of this. The idea is that it will allow powders to slide off more easily …ensuring quantitative (100%) powder transfer.
Item #: TBD = $TBD


UniqueTek Powder Pan

Static on Powder Pans: Although electrically conductive, even a metal powder pan can still hold a static charge … if there is no pathway to an earth ground for the static to drain. If there is static on your body, the powder pan will become similarly charged when you pick it up. So, keeping your body grounded (See Tip #7) is important.

Plastic Powder Pans: Most electronic powder scales come with plastic powder pans (Lyman® is one exception). And those plastic pans usually leave much to be desired. Fortunately, there are alternatives.

TIP: If you have an old balance beam scale packed away, just use the metal pan that came with it.

The best plastic powder pans I've found are:

- Lyman® Powder Pal™ ($8.95 MSRP)
- RCBS® Scale Pan/Funnel ($8.99 MSRP)


Lyman®
Powder Pal™

Both are made of anti-static plastic and have a unique feature of combining a scale pan with a powder funnel. In a previous revision of this Tips file, I gave the RCBS® pan a slight advantage because it also had a conventional pour spout. But Lyman has since changed their design to include a pour spout … making it essentially identical to the RCBS® pan.

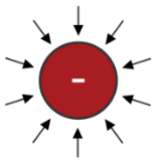
One caveat is that these are not recommended for use on a balance beam scale. Not sure just why that is, but there are two likely reasons:

1. The scale "zero" adjustment may not have enough range to adjust for the difference in weight between the plastic pans and the original metal pan.
   NOTE: You may be able to accommodate this by putting a shim under the adjustable foot that is used to zero the scale.
2. The plastic powder pan is also unlikely to fit the pan hanger.

If you can't find an alternative powder pan that fits your powder scale, try washing the original plastic powder pan thoroughly and then spraying it with Static Guard® (mentioned in TIP #7 on page 7). PACT recommends washing the powder pan for the BBK and BBK II scales* occasionally with soapy water and allowing the soap film to dry on the pan. The soap film helps dissipate static electricity.
* The BBK and BBK II scales are no longer manufactured but there are many of them still in use.

Powder Pan vs Scale Cover: If your scale has a cover that is designed to be closed during weighing, make sure that any pan you choose fits under the cover with plenty of clearance! The Lyman® Powder Pal and RCBS® Scale Pan/Funnel have a much taller profile and may not fit. That said, you can operate your scale with the cover open assuming you don't have issues with air currents in your reloading room. Likewise, if you have an electronic scale that has an integrated, or connects to, an auto-trickling mechanism, you must make certain that any replacement pan doesn't interfere with the tricker operation.

Static on Powder Grains: Gunpowder grains are typically neutral in their natural state. But during pouring and dispensing, they can develop a static charge (usually negative). This charge can cause them to cling to powder pans, powder hoppers and other surfaces … especially in low humidity environments. In particular, small flake powders are most susceptible due to their higher charge-to-surface area ratio compared to ball or extruded powders. The bad news is that this charge is very



persistent and slow to bleed off. But these "clingy" powder grains are usually easily dislodged with a gentle tap on the powder pan or hopper.

Tip #12: Working with Auto Tricklers

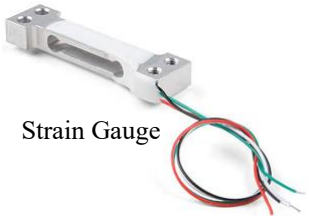

Lyman® Gen 6™

Several automatic powder trickler scales are currently on the market. (e.g., Lyman® Gen 6™ Compact Touch Screen Powder System, RCBS ChargeMaster Link Electronic Powder Measure, Hornady® Lock-N-Load™ Auto Charge™ Pro). As good as they are, you may not want to trust Auto Tricklers 100%. Crosschecking is easy if you still have the scale you used before buying the auto trickling scale. Of course, if your auto trickler is performing well, you won't need to do this every charge. Regardless, it is a good habit to crosscheck periodically during a loading session to make sure nothing has drifted and, in particular, when trickling gun powders you haven't used before.

