

# ladder test and barrel node

Does anyone know a method of finding the upper and lower barrel nodes using the ladder test? I heard there was a way to find them by using the ladder test and a chronograph. any ideas???

John, there is a learning curve to the Ladder and I would say I am at the bottom 10%. That being said, I am having a hard time understanding your question. I will attempt to shed some light by offering this:

The nodes are established by you varying one of several things, one at a time. Most start with a powder and shoot a string with pwr varying by .3 or .5 gr and look for clumps of shots, say 4,5,6 or 2,3,4 or 7,8,9. Where your clumps (nodes) occur will tell where the bbl is on the vibration swing. If you have a group in the middle of your vertical string and have a group either lower or higher, we are supposed to check out the one in the middle of the vibration arc. Going to either extreme and developing those could conceivably put shots beyond what the bbls arc would be. That was an opinion.

I have read that avoiding the extremes is best. Where a chrono would play into this for developing nodes, I have no idea. I would think that would give you info to determine which of several groups of components would be the choice for your particular application. E.G. Trying several powders, or primers, finding the best node for accuracy then chronoing those for whatever degree of speed you desire would be the chrono's use - as far as I know. As I said, I am new to this so if I am all wet, won't hurt to hear about it. Just wanted to answer to the best of my limited knoweledge as it seemed your post was languishing a bit. Was really waiting for someone more experienced to chime in. Maybe it will happen now, when someone reads my ruminations and figures they need to save you from ruination. See less

## **The way it was explained to me.....**

the example will be my 223AI. I vary the powder by .3g and start at 25g to 27g. I shoot the string and record the fps. The fps will increase as the powder increases. When the fps varies by just a "few" fps that is where a node is (top or bottom of the vibration). It is at that point the barrel will be the most stable and thus the load development should be.

clear as mud?..... johninfresno

## **LONG (rambling) reply**

John, this fps aspect of ladder load development appears to be fairly theoretical at this point, at least in my tests. I do shoot my ladders over a chrony and plot the velocities, but I do it for one reason only: To help me determine when I'm at max charge. The one thing that appears to be true is that as you approach max pressure, you'll see velocity flatten and sometimes even dip slightly. When that happens, you want to STOP, because even a tenth or two more powder may be the increment where pressure spikes SHARPLY. So when you get up near or above what the manuals say is a max charge, start watching velocity as well as your primer and bolt lift.

What I look for in my ladders, John, is three increments that are very close in vertical dispersement. And I shoot three shots per increment, not one; reason being that a single shot may fall a little high or a little low and you'll never know it. If one increment falls high and the next happens to fall on the low side, you can miss what may really be a sweet spot. So, I use a separate aiming dot for each increment

and I fire three shots at each. In order to lessen the effects of fouling, do this round-robin style. If your loads start at 25.0, then fire your first round of that charge. Then move to bullseye #2 and fire a round with 25.3. Then move to bullseye #3 and fire a round with 25.6. Obviously it's a good idea to label your targets carefully and you must make absolute certain sure that you fire the right load at the right dot. If you get out of sync, you're screwed and pretty much need to start over.

When I'm done firing, I use my MkI ModI eyeball to plot the VERTICAL center of each 3-shot group. Then I determine an arbitrary baseline and I measure from that baseline up to the vertical center of each group. It's hard, but you must force yourself to ignore group size and focus on the vertical. Look for spots on your ladder where 3 increments have the smallest vertical difference. Those are your potential nodes (sweet spots). If those nodes have one or two groups that are especially tight, so much the better, but some of my best loads didn't produce especially tight groups at this point in the process.

Say you find two nodes that look promising. Pick the middle increment and load up 10-15 rounds at each of those two charges. Scrub the barrel well, fire a few foulers, then fire these rounds in 5-shot groups, preferably over a chrony, recording all the data. This time, you ARE looking at group size, and you're also looking to see if one charge or the other throws more fliers. Look at your chrony data and see whether one load or the other has significantly better numbers for standard deviation and extreme spread. If the loads seem equal in accuracy or very close to it, I'll always choose the slower of the two; reason being is that I want to give myself some leeway for the load not going over pressure on a really hot day.

Once you've settled on a load, you do the ladder process again, this time varying bullet jump. Same theory, same type measurements, but the variable this time out is jump.

I should have mentioned earlier that IMHO you need to shoot ladders for factory guns at 200 to 300 yards. For custom guns, this method of load development frequently doesn't show differences until 300 or 400 yards. The farther the target, the more apparent will be the differences in your load increments. Even if you're developing a load for 100 yard competition, you can't shoot your ladders at that distance because the differences will simply be too small to measure and evaluate easily. Hope that makes sense.

