

# Sighting In a Mosin-Nagant "Sniper" Rifle

By **Paul Oats**

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Arguably the most popular, if not most prevalent, rifle currently on the military surplus market is the Russian Mosin-Nagant bolt action rifle in 7.62x54R. A combination of interesting history, low price, reliable design, and many variations make it an ideal rifle with which to begin a military collection.

One of the more interesting variants of the Mosin-Nagant is the 91/30 sniper rifle. A major surplus distributor has imported many thousands of 91/30 rifles, along with a boat load of PU scopes. Their "wizards" (calling them gunsmiths is a bit of a stretch) have cobbled together these rifles and scopes, which are now being sold as collectible sniper rifles. The easiest way to tell if you have one of these cobbled rifles is by the price. If you paid around \$300, you can be sure it's one of these, as a genuine MN sniper rifle goes for about \$700.



Fig. 1 - The PU scope and mount.

Now don't get me wrong - I love MN rifles, and with a little TLC, these "sniper" models can be made to shoot quite accurately. The problem with them is that since the scope mount was not machined to match the rifle at the time of original manufacture, some misalignment problems with the scope, particularly with the windage (horizontal) adjustment can occur. While a genuine sniper rifle would have had any variations between the scope and receiver machined out, these "wizard" jobs have not. Also, unlike modern rifle scopes where the reticule stays centered and the entire field of view moves for sight-in purposes, the PU scope's field of view is fixed and only the reticule moves. The drawings that follow illustrate the problem.



Fig.2 - The ideal sight picture on a properly adjusted scope. The red cross represents the point of aim, and the red dot is the bullet impact. The 3 line reticule of the PU scope centers on both.



Fig.3 - Typical sight picture of an unadjusted "wizard" sniper rifle. The bullet impact is high and left of the point of aim at the red cross indicating both elevation and windage adjustment problems.

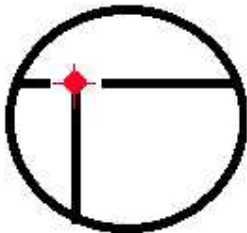


Fig.4 - The windage and elevation adjustment knobs on the PU scope actually have enough play to move the reticule to center the crosshair on the point of impact as shown in here. (Remember what I said earlier that adjusting the PU scope moves only the reticule, not the entire sight picture as on a modern scope.) However, this is a really poor sight picture. We're looking for the sight picture shown in Figure 2.



Fig. 5 - The elevation adjustment screws on the mount (see Fig. 1) can be adjusted to give the sight picture shown in Figure 5 by loosening the bottom screw and tightening the top screw. If your bullet impact was low in the sight picture, loosen the top screw and tighten the bottom. Use very small adjustments on these screws. A 1/4 turn of these screws causes about a 6 inch change on the target. Now the elevation picture is correct, as shown here, but the windage still leaves much to be desired. Once the elevation has been adjusted, it would be useful to put some loctite on the **BOTTOM SCREW ONLY**. The top screw must be able to loosen if you ever want to remove the scope base from the mount.

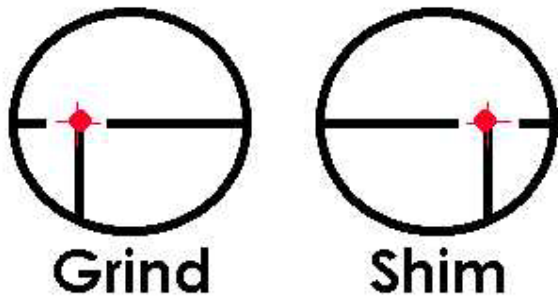


Fig. 6 - Once your elevation is adjusted properly, you now must decide whether to grind or shim the scope base in order to adjust the windage. If you have a sight picture similar to that on the left, grind it. If something like that on the right, shim it. When grinding, again use SMALL increments, so as not to grind off too much.



Fig. 7 - Photo of how much I had to grind off my scope base in order to get the ideal sight picture shown in Figure 2.

Now that you have the ideal sight picture, it is now time to calibrate the scope. By loosening the 2 small calibration screws on the windage and elevation knobs (see Figure 1), the top portion of the knob can be turned without moving the reticule. Set the windage to 0 and the elevation to whatever range you were firing at (in meters). Tighten the calibration screws, and you're done.

