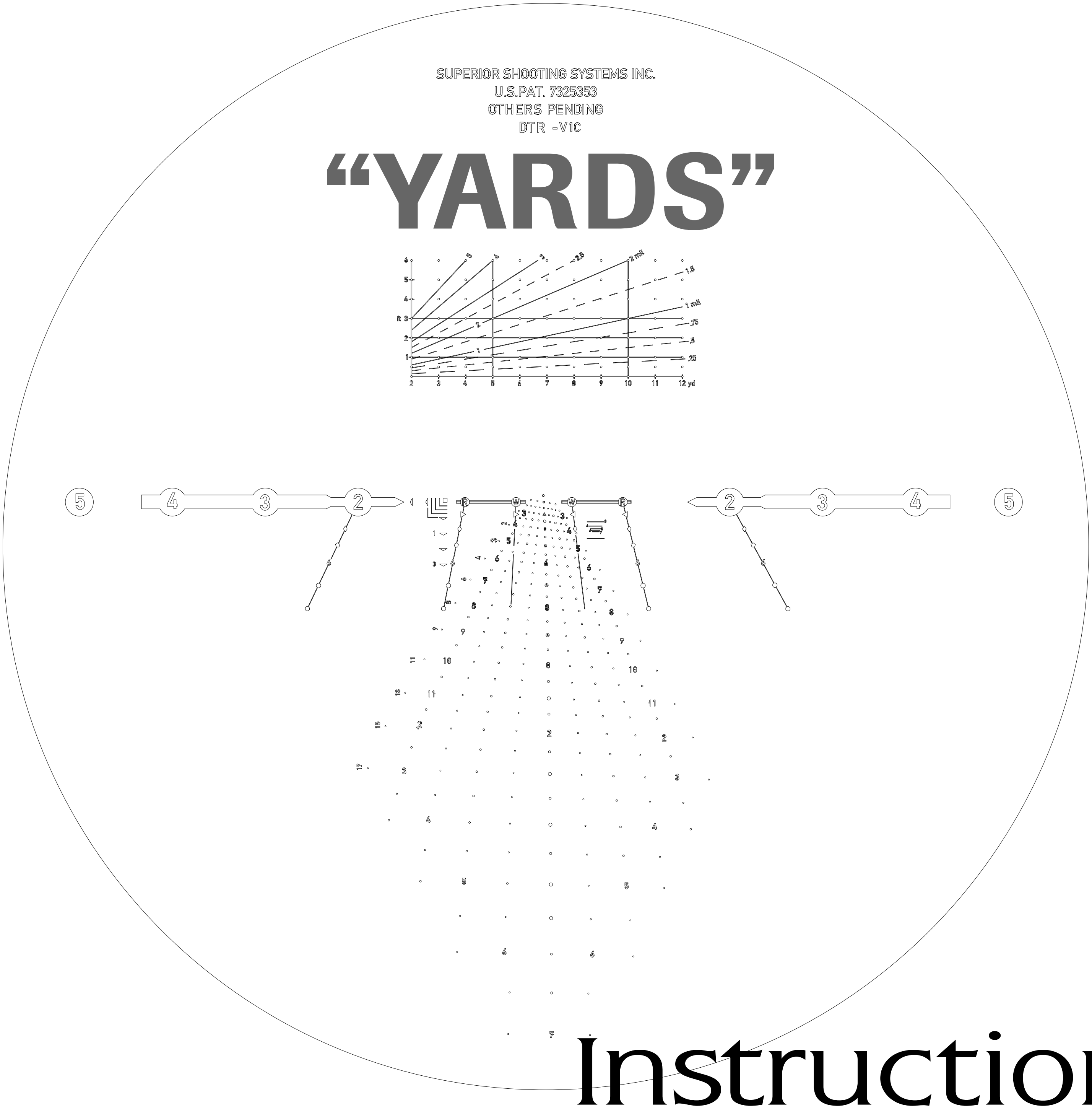
DYNAMIC TARGETING RETICLE

DTR™

WITH "AFS" (ANGLE FIRING SOLUTIONS) TEMPLATE



US PATENT
#7325353
OTHERS PENDING

Instruction Manual

YD VERSION

DYNAMIC TARGETING RETICLE

DTR™

Overview and Manual Content

Contents

DAVID TUBB (inventor of the DTR system) is one of the world's most accomplished rifle shooters. His wins include:

11 NRA National High Power Rifle championships at Camp Perry, Ohio (200, 300, 600 yards – fired from standing, sitting, and prone positions, plus rapid-fire events)

6 NRA High Power Long Range Rifle championships (with two national records, including a perfect championship aggregate score) at Camp Perry, Ohio (600, 800, 900, 1000 yards)

2 Wimbledon Cup titles at Camp Perry, Ohio (1000 yards)

1 Leech Cup title at Camp Perry, Ohio (1000 yards)

Including his numerous NRA High Power Silhouette and Smallbore Rifle titles, David has won over 40 open, individual National Championships.

FOR MORE INFORMATION ON THE SCIENCE, DESIGN, AND ADAPTABILITY OF THE DTR, DOWNLOAD OUR *REFERENCE MATERIALS* PUBLICATION AT WWW.DAVIDTUBB.COM

US PATENT #7325353, other patents pending

1 DTR Design Philosophy

David Tubb's Dynamic Targeting Reticle – **DTR** – is revolutionary and unique in many ways, most fundamentally because the firing solution is expressed in YARDS of range and MPH of crosswind velocity rather than angles (minutes of angle or MILS). Additionally the DTR provides automatic correction for spin drift, crosswind jump and dissimilar crosswind drift, none of which are provided by any other reticle. As a direct result of these unique capabilities, the shooter can develop precise long range firing solutions faster than with any other reticle.

The fact that this manual is probably the most lengthy and detailed ever written for a telescopic sight reticle might lead you to think that the reticle is hard to use. However, the truth is just the opposite: this manual is complex because the reticle automatically does so much for the shooter that explaining how it does it takes a big manual! The reason other reticles don't require complex manuals is that, by comparison to the DTR, they do very little *for* the shooter. If you are shooting a corresponding BC (ballistic coefficient) bullet and the muzzle velocity and current atmospheric conditions match your DTR's Nominal Assignment Value, all you have to do is call the range in YARDS and wind in MPH, place the dot(s) to center the target and release the shot. It is literally a point-and-shoot reticle out to the maximum range of your bullet. When any conditions change, it's very simple to reassign a density-corrected value to the DTR using an easy calculation. All the information you need is built into the scope itself. No other reticle even comes close to the DTR for providing extremely fast and precise dynamic targeting solutions.

Manual Organization

Section 2, DTR Overview identifies and then provides a look at each of the reticle's components.

Section 3, Using Your DTR contains the details required to use the reticle including determining range, air density, and angle firing solution.

Section 4, Usage Examples provides detailed examples of developing firing solutions.

Section 5, Density Adaptability discusses and illustrates the use of the DTR with different ammunition velocities and specifications.

Additionally, a detailed ***DTR Reference Materials*** manual provides basic information about air density, sensors, graphs, angles, ballistics, mounting the scope, zeroing, and more. This separate publication is available for download at **www.DavidTubb.com**.

1 DTR Design Philosophy

The design goal was to create a telescopic sighting system that encompasses the following attributes:

1. A system that is very quick to use and allows for shots from point blank range to well beyond 1000 yards. Time element was a huge factor in this design. Time is what wins most engagements.

2. A system that does not require an auxiliary computer or data book which take your attention away from the target and whose failure or loss would leave you ineffective.

3. A system that accommodates changing atmospheric conditions, allowing its use in any geographic location.

4. A system that provides the means to actually determine target range in YARDS, not just measure it in MILS or MOA.

5. A system that requires only the most simple of mathematical calculations by the user.

6. A system that uses miles per hour (MPH) for windage — no MILS or MOA conversion needed (call in MPH, hold in MPH)

7. A system that accounts for the boundary layers of wind flow.

8. A system that accounts for Spin Drift thus giving the user a true No Wind Zero at each central aiming dot.

9. A system that accounts for Crosswind Jump (lift) of the bullet as it undergoes crosswind deflection.

10. A system that accounts for Dissimilar Wind Drift (DWD) (a right-hand wind will drift a right spinning bullet further than a left-hand wind).