Now, as to your original question. Common sense might have us believe that if you find a 3-charge sweet spot in your ladder testing, then those 3 charges must also be fairly close in velocity. The truth, however, is that there are several factors in addition to velocity that dictate where a bullet hits vertically. If you've studied this node business much, then you're familiar with the concept of barrel dynamics (vibration). In a 3 shot node, the low charge may have the bullet leaving the barrel just before it hits the top of its swing. The middle charge may have the bullet exiting when the barrel is stationary, at the top of its swing. And the high charge may have the bullet leaving the barrel just as it begins its downward swing. If I understand correctly, those three charges may plot on a velocity graph as continuing on the normal, upward route, but the bullets print close on paper because of the precise point at which they leave the barrel in its swing.

I understand your theory about velocity spread being lower across the three charges of a sweet spot and my only reply at this point is that I haven't seen enough data to comment one way or the other. If it turns out that finding sweet spots is as simple as shooting incremental charges and plotting velocities, you'd think someone would have uncovered that method decades ago, wouldn't you?

Good luck and give some thought to my suggestion about shooting 3 shots at each charge rather than only one. Also, for sure do your testing with that .223AI at a minimum of 200 yards, preferably 300.

Use your very best bench shooting techniques, but don't worry all that much about the wind. Remember that your first test is strictly examining the vertical and you're looking for the VERTICAL center of that 3-shot group, not the width.  
See less

Nice Mike, I learned a bunch more. Maybe we can make a range trip one of these days when I head N. or am returning.

Just one thing I would have to politely take issue with and that is the "don't worry that much about the wind". I would think that anything from 10:30 to 1:30 and just the opposite could put a kink in the results, thereby either increasing flight time or decreasing same, thus allowing gravity different amounts of time to act. Now, as you said the lateral dispersion is a non event for what is being attempted. Whatcha think?

### **Ladder comments**

I've found that ladder testing can be a very useful tool in load testing but doesn't always produce immediate and obvious answers. Paul Workman appreciates the fact that ladder testing usually and quickly identifies loads that don't warrant more testing----certainly reduces component waste and barrel erosion.

You can sometimes, but not frequently, find loads that stand out like that diamond and the goat.

You usually have to collect and correlate results that tend to be confusing. If you don't have these skills or the willingness to develop them, ladder testing will produce a mixture of a few roaring successes a lot of glaring failures.

This doesn't mean that ladder testing isn't a viable tool but does have some limitations and that it also places some requirements on the user----this isn't a process that receives a few inputs and always spits out hard answers to identify good loads. Get ready for a process that sometimes sometimes requires a certain amount of abstract thinking.

For example, many think that vertical spread carries much more weight than horizontal spread. I shot a ladder with a 22-250, 8" twist, H4350 in .3 gr increments and 75 gr VMax at 200 yds, that had essentially zero vertical spread that had no two shots close horizontally. Each shot was further left than the preceding shot. This ladder was horizontal rather than vertical and the horizontal spread was much greater than expected in the existing wind conditions.

My benefit from this ladder was an obvious conclusion that I should look for another load combination. I have no explanation for the very small vertical spread and unexpected horizontal spread. I'll look at this again when I have more time.

Ladder testing has some non-believers on the grounds that the statistical sample size is not adequate to produce valid results---and this is true. Ladder testing is an empirical method which attempts short cuts around the laws of probability and accepted statistical methods-----sometimes works great and other times it bombs out.

In spite of all the negative comments, I still use ladder testing. The user just needs to know, in advance, the workings of the process.

A. Weldy

I totally agree with you, Tom, that a head or tailwind (and maybe even one from the sides) can drive a bullet up or down. And I pretty much always tell people that if they aren't using flags and paying attention to the wind, then they're plinking, not doing accuracy work. That said, when I'm trying to explain the basics of the ladder method to someone who's never tried it, I usually advise them to work on the vertical and ignore the wind. That may be a mistake, as Lucky Shooter (Alan) is very experienced at using the method and points out that, at least in his experience, it's NOT all about the vertical.

### **Hey there, Alan**

I still think it's all about the vertical, Alan. Was that rifle a Remington by any chance? I'm thinking when they screwed on the barrel, it was 90 degrees out of phase and they just didn't bother to fix it. The barrel was still vibrating in the vertical plane, it was just fastened to the action a quarter turn wrong. So you see, you misinterpreted the ladder results, that was vertical dispersion after all.