It is generally recommended to use the pan that came with the auto trickler. Fortunately, all three auto trickler models mentioned above come with metal pans that are designed to work with the trickler. If you try an alternative powder pan, you must do tests to assure that it works correctly.

TIP: If you buy a spare powder pan for your auto-trickler, you can start trickling the next charge while pouring the first charge into a case. This can save a lot of time. They should be easy to get directly from the auto-trickler manufacturer.

Tip #13: How NOT to Break the Strain Gauge in your Powder Scale


Strain Gauge

At the heart of every electronic scale is a Strain Gauge or Load Cell. Lower priced scales usually use a strain gauge similar to the one in the photo at right. One end is attached to the frame of the scale and the other to the weighing platform. Strain gauges can be easily damaged if handled roughly.

Here are a few basic rules to follow.

- Never leave a load on a scale for an extended period of time as this can damage the strain gauge. The length of time to trickle a powder charge is no problem. But leaving weight on overnight is. The heavier the weight, the more likely it is to damage the strain gauge. And the worst-case scenario is a weight near the maximum capacity of the scale.

- Never place more weight on a scale than its uppermost limit. Overloading the scale can damage the strain gauge. Don't forget that the scale's weight limit includes any "tare" weight. For instance, if your scale has a 500gr maximum capacity and you "tare" the scale (zero) with a powder pan that weighs 100gr, the remaining capacity is now only 400gr. Even though the scale reads zero, if you then place a 500gr weight on the scale, you will overload the scale.

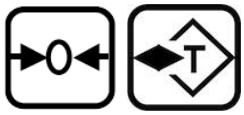
- Never drop anything on the weighing pan. Always place the load or calibration weight gently onto the scale. Dropping weight on the scale can damage the strain gauge, even if the weight is well below the scale's uppermost limit.

Overload Indicator: Most scales have an Overload indicator of some type. It may be text (like the example at right) or it may be an icon. On a few scales, the backlight may turn red. Check the User Manual to see what it looks like. If the Overload indicator ever appears on the display, immediately remove the weight from the scale! And, yes, you can overload your scale even when it is turned off! If you ever do accidentally overload your scale, it is a good idea to check the calibration before continuing. You may get lucky and the scale's overload protection worked. If there is damage, and the damage is slight, you may be able to save the scale by recalibrating. You may need to calibrate it several times to get it back to normal.

O-Ld

NOTE: Although many scales do have built-in overload protection, it is not good practice to depend on it to protect your scale.

Tip #14: The Difference Between Zero and Tare



I added this section in response to the many inquiries I've received about the difference between Zero and Tare. Some scales have both "ZERO" and "TARE" buttons. But many scales combine these functions into one "TARE" button. Although they would seem to be identical functions, there is a discrete difference.

NOTE: Scales from different manufacturers may have Zero and Tare buttons that look different that the button icons above. In fact, on most scales the buttons will simply have "ZERO" and/or "TARE" in text on the buttons. These icons are from the buttons on a MyWeigh® CTS 30000 Precision Counting Scale.

NOTE: The examples below are based on the characteristics of a MyWeigh® Gempro-300 (see photo at right). But this is not an endorsement. In fact, the Gempro-300 is no longer being manufactured. But it is a good example of a scale that had both "TARE" and "ZERO" buttons.

MyWeigh® Gempro-300

ZERO: If your scale has a separate "ZERO" button, it does just one thing. If the display doesn't read 0.000 after removing all objects from the weighing platform, pressing the "ZERO" button will force the display to read 0.000. If you have separate "TARE" and "ZERO" buttons, pressing the "ZERO" button with weight on the weighing platform will do nothing. Of course, someone will point out that the scale isn't smart enough to know that there really isn't anything on the weighing platform and thus allow the "ZERO" button to work regardless. The answer is that it's all in the programming. The Zero function of the scale is programmed with a weight limit. On a Gempro-300, that limit is 6g (92.59 gr). Anything over that and the "ZERO" button is disabled. Strangely enough, it is only limited in the + direction. So, if I Tare a 50g weight and then remove it, the display will show –50 g. I can then use either the "TARE" or "ZERO" button to restore the display to 0.00. At least the "Zero" button behaves that way on a Gempro-300. Scales from other manufacturers may be programmed differently. But if you think about it, it does make sense as it is impossible to overload a scale in the negative direction.

