

Plugging in your Offhand

Part I

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Introduction

Behold the mighty personal computer. It is a tool with flexibility matched by few other machines. Some look at PCs as a godsend, using them as a tool for increased productivity. Others, such as my gunsmith, curse their computer's idiosyncrasies.

Highpower shooters with little computer knowledge tend to devalue these devices. Even the ones with more experience use it for little more than surfing the Internet and posting to discussion boards. Being able to discuss optimum powder charges with shooters on the other side of the country is really great. But wouldn't it be better if we could use the computer to directly increase our shooting skills in the privacy of our own homes.

While this may have been impossible ten years ago, today it is within reach of many competitive shooters.

Introduction to Electronic Trainers

Electronic trainers are computer-based devices that allow you to graphically see a trace that represents your rifle's aiming point. While many highpower shooters have heard of NOPTTEL, RIKA, SCATT, and Beamhit, they still have only a marginal understanding of the proper use of these devices.

It is easy to dismiss Electronic Trainers as glorified dry-fire aids. Shooters see a sample screen showing a wobble trace and final hit position and they feel that's all there is to it. Unbeknownst to them, they have only scratched the surface of this technology. Dry-firing with an Electronic Trainer is certainly helpful, as is dry-firing by itself. But it's the information that can be extracted from each shot that makes these gadgets worthwhile. The sheer volume of data coming from just one shot can be intimidating. But if you can peer it down and use the data that's relevant to what you're analyzing, the results can isolate trouble spots in your shooting technique.

Capabilities of the NOPTTEL Shooting system

While I have also used the RIKA trainer, the NOPTTEL is what I have the most experience with. The NOPTTEL consists of an LED optical unit that mounts to the barrel of the rifle, an I-O box that connects the optical unit to a personal computer, and special reflective targets. When the NOPTTEL is in use, a light beam is sent from the optical unit and reflected from the special target. The reflected light is received by the unit and is converted to coordinates and, ultimately, a trace on the computer monitor. The optical unit also senses the vibration in the rifle during trigger break. This tells the unit when the shot has been "let go".

Once the hardware is setup and the software installed on the computer, the NOPTTEL is transparent to the user from shot to shot.

During the holding of the rifle on the target, but before the breaking of the shot, the NOPTTEL shows the location of the rifle aiming point by projecting a dot at the appropriate point on the computer monitor. For a lone user this has no practical purpose since the shooter, at that point, is looking through the sights of the rifle.

Once the shot is taken is when the NOPTTEL starts yielding useful information. Figure 1 shows a typical post-shot trace.