Every time you respond to a thread like this I learn something. Usually two three somethings. I'd love to hear whether you tried any ladders with that same .22-.250 but using different powders or bullets. I'm wondering whether those ladders also showed the lateral dispersion with almost no vertical. And I wonder how much range your charges covered, from low to high. Reason I ask is that if the range covered say 3-4 grains, it just seems there should be some vertical difference showing up at 200 yards. But then I've seen countless times where "common sense" and what I consider the normal laws of physics don't seem to match with the "alchemy" of reloading and ballistics. You've got to get to a Somerset event sometime soon so you, Workman and I can sit down over some beers or coffee and spout ladder stories for a few hours. I know the spring shoot usually conflicts with a PD hunt for you, but is there any chance we could get you up for Top Gun this fall? You'll be absolutely amazed at how the competition has ratcheted up everyone's abilities, especially in factory class. Just making the shoot-off now takes shooting that would have won you a trophy just a couple of years ago.

As a former engineer of some variety (right?), your comments about the sample size in ladder testing are right on target, of course. My propensity to fire 3 shots at each charge level rather than just one is an attempt to acknowledge that a single shot may fall high or low, which I tried to explain in my long post. And your observation that the ladder method involves quite a bit of "reading the tea leaves" is correct as well. I seem to have had better luck than most at finding what turn out to be true sweet spots via the ladder method, but I doubt that luck will hold up if I subject it to a larger total number of tests.

Leaving the ladder for a bit, have you bought anything in the new .204 Ruger chambering? I'm not at all a "speed freak" when it comes to my rifles, but this quick little caliber really has my attention, as does the new Savage LRPV. If and when I can scrape together enough spare change, I may have to have a Savage in that caliber. Another caliber I've taken an interest in is the .220 Swift. I shot Don M's quite a bit one day out in South Dakota this spring and that rifle was an absolute lazer, even in heavy wind. I talked with some knowledgeable folks back at camp and was told I would get very similar performance from a .22-.250 AI. At the very least I may buy a .22-.250AI barrel for my current Savage egg gun and use it on PDs.

Later.

See more

[Reply](#)

[Save](#)

[Like](#)

[Lucky Shooter](#) · #9 · Jun 17, 2007

## 22-250 ladder----horizontal results 75 gr AMax

This gun shot a very good vertical ladder with the 80 gr SMK. The load range indicated by the ladder produced very good groups---one of the very few times a ladder has given me a simple answer.

This gun also shot a very good ladder with the 90 gr SMK at 80°F in spite of the lack of the recommended 6.5" twist. The groups indicated by the ladder were even better than the 80 gr SMK when the temp stayed up around 80°F but weren't good at all when the temp dropped to 60°F-----an indication of poor to marginal stability.

Some day I'll try the 75 gr AMax again with different seating depths but will probably never understand the workings of the horizontal ladder.

In the meanwhile, I'll continue to depend on Mike and Paul for the tricky ladders.

A. Weldy

See more

I've been following this, and while I don't use the single shot ladder, I do use the round-robin method ala Dan Newberry. I don't worry so much about vertical alone. My interest is in finding 3 charge weights that land in the same POI. Sometimes that may be high right, and sometimes low right, or low left....I just look for 3 adjacent charges that land in the same minute of angle group, or less. I don't know if I'm doing it right, but the loads I get shoot well, and almost always compare closely to the loads that are predicted by Quickoad/Shockwave

Another thing to keep in mind is that the ladder, and it's variations, is showing the most flexible load. There may actually be a load that shoots better, though is extremely sensitive to tiny variations in temperature, seating depth, charge weight, etc. I know I'm preaching to the choir, but I hadn't seen that point mentioned earlier in this thread.

See more

**I too am following along...**

When one looks at all the posts, one can't help but notice what is essentially the message ladder tests provide...interpreting results requires one to be able to read between the lines, to some degree. Or, as Alan W. once said, "...the concept is abstract". Alan nailed it with that.

I don't know that I can add much to this discussion, but I can support many of the comments by the various individuals, as my experiences with the Audette Ladder Method are echoed in them. That said, I'll put in my two cents and maybe the tea leaves will align a little better...

The Audette method is a one-shot method which he called the "Ladder Method". Contrary to what Newberry claims, his 3-shot method is NOT Audette's Ladder method, per se'.

The ladder method is more abstract and trickier to "read".