TARE: A "TARE" button sets the display to 0.00 with an object on the weighing platform. This is a very handy function. When weighing gunpowder, you Tare the weight of the empty powder pan. The display then shows only the weight of powder you add to the powder pan. Essentially it is doing the math or you.

But there is a limitation to the Tare function. Tare doesn't change the scales total capacity. For example, if your scales maximum capacity is 1000 gr and your powder pan weighs 100 gr, and you Tare the weight of the empty powder pan, you'll only be able to weigh a powder charge up to 900 gr. Some older scales limited how much you could Tare. I believe this was done to reduce the possibility of overloading the scale. Most modern scales have overload protection and may allow you to Tare up to the total capacity of the scale. Of course, if you did that, the scale would not be able to weight anything additional.

But wait! If there was a 6 g offset and you used the "ZERO" button to bring the display back to 0.00, doesn't that also deduct 6 g from the scale's total capacity? The short answer is No. That is because the Gempro-300 is designed with an extra 6 g of hidden capacity to allow the Zero function to work without deducting from the scale's rated capacity. Tricky, eh? Other electronic scale manufacturers may include a similar capability.

NOTE: Scales from different manufacturers, and different scales from the same manufacturer, will have different limits and offset values from those mentioned above.

Tip #15: Read your Owner's Manual

Last, but by no means least, read the owner's manual! The owner's manual for your scale is full of useful information specific to your scale. It may not be as exciting as a Tom Clancy techno-thriller, but it is worth reading.

A Final Word

These tips will get you a head start on accurate powder weighing and, hopefully, save you a few of the lessons I learned the hard way.

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In This Revision – Rev 19

– Added a space between the numerical weight value and the unit of measure to be consistent with NIST style conventions. See "NIST Guide to the SI, Chapter 7: Rules and Style Conventions for Expressing Values of Quantities".
– Edited and updated sub-section regarding Low Battery warnings.
– Added a sub-section regarding the use of power strips.
– Added a sub-section regarding EMI from fluorescent and LED lights.
– Added a sub-section about static on powder pans.
– Added notes regarding static on powder pans and static on Vinyl and Poly gloves.
– Added a sub-section about static on powder grains.

In Rev 18

– A few technical corrections.
– Edits to text to clarify certain descriptions and make it flow better.
– Added a few more Icons.
– Updated the referenced ASTM calibration weight standard to the latest release (published November 2023).
– More details on and a photo of a 2-piece calibration weight.
– Swapped the positions of Tip 14 and Tip 15.
– Added more Subsection titles (the headings shown in blue text).

Additional Subsections include:

- A new Scale Leveling Platform.
- Linearity and how calibration weights of lower "Class" can affect "Linearity".
- How using multiple calibration weights rather than a single weight of the correct mass can result in calibration errors.
- How pressing "Tare" also clears the "counts" register back to zero.
- Calibration Weight Storage.
- Buying Calibration Weights.
- Handling Calibration Weights.
- Cleaning Calibration Weights.
- Tip on installing an aluminum static grounding strip on the edge of the bench.