11. A system that allows effective elevation hold points with no external corrections under all atmospheric conditions.

12. A system that provides angle firing solutions without referencing cosines by using a simple Hold Closer Distance method.

Meeting all these goals was accomplished by employing one simple solution:

Providing graphs etched into the scope body and in the reticle itself to facilitate most ranging and ballistic computations. This allows the user to make accurate compensations for varying shooting conditions without looking away from the scope. Graphs are powerful tools to display reference data and perform “no math” computations.

1 DTR Design Philosophy

There are many factors that influence the flight of a bullet. The goal is always a quick, accurate shot.

Our goal with the Dynamic Targeting Reticle was to develop a system that takes virtually all influential factors into account, addresses them, and provides "on the fly" compensations so the operator may quickly and accurately determine the firing solution. This "equation" gives you an idea of all that is at work. With the DTR, instead of these factors working against you and requiring excessive calculations, they now work for you — automatically!

The flat-fire trajectory (no firing angle) of a projectile can be characterized as follows: Note that DTR-preferred nomenclature is in italicized wording.

[The Complete Flat Fire Trajectory (*Bullet Flight Phenomenon, no angle*)] = [The Flat Fire Point Mass Trajectory (*Bullet affected by gravity and air density*)]

\+ [Lateral Throwoff]

\+ [Aerodynamic Jump (*Crosswind Jump*)]

\+ [Epicyclic Swerve (Coreolis effect) (*Other small aerodynamic forces*)]

\+ [Drift (*Spin Drift*)]

\+ [Dissimilar Wind Drift]

Note: Skeptics may disagree, but our own tests and the work of others has convinced of the influence of Dissimilar Wind Drift.

Source credit: "A Hybrid Supersonic/Subsonic Trajectory Model for Direct Fire Applications"
Paul Weinacht, Army Research Laboratory

2 DTR Overview

Several DTRs are available for a number of popular bullets. This particular manual is for a .308, 175 gr. Sierra Match King bullet, scope 2.75 inches over bore centerline and a 100 yard zero. The bullet path will match the reticle at the following combinations of muzzle velocities and air densities:

0k DA = 2675 FPS
1k DA = 2650 FPS
2k DA = 2625 FPS
3k DA = 2600 FPS
4k DA = 2575 FPS
5k DA = 2550 FPS
6k DA = 2525 FPS
7k DA = 2500 FPS
8k DA = 2475 FPS
9k DA = 2450 FPS

Nominal Assignment Values (NAV)

A card is provided with each scope which defines the bullet path values (come-ups) at 100 yard intervals. When you set up your rifle system, you chronograph your rifle and pick the Density Altitude number which matches rifle velocity. These conditions which result in a bullet path that matches the reticle is referred to throughout this manual as the “Nominal Assignment Value” (NAV). This is a velocity-based assignment value and literally is your “nav point” for using the DTR. The scope legend, viewed by zooming back to the minimum magnification, shows the model and revision number of the reticle from which can be determined the main conditions which match the reticle. When you shoot at different Density Altitude numbers you will use the Air Density Correction (ADC) numbers to the left of the reticle to make an effective hold point calculation.

The illustration on page 7 indicates several elements of the reticle:

1. **Aiming Dots —** Elevation and windage aimpoints.
2. **MIL Scale —** Object subtension measurement for range calculation.
3. **MIL Range Graph —** Measured Distance (Slant Range) determination.
4. **Air Density Graph —** Density Altitude determination (etched onto scope body).
5. **Angle Firing Solution —** Uphill/Downhill compensation (etched onto scope body).
6. **“One Foot” Rangefinder —** Position a one-foot tall object on the bottom line, read the range in hundreds of yards along the line that touches the top of the object. Each line is also one foot in width at those distances, so they can function on horizontally-oriented objects.

This section provides a brief introduction to each of the reticle’s main features at a summary level of detail. Section 3, “Using the DTR” contains the details required to use the reticle. Section 4, “Usage Examples” provides detailed examples of developing firing solutions. Note that the illustration on page 6 is how the composite reticle appears when viewed through the scope at minimum power.

Next we’ll look at DTR components in more detail.

2 DTR Overview

❶ **Aiming Dots —** Elevation and windage aimpoints.

❷ **MIL Scale —** Object subtension measurement for range calculation.