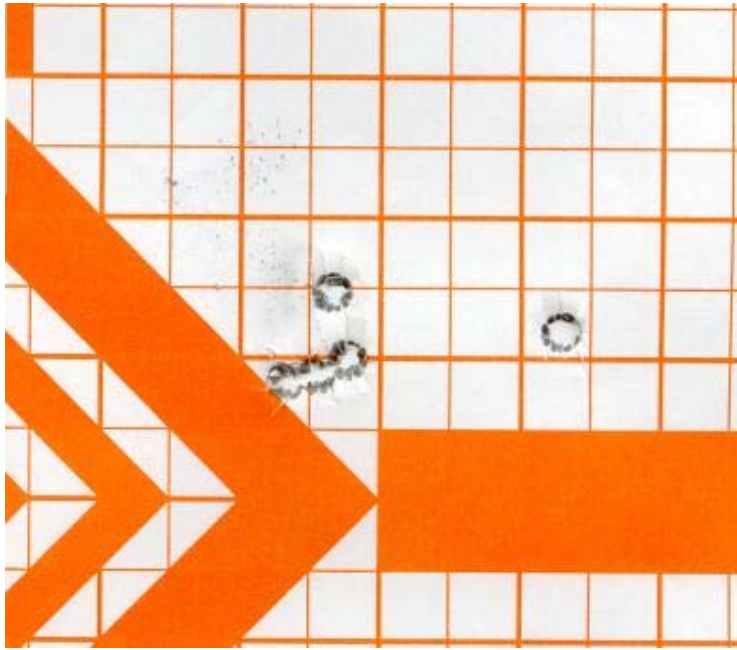


Fig. 8 - One of my better groups.

With a well tuned in hand load, you should be able to achieve sub MOA groups with your Mosin-Nagant. The group shown in Fig.8 is at 100 yards with my pet load of 44.5gr of IMR 4895 and 165gr Sierra BTSP (.308 diameter). I'm sure the one flyer was me, not the rifle! But this target does show one of the downfalls of the PU scope, which is it's lack of fine adjustment. When you move the dial what you think is just a slight adjustment can actually move the group several inches. Oh well - Tuco's postal match was going for group, not accuracy!

# Fine Tuning of the PU Scope

By **John Mitchell**



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I have seven PU snipers now and have examined a half a dozen others. I regularly shoot a few of them and have learned a few things through observation and practical use that I thought I might share with some of you fellas picking up a PU sniper for the first time. I test my rifles off the bench at a 100 yard indoor range, regularly shoot at a 100-300 yard military style range, and shoot long range precision target/tactical at a 1000 yard facility. All parts of the PU rifle setup work together to give its optimal accuracy and any part not given the proper setup attention can detract from its performance

## **First on accuracy:**

I have found a good PU 91/30 sniper will shoot 3 shots out of 5 touching at a 100 yards fairly consistently indoor or outdoor with good ammo. (That may sound unreal but this is a common occurrence with MOA rifles-it is almost assured that 2 or 3 shots will be touching when you put 5 .30 caliber bullets into an inch at a 100 yards) I don't hand load yet, so the best I use is new production S&B FMJ and I have had excellent results with silver tipped Czech green lacquered steel case, head stamp 63 (through 67)/bxn. The challenge is usually trying to hold the thing on target through the trigger pull! I found the following accuracy standards on the **Russian Sniper Page**: a 91/30 PU rifle was expected to shoot 10 shots into 3.5 cm (1.38") at 100m, 7.5 cm (2.96") at 200m, 18 cm (7.09") at 400m, and 35 cm (13.79") at 600m. I would imagine this would be done off of some kind of mechanical vise type rest.

## **PU scope use:**

1. Sighting through the PU scope, if you look to the lower portion of the field of view you will see a small circle with a vertical bar - this is the front globe and post iron sight. Move your eye/head position right or left until the bar (front sight post) superimposes over the bottom of the vertical reticule element. When it is aligned it will "split" into two thin lines that bracket the lower portion of the vertical reticule element. Then put your pointer on target. This will help you to consistently align your eye to the scope.

Note: You may or may not be able to see the full globe and post in your field of view. This depends on how you have set up your mount using the vertical adjust screws on the base. All four of my Russian snipers came to me with at least one of the vertical adjust screws punched in place. As configured I can see the full round of the front globe and post sight. This image sits at the bottom edge of my field of view-the bottom of the globe touching the bottom of the field of view. This image was so consistent with my first four PU rifles I thought I was actually seeing a "rear lens alignment reticule" within the scope! Also with the vertical adjust screws punched in place the horizontal bars are up at the top quarter or third of the field of view sighted in at 100 yards. This gives the reticule enough range of travel to still be comfortably in the field of view out to 1300 meter elevation setting.