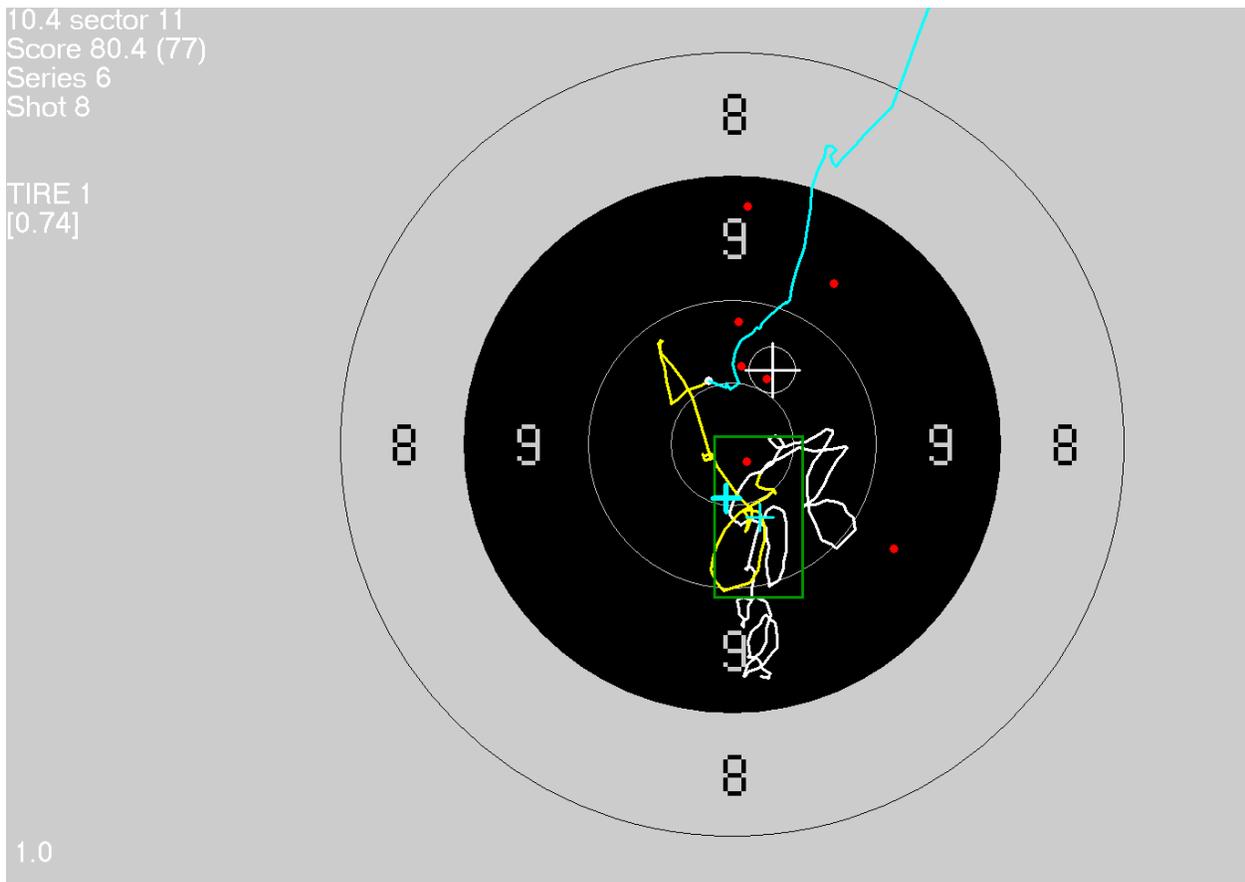


Figure 1

The shot trace consists of the pre-shot wobble (3.0 sec) and the post-shot follow through (1.0 sec). The pre-shot trace starts as white in color. At 1.0 sec before shot break the trace turns yellow and stays that color until the shot. After the shot the trace is blue to show follow through.

You will notice that, in addition to the shot trace, the screen also shows the location of the shot hit (just off the X-ring at 11 o'clock), location of previous shot hits, a description of hit location (upper left corner), score for the series, shot and series numbers, as well as other statistical

information. All of this information is provided for after each shot but its examination is best left for later during analysis of the training session.

The scoring done by the NOPTEL is based on decimal international competition scoring. This means that a shot within a scoring ring is scored higher the closer it is to the center of the target. In other words, a shot just outside the 10-ring would be scored a 9.9 while a shot just breaking into the black on the SR target would be scored a 9.0. If the shot is scored as a 10.5 or higher it is considered an X. The example shot in Figure 1 is just off of the x-ring at 11 o'clock; therefore it is scored as 10.4 sector 11. The NOPTEL also keeps track of shots using NRA Highpower integer scoring (10, 9, 8, 7, 6, 5).

During the course of the session the NOPTEL saves the shot information for all shots fired. Once the session is completed is when the analysis can begin. The Replay Manager allows the user to view any shot or series that is saved.

