

ATTENTION PREDATOR HUNTERS (and other hunters as well)

There is no worse feeling for a hunter than to get the prey in your crosshairs and then to miss. When you are hunting coyotes or bobcats, they are mostly hair. They are very wary and will either be 200 yards out or right behind you. The vital zone in the vertical is about 6" (+3" or -3" from vertical center) for a coyote. The horizontal vital zone is longer since the animal's body is twice as long as it is high.

Because these critters are hard to hit (being far away frequently and moving) and also hard to bring down, you need all the help you can get. Use the best ammo you can get with the most muzzle velocity and best flying bullet. In addition to that, you need to be very familiar with your ballistics. There are a couple of "techniques" that you can use to help you get the bullet on target if they are very far out.

First let's look at the Federal Premium P223F round. It is a .223 Remington using the 55 g Nosler Ballistic Tip bullet with a muzzle velocity from their gun of 3240 fps and a bullet BC of .267. This round is perfect for predators. The round is very fast and the Ballistic Tip bullet may fragment when it hits the target and do a lot of damage so they don't run off.

Below is Federal's two scope zero choices for that round - "short range" and "long range". The short one shows a scope zero at 100 yards and the long one shows a scope zero at 200 yards.

Short Range

Load No	Caliber	50 Y	100 Y	200 Y	300 Y
P223F	223 Rem. (5.56x45mm)	-0.3	⊕	-2.8	-11.

Long Range

Load No	Caliber	50 Y	100 Y	200 Y	300 Y	400 Y	500 Y
P223F	223 Rem. (5.56x45mm)	0.4	1.4	⊕	-6.8	-20.8	-44.6

Notice on the short range table that you fall to 3" low at about 200 yards. Notice on the long range table that you are right on at 200 yards but only 1.4" too high at 100 and fall to 3" low somewhere between 200 and 300 yards. You can shoot using "crosshairs" from 0 out to considerably beyond 200 yards if you zero your scope at 200 yards. A 200 yard zero is a much better choice for predators (actually any game).

How about we take this 1 step further and find a scope zero distance where we are exactly 3" high and 3" low so as to maximize our distance that we can use crosshairs without fussing and calculating or remembering things.

TECHNIQUE 1

Zero your rifle scope using the "Point Blank Range" technique. This involves zeroing your rifle at a range such that the round is never higher than a desired amount (say 3") above your crosshairs and never more than the same amount (3") below your crosshairs out as far as possible. Use any ballistics calculator and do it by trial and error. Keep picking a zero range until the "up" amount is equal to your criteria.

Below is a calculator output table for that Federal .223 cartridge using a sight height of 1.5" and using a temperature of 35 degrees F and 1000 feet altitude. The column labeled "Drop" is the amount the bullet drops below the bore line regardless of where the scope is pointed. This number is strictly a function of air density, muzzle velocity, and ballistic coefficient (drag) of that bullet. The column labeled "Impact" is the amount that the bullet impact differs from where the SCOPE IS POINTED (crosshairs).

Notice from this table that if you **zero your scope with this round at 252 yards**, the bullet will never be higher than 3" above your crosshairs or lower than 3" below them from 0 yards out to about 280 yards. In other words, forget any hold over etc. Put your crosshairs on the dog anywhere from 0 out to 280 yards and your bullet should strike within + or - 3" of your aim point.

At 300 yards this bullet still has 581 lb-ft of energy so it should be enough to bring him down. The bullet is still moving at 2182 fps which is well above the minimum of 1600 fps for the Ballistic Tip bullet.

If you don't get 3240 fps from your gun or shoot a different bullet/cartridge than this one , you will have a different table. Chronograph whatever round you are going to use to make your own table. If you don't have a chronograph, get a friend to chronograph your round from your gun for you. You need to know the MV of your round from your gun on a similar day if you are going to shoot small targets at long range.

Velocity	Bullet Wt.	Sight in at	Ball Coef.	Sight Ht.	Intervals	Mx Range
3240	55	252	.267	1.5	25	500
Muz Elv	Temp	Altitude	Wind mph	Wind dir		
0	35.0	1000.0	10.0	90	[Calculate]	