2. Get your eye up close to the scope so you have optimal field of view. It is not too comfortable but you will have more light and a more consistent scope picture. You won't really have a cheek weld more of a chin weld. I have found that a major factor in achieving consistency with these short length scopes is a consistent scope picture, i.e. you can move your head/eye placement and the pointer will move slightly on the target. This is very apparent when holding on small long range targets. The trick is to again use the image of the front sight as a lens alignment reticule: position your head/eye so that you can (1. See full field of view through the scope, and (2. See the full circle of the globe sight hood-this is a must so you don't have to move your head, only your eye-from pointer to front sight alignment image to target. If you consistently achieve this scope picture your head/chin placement will be more consistent and you should be able to achieve better groups and POI repeatability at different elevation settings. If you hold your head to far back in a more comfortable position you will 1) lose the full field of view 2) increase parallax effect.

Note: I don't know if these rifles were intentionally set up to take advantage of seeing the front sight in the scope field of view or not. All I know is that I can see it and have used it with good results. Consistent stock weld is a fundamental taught even today in precision shooting. Even with today's modern equipment with parallax focus adjustment consistent stock weld is considered a basic building block essential to making these finer tuning adjustments effective. It is critical with the very basic short focal length PU scope and is a challenge with the scope set so high above the receiver and with the stock comb as low as it is.

3. Hold the horizontal reticle bars consistently level.

4. It takes some practice to get used to the horizontal bars and pointer reticule. With only 3.5 power you have to concentrate hard on the tip of the pointer and how you hold it on your target, and then repeat the hold for all the shots in your group. It is easy to find yourself just plastering the tip over a 2 inch square piece of tape at 200 yards, not really trying to place the tip of the pointer on it in a consistent manner. The rifle should be capable of shooting within about 2 inches at that distance, but on one shot if your pointer is at the bottom of the 2 inch square and the next shot your pointer is at the top of it. You may find that you have a group that is spread over 6 inches or more and you will be scratching your head wondering why. These PU's are about as far from a target scope as you can get and still be looking through two pieces of glass. It is a real challenge to get the best out of your rifle using one. It is more of a precision optical sight, a couple steps above iron sights, rather than what you think of in terms of a modern day scope.

5. The Ordinance Corps manual states the windage adjust knob calibration marks are one mil (milliradian) which is 3.6 inches at 100yd and I have found this to be a practically correct.

6. Tighten the thumb screw down with a screw driver. I have found that finger tightening will allow the scope to move after a couple of shots.

## Notes on scope setup:

1. These things were sighted in by a pro and the base lower vertical rough adjust screw may be punched and immovable. Or at the very least there are usually some punch marks that put pressure on the screws to keep them from falling out. Try to keep these screws aligned to their original struck positions (or at least note their position down if you are inclined to move them). Keep in mind that though the horizontal bars may be further towards the top of the scope than you like when sighted in at 100 yards, at 600 to 800 yards they will be at or near center scope-right where you like them to be when trying to make the long shot. If you want to center the horizontal bars at a 100 yards and your bottom screw is movable be sure to note down where it was originally set.

2. If you aim through the iron sights and hold them level to the horizon and then look through the scope and notice that the horizontal bars are not level there is probably a purposeful reason for this. It has to do with alignment of the scope longitudinal centerline to the bore longitudinal centerline. When you rotate the rifle along its longitudinal axis to bring the scope horizontal bars level, you are probably bringing the scope and bore longitudinal centerlines into alignment by centering the scope over the barrel. There may have not been enough room for adjustment on some of these re built, re used scope mounts and bases to get the scope over the barrel through means of filing the tabs on the mounts. Though it may seem awkward or unnatural to not hold the rifle in a perfectly vertical position, these fellas knew what they were doing when they set these things up. This alignment is critical in precision long range shooting or precision shooting at varying ranges.

Think about it: with scope CL right or left of bore CL you have to aim the scope (adjust windage) left or right to converge with the bullet at any given distance. You will be fine for a single distance, say 100 yards, but when you aim out to 200 or 300 you need to adjust windage to hit point of aim to compensate for the built in error caused by the difference in scope and bore longitudinal CL. Depending upon how far out this alignment is and if shooting at shorter ranges, this effect can be negligible. It will be much more pronounced at longer ranges but can be compensated for by preemptive windage settings in addition to the normal elevation settings as you sight in for each range. There will be more consistency and less room for error though, if you just rotate the rifle so the scope is over the barrel-that is why these guys set them up that way so you will aim over the bore CL.

## Shooting it:

1. Consider taking the time to break in your barrel just like you would a brand new rifle. Properly breaking in should greatly reduce or eliminate fouling and greatly improve accuracy and consistency.