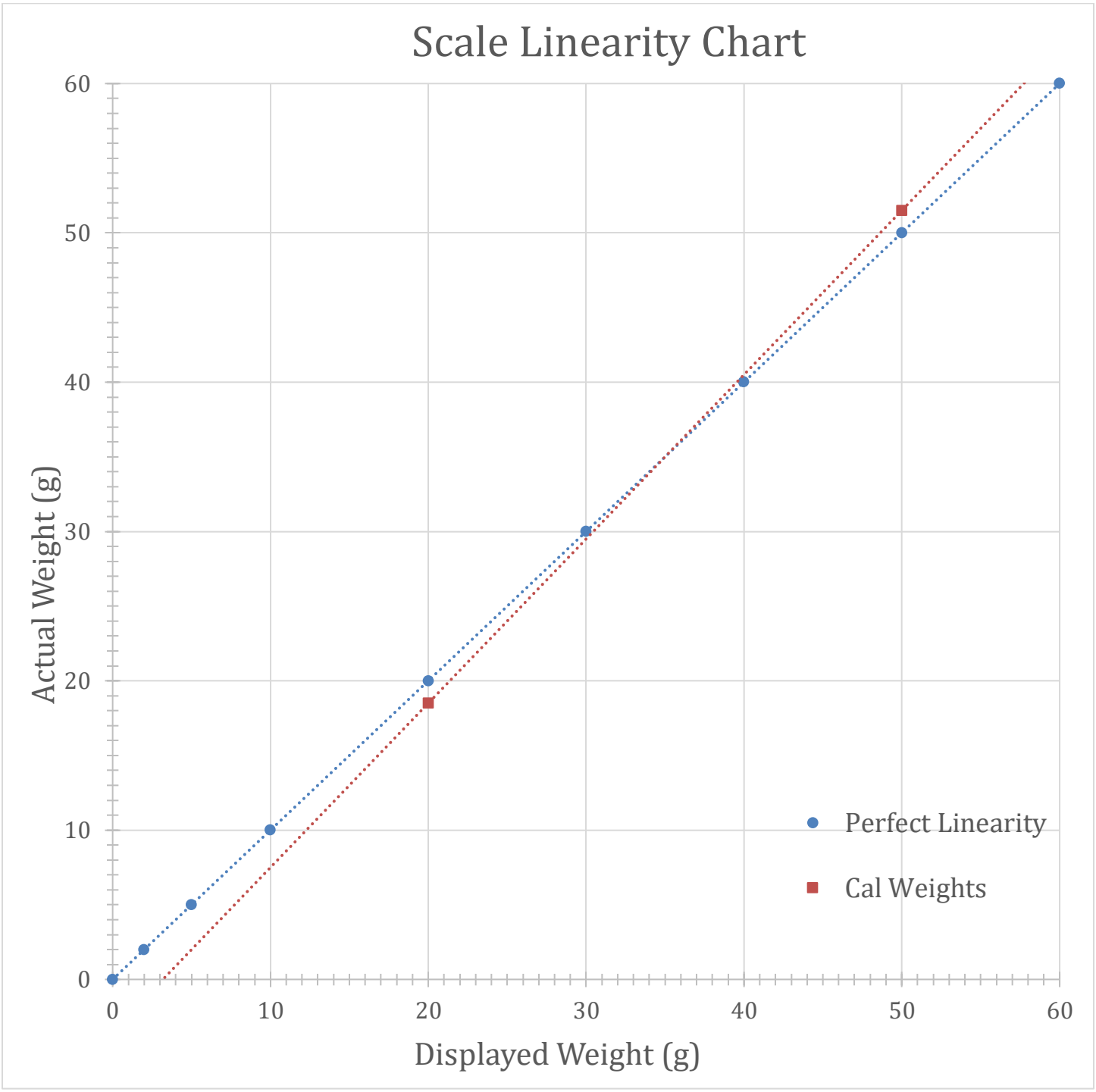
References

1. OIML R 111-1, Edition 2004 (E), Annex B, Section B.4.2, page 29.
2. "ASTM and OIML Calibration Weight Tolerances" comparison table by Accuris Instruments.

Acknowledgements

All product photos are courtesy of their respective manufacturers.
Product photos are for clarification only and are not intended to be product endorsements.
"ASTM and OIML Calibration Weight Tolerances" comparison table provided courtesy of Accuris Instruments.

Trademarks



NOTES:
1) Calibration Weight errors greatly exaggerated to better see the effect on Linearity.
2) For this example, I made the 20g calibration weight too light and the 50g calibration weight too heavy.