Range	Velocity	Impact	Drop	ToF	Energy	Drift
0	3240	-1.5	0	0	1282	0
25	3131	-0.15	0.16	0.03	1197	0.5
50	3036	0.99	0.53	0.05	1126	0.7
75	2942	1.89	1.14	0.08	1057	1.03
100	2850	2.54	2	0.1	992	1.5
125	2760	2.92	3.13	0.13	930	2.11
150	2672	3.01	4.55	0.16	872	2.87
175	2586	2.8	6.27	0.18	817	3.79
200	2502	2.26	8.32	0.21	765	4.86
225	2420	1.37	10.72	0.24	715	6.11
250	2339	0.11	13.49	0.28	668	7.54
275	2260	-1.53	16.65	0.31	624	9.15
300	2182	-3.62	20.25	0.34	581	10.96
325	2106	-6.16	24.3	0.38	542	12.97
350	2031	-9.19	28.84	0.41	504	15.2
375	1958	-12.75	33.91	0.45	468	17.66
400	1886	-16.88	39.55	0.49	434	20.36
425	1817	-21.62	45.8	0.53	403	23.32
450	1749	-27.02	52.71	0.57	374	26.54
475	1683	-33.14	60.34	0.62	346	30.04
500	1619	-40.02	68.73	0.66	320	33.83

Now for the bad news: In a 10 mph crosswind, the bullet will be almost 11" to the side of the crosshairs. There is no canned solution for that. You must learn to judge the wind 300 yards away across gulleys and past trees. You can buy scopes with horizontal reticule dots but you still have to estimate the wind to use them. Fortunately you can get away with being a little off horizontally but not so much in the vertical due to the animal's body shape.

What if you only have a 100 yard range to zero your scope. Check the table! At 100 yards this round's bullet should strike a target 2.54" above the crosshairs. Adjust your scope until the bullets strikes the target at 2.54" above your aim point at 100 yards. **This not a very good technique because it is very time and ammo consuming AND a small error here could cause a large error at 300 yards.** Better to set up a target at 252 yards and zero you scope on it. Sometimes 100 yards is all we have, however, so let's talk more about how to do it.

Start with a clean barrel and shoot 3-4 fouling rounds of your hunting ammo into the dirt of the backstop at target height. **Let the barrel cool completely to "cold" (2-5 minutes)**. We are trying to simulate actual hunt conditions where you have a cold, fouled barrel for that one trophy shot.

Do not hunt with a clean barrel! The first 2-3 rounds from a clean barrel can be drastically different from the next 30 or 40. Sometimes the same thing happens if you change ammo. Most rifles show a slight loss of accuracy after 30-40 rounds. Some can go more. Some hunters say they never clean their barrel. But they don't shoot more than 20-30 rounds every 10 years so they are correct. The rifling in the bore is there for a purpose and it cannot do its job if the grooves are filled with copper.

Now fire one round onto the paper. Adjust the scope the amount that the hole in the paper is off of a pencil x placed on the paper at 2.54" above the bull.

If the bullet hole is 3" left and 4" below that pencil x, you need $3 \times 4 = 12$ clicks to the RIGHT and $4 \times 4 = 16$ clicks UP (for most scopes where 1 click is 1/4 MOA. At 100 yards, 1/4 MOA is about 1/4" so it is 4 clicks per inch). **Let the barrel cool completely between each round!**

Fire another round. Adjust the scope. Keep doing this until a string of 3 rounds with no scope adjustment yields a group of 3 whose vertical center is at 2.54" above the bull when you aim at the bull. **Let the barrel cool completely between ALL rounds**. Do **not** clean the barrel before going to the field.

To check this, go home, clean the barrel, come back to the range, fire 3 fouling rounds into the dirt and then 3 onto the paper with each paper round out of a COLD barrel. If they are pretty much centered vertically at 2.54" above your aim point, then you can go to the field. DO NOT CLEAN THE BARREL. When you get to the field select a target at 252 yards and see how you do. Now call in the predators.

TECHNIQUE 2

This may surprise you. Technique 2 involves raising your scope height as much as practical (2 1/2 - 3 1/2 inches) above the bore line. Put your scope on top of your carry handle of your AR. Use "see thru" mounts on your bolt, single shot, or lever gun. This will get you about 2"-3.5" above the bore line. (Don't raise it so high that you cannot see thru it, of course). Compare the table below with the one above. Only difference in these two tables is that the "sight height" in the one below is at 3.5" instead of 1.5". Same round still zeroed at 252 yards.

Notice from this table that your 100 yd height has changed a little BUT you are much closer to being "on" at hunting distances out to 290 yards or so. You have extended your "crosshairs" distance a little (from about 280 to about 290 yards) and reduced how far off you are along

the way a little. Now put the crosshairs on the dog from 15 yards out to 290 yards and you will be good (never more than 2.2" up or 3" down). If the target is closer than 15 yards, use your handgun or shotgun. If he is more than 290 yards, use your marksmanship or pass on the shot.

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To build your own table: chrony your round to get mean MV, determine the bullet's ballistic coefficient, measure your sight height, and estimate the weather conditions for your hunt day.

Good luck. Time on the range will pay off. This particular ballistic calculator is at handloads.com. Any will work just as well.