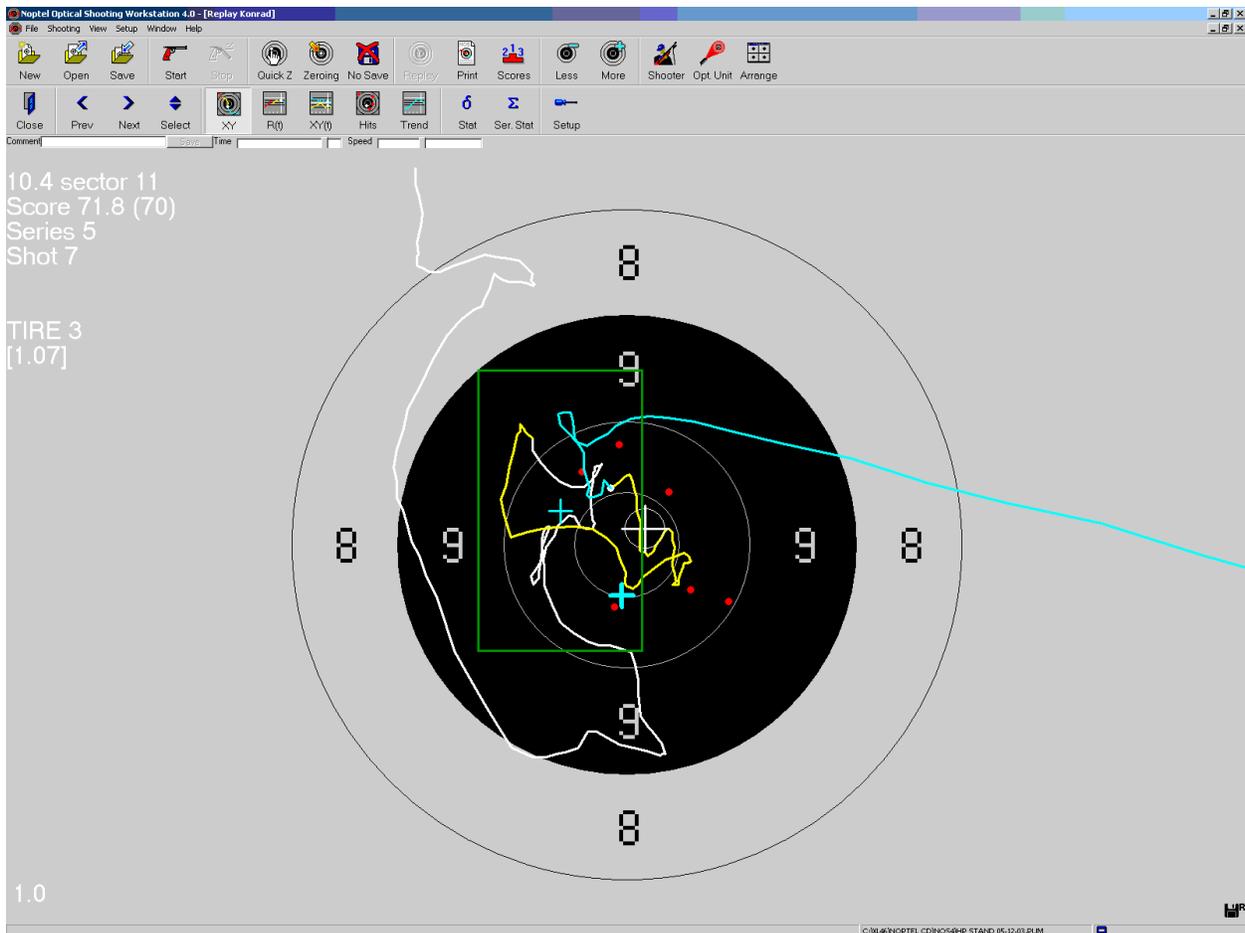


Figure 2

Figure 2 shows the target in XY replay mode. Slightly to the left of center is a rectangle. The width and height of this rectangle represent the standard deviation of the size of the hold during

the statistical time, which in this case, is 3 sec. The wider the rectangle, the more rifle movement there was in the horizontal direction during those 3 seconds. The taller the rectangle, the more rifle movement in the vertical direction. At the center of the rectangle is a cross that represents the statistical center of the wobble for that shot. Other information in this view is a thick cross in the bottom of the X-ring that shows the statistical center of the wobble for all shots in the series. A cross within a circle in the X-ring shows the center of the hits in that series.

Even though the graphical capabilities of the NOPTTEL are quite useful, sometimes we want to look at information in a way that the NOPTTEL can't provide graphically. This flexibility allows an analysis of specific areas of shooting technique. To get this flexibility the NOPTTEL provides a way of outputting the raw numerical data to a text file. This text data can then be imported into another piece of software, such as a spreadsheet. At that point the data can be sorted and graphed in a way that highlights the information to be examined.

Overview of the Shot Sequence

Before beginning an analysis of offhand shooting let's look at the sequence of events that lead to the making of a shot. While each individual has a unique way of holding and shooting a rifle in the standing position, the events that take place in the few seconds before the shot are consistent from shooter to shooter.

The shot sequence begins when the rifle is mounted in the shoulder and brought down to point in the general vicinity of the target. Since the rifle is now pointing at some point away from the center of the target, the shooter exerts muscular control over the rifle to approach the intended point of shot break. Keep in mind that when I use the term "approach" I am not talking specifically about the approach method that David Tubb is known for. I am saying that since the rifle starts out pointing somewhere other than the center of the target the shooter approaches the center using control over the rifle.