Newberry's method is still involves shooting groups - exactly what Audette was trying to avoid in his "Ladder Method". However, Newberry does introduce the concept of measuring and recording the vertical movement of the individual groups as part of his analysis - different from simply looking at

group sizes for the different groups. Both Audette and Newberry's method have their merits. Newberry's is less "abstract", to use Alan's description, but Audette will allow one to test 3-times as many load combinations for the same number of shots fired!

IMO, shooting one load using the Audette method will not tell you a thing, unless you have others with the same rifle to accompany it. Interpreting the Audette method requires one to look at the overall results before looking at the individual results from a single bullet/powder combination. I find that combinations worth investigating will be obvious, when compared to other tests.

The Audette Ladder probably eliminates more load combinations than it finds. And, the method is not absolute either, as soooo many other factors can affect the performance of a particular bullet/powder combination!

A chronograph used in conjunction with the Ladder test will, as Mike pointed out, show you when you are approaching maximum pressure - usually foretold by a flattening of velocity for a uniform increase in powder charge, or "plateauing". This may or may not be where the barrel harmonics are favorable. When it is, I call that situation the "Holy Grail" - the best possible of situations is when the barrel harmonics are in coincidence with the powder "plateau".

However, barrel harmonics follow their own physical laws. So, it is more often that a barrel will group best somewhere short of maximum load or even the plateau region. I find such loads are characteristically more finicky than those 'Holy Grail' loads - being affected more by anything that affects powder burn, e.g. temperature, slight powder weight variations, different lots of powder, etc. (But, I digress...)

I use the (pure) Audette method initially with any new gun. Once I find something that looks promising, I immediately switch to a method very close to Newberry's approach. By shooting groups one can quickly determine if what looked promising in the Ladder test(s) is really good, or if it was just a fluke. But, by the time I get to Newberry's method, by using Audette's Ladder method I have eliminated perhaps several powder/bullet combinations and using a fraction of the bullets and powder and range time in the process - going thru a lot of "ore" to get to the gold (so to speak).

Newberry suggests a "round robin" procedure for testing several groups at one time. This method I find to work well enough that I generally follow that suggestion, and it does seem to work the majority of the time: The concept makes sense, and my experience tends to agree with his suggestion.

*\*\*\*"Round Robin" testing requires one to shoot all of the bullets of a load group at their respective target. However, successive shots are fired in turn from each group. In this way, the barrel heating and fouling and any dispersion of shots due to these affects are spread across the entire set of groups, essentially mitigating the effects of heat & fouling buildup (theoretically).*

The key making the Audette (one shot) ladder method work is not to try to analyze a single test, but compare the results of several tests. From that you should be able to either pick out some loads for further testing, or determine that nothing works and there may be a problem with the rifle where NOTHING is going to shoot well! (I can tell you the latter is a hard pill to swallow, and I have at times been sucked in by the desire to "see" something that wasn't there!) The Audette Ladder will only work for those having an open, objective mind. I guess what I'm trying to say here is, keep your distance, and don't look for something that isn't there. When you run a ladder test and hit a magic load, you will know it right off. If you have to struggle and strain to make any sense out of results, then beware of any

conclusions you might come to regarding the loads.

Keep in mind that some rifles don't shoot for crap! When that happens, all the ladder tests will also be crap! But, at least you know it w/o using up all your components shooting 3-shot groups (and incidentally, 3-shots are not enough to be "statistically significant" either!)

Bottom line:

When Newberry says he's looking for loads where several different powder charges result in the same POI, and you find it, that has to be considered on its own merit - being at the powder plateau NOT withstanding. I find that lots of very accurate loads are not on the powder plateau. However, those that are tend to be much more stable over temperature and other minor variations than those loads which are on "the side of the slope", so to speak.

Don't forget other factors are at play too, e.g. temperature, barrel heat and fouling, wind(!)... So, the fewer variables you have when "running a ladder", the better or at least the less ambiguous the summary becomes.

Hope this helps,

Good thoughts, Paul, and well-stated. Another one of the things I've noticed since getting involved in this method.....When I get the load at the "calm" point of the muzzle, and I get a load at that point for different bullet weights....the different bullet weights also shoot very close to the same POI. In fact, I'm starting to use that to determine when I have the loads right. My .223AI, will shoot the 40 Sierra HP, the 40 Nosler BT, the 45 Sierra spitzer, and the 53 Barnes TSX into a MOA group at 100 yards. That's 3 different weights and 2 different powders. With that rifle I'm confident I have the loads on the correct barrel vibration point. I'm still working up loads, with both 25 and 30 grainers, in the .17 Rem. to see if it holds true for that rifle also.