2. Re-check all screws on scope/mount and rifle for tightness after first 5 shots. Check again after 20 shots and periodically there after. If groupings were good then spread for no apparent reason-- check for loose take down screw or scope screws. These little used snipers have not really been "shot in" yet with the actions seating snugly into the stocks as on a well used rifle. Bring a white or yellow grease pencil to the range and mark all the screw slot locations on the scope, mount and action. Check them occasionally to monitor working screws. I have found the tang takedown screw has always been the first to move on most of my rifles, then the forward takedown screw. I have found backing the tang screw out even an eighth turn will make a difference in POI

3. Sighting in to point of aim is quick and easy with the PU scope. After your 5 shot barrel warm up, off rests pick an aim point and shoot a three shot group. Keep the rifle aimed at the aim point and don't move it while adjusting the windage and elevation knobs until the pointer



is centered on the group you just shot. In this way you are aligning the scope to where the bullets just hit (POI), so next group will probably be darned close to point of aim. The toughest part is the fine adjustment of the knobs-it is hard to move them in the small amounts necessary to pin point a bull at 100 yards so you may want to try it at 50 yards first to make it easier. There are two screws on top of the adjusting knobs that hold the silver elevation and windage calibrated rings in place. Loosening these screws slightly will allow you to turn the calibration rings to zero your settings. Be sure not to move the adjusting knobs while doing this. Be careful not to over tighten these screws as they will strip easily. There is plenty of clamping surface area holding the calibrated ring in place and it does not require a lot of screw pressure.

4. Don't let the barrel get too hot! Shoot 3x5 and then give it a rest. Bring another rifle or two and rotate through them. This lets you get the most out of your range time but doesn't burn up one rifle.

5. Get to know your rifle. Record elevation settings for varying ranges and ammo. Note where the first few cold shots hit so you can compensate for it next time out and impress your buddies by screwing the mount on and hitting a first shot bull. These things are that predictable and will hold zero that well.

6. Or you can not shoot it and let it just sit there and admire its ungainly beauty. That is fine, too.

Suspect your scope knobs are moving between shots and spreading your group but don't want to take the risk of disassembly and trying to tighten up the knobs? Try this:

Once you sight the rifle in for the distance you wish to shoot, instead of zeroing the calibrated rings, turn them so the calibrated ring stop tabs move forward to the stop pin then tighten the screws. Between shots you can check to make sure the stop tab is making contact with the pin and can be pretty much assured that your reticle will be in the same position for each shot. This is a fool proof way to eliminate the possible knob movement factor from poor grouping problems.

## **Problem Group Patterns and Things to Check:**

How are your 5 shot group patterns using the scope? Are they random spread, couple flyers but otherwise tight, signs of tight or loose stringing diagonally or vertically. I have seen all of these in my PU shooting.

Things to check for:

- Loose thumbscrew-- even though it is a ""thumb"" screw you have to use a screwdriver to tighten it down or it will let the mount start moving only after a couple of shots. Will cause a rapidly expanding string with increasing distance between impacts as you progress through the five shots. Make sure to crank it down using the full force of one hand on a screwdriver.
- Moving base vertical adjust screws. Will cause vertical stringing or diagonal in conjunction with an overly loose thumbscrew.
- Moving scope adjust knobs--may be imperceptible at first and drive you nuts. Usually will make a tight stringing pattern vertical or horizontal depending on which knob is moving or diagonal if both are moving. May make sudden post first shot change in POI and then string the next four shots tightly. This is because after the first shot one

or both knobs may move or jump to the next friction point and then start creeping imperceptibly from there.

- Scope knob backlash. Where you move scope knob but don't see immediate corresponding movement of reticle. This condition could allow reticle to move freely with shot to shot recoil although having apparent fixed knob position. Check that the tiny scope knob locking screw is in all the way and tight for the affected knob. If this doesn't tighten the backlash problem up you could have some loose internals.
- If you are doing well open sight then I won't tell you to check your take down screws--but check them anyway and often. Use a white or yellow grease pencil and mark the slot positions to see if they are working. Do this on all of the screws on the scope mount, too, and on the thumbscrew and base vertical adjust screws (one which may be punched immovable anyway).
- Maybe your base is loose? This is not something I have run across with my collection but it is something to check.
- How I tighten my mount to base. Bring thumbscrew to light finger tight. Lightly tighten vertical adjust screws. Bring thumbscrew to full finger tight. Tension vertical adjust screws to final position. Torque thumbscrew in with single hand on screwdriver.

Following is a tip on eliminating scope knob movement on recoil as a cause for poor grouping.

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Have fun and safe shooting,  
JohnM.