For many shooters the approach to the center of the target is not a simple affair. At times the rifle seems to have a mind of it's own, waving and wobbling around. Even though for some the wobble may be large and for others it is quite small, we are all endeavoring to bring the sights to a certain point on the target. This is the point where the shooter consciously or subconsciously decides that the sight picture is acceptable for the shot to break. While you may think that that point is the very center of the X-ring, this is not always the case. Due to our imperfections as human beings we realize that pointing at the exact center of the target may not be possible so we accept the hold that we have. Using this hold, the shooter looks at the sight picture and makes a decision to break the shot. How this decision is reached is dependant on the individual and his or her unique shooting style.

Once this acceptable sight picture is reached, our mind makes the decision to fire the rifle. At this point in time our bodies take over and a series of events take place within us. The final result of these interior actions culminates with the trigger finger placing enough force on the rifle trigger that the rifle goes off. Between the decision to shoot and the actual shot break is a lag called "reaction time". Human reaction time varies from individual to individual but is roughly ¼ seconds. Because of this, even if the shooting decision was made when the sight picture showed a perfect center shot, the rifle would not go off until about ¼ sec. later.

A lot can happen during this $\frac{1}{4}$ sec. reaction time and usually does. Because of imperfect hold the shot can wander from the point of decision. The rifle position can also be affected by less than ideal trigger control. Only with perfect hold and a trigger control that does not disturb the sights will the shot wind up at the same point that the shot break decision was made.

Although it takes place after the shot has already been made, follow through is still an important part of the shot sequence. Examining the final 0.5-1.0 seconds after the shot gives some insight as to the shooter's perception of that shot. A follow through wobble that is consistent with the pre-shot hold wobble shows that the shot break was an event that had little effect on the control that the shooter had over the rifle.

Training sessions to analyze the offhand shot

In an effort to make myself a better offhand shooter I wanted to use the NOPTTEL as a training aid and to assist me in examining my offhand shooting. All of the "firing" was done in my well lit basement using my primary Highpower Rifle, the AR-15 service rifle.

To more efficiently utilize the NOPTTEL and to make the statistics more meaningful, I came up with a plan for my training sessions. There would be 6 sessions with each session consisting of 60 dry-fire shots. This would give me a final total of 360 shots. By way of comparison, during the 2002 highpower season, I shot 620 record offhand shots. My feeling was that 360 statistical shots would be a good population to extract data from.

The six sessions took place from April 24 to May 12, 2003. Each session started with a confirmation that the NOPTTEL system was zeroed on my rifle. During the April 24 and April 28 sessions I fired 30 shots, took a break for a few minutes, and finished with the remaining 30 shots. The other four sessions had me shoot 3 groups of 20 shots each with a break between each. When using the NOPTTEL each shot is part of a larger group called a series. The maximum series size on the NOPTTEL is 10 shots. The series size only affects the raw scoring and not the shot statistics.

With a plan in place the sessions proceeded uneventfully. I tried to be consistent and focus on breaking good shots the same as I would at a match. Even when I took my time to break shots, I found I could shoot 20 shots well within my time limit.

Raw data from NOPTTEL

This, finally, brings us to the data that we will use for analysis. The most obvious data from each session is the score of each shot. The scores from all 36 series are listed below:

Session	Series 1	Series 2	Series 3	Series 4	Series 5	Series 6
4/24/03	93-1x	100-3x	98-5x	98-3x	98-5x	97-2x
4/28/03	96-4x	97-2x	98-1x	98-3x	99-4x	97-1x
4/29/03	97-3x	98-1x	99-5x	97-4x	99-5x	98-6x
5/3/03	99-3x	99-4x	97-2x	98-3x	99-2x	97-1x
5/11/03	96-3x	95-0x	98-2x	98-4x	99-1x	95-3x
5/12/03	98-3x	98-5x	96-0x	98-4x	100-1x	96-1x

Breaking down all these shots by the hit values gives us,

Shot Value	Quantity	Percent of total
X	100	27.8%
10	176	48.9%
9	81	22.5%
8	3	0.8%
Total	360	100.0%

Score wise the numbers seemed good. These 360 shots indicated that I am capable of averaging in the mid-190s in a 20 round offhand match, at least in my basement anyway. This is certainly good but by using additional statistical functions I had the opportunity to find out where I was losing those remaining five points.

While these numbers are what some people look for when using an electronic trainer, there is a lot of information beyond this. The additional information is sometimes unwieldy to view in the NOPTTEL program itself. That is why outputting the data to a spreadsheet via a text file can be more enlightening. In the second part of this article I will use the raw data extracted from the NOPTTEL. These numbers will be organized and graphed so that a trend can be seen and an analysis of my offhand shooting can be made.