❸ **MIL Range Graph —** Measured Distance (Slant Range) determination.

❹ **Air Density Graph —** Density Altitude determination.
[ETCHED ONTO SCOPE BODY]

❺ **Angle Firing Solution —** Uphill/Downhill correction.
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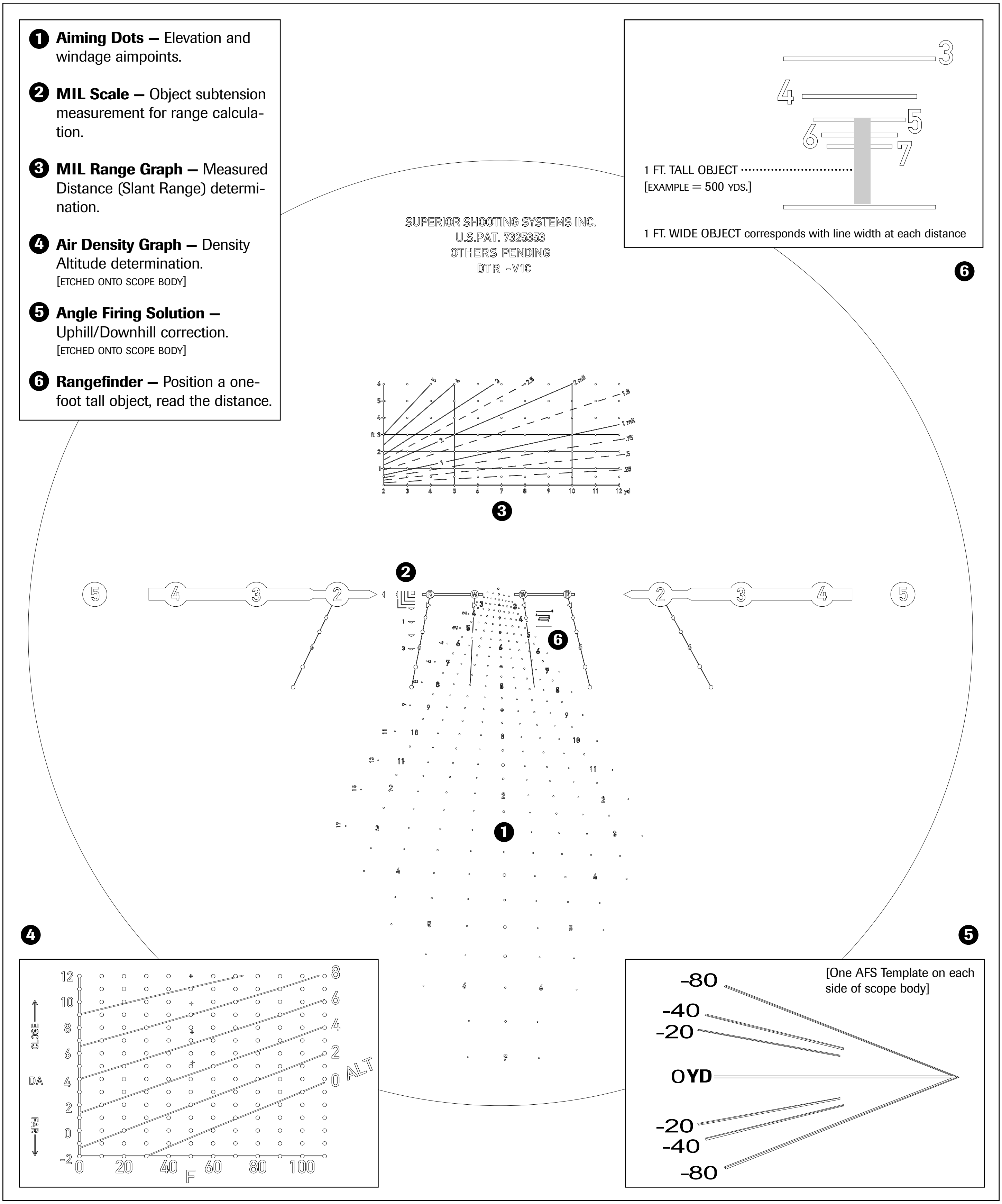
❻ **Rangefinder —** Position a one-foot tall object, read the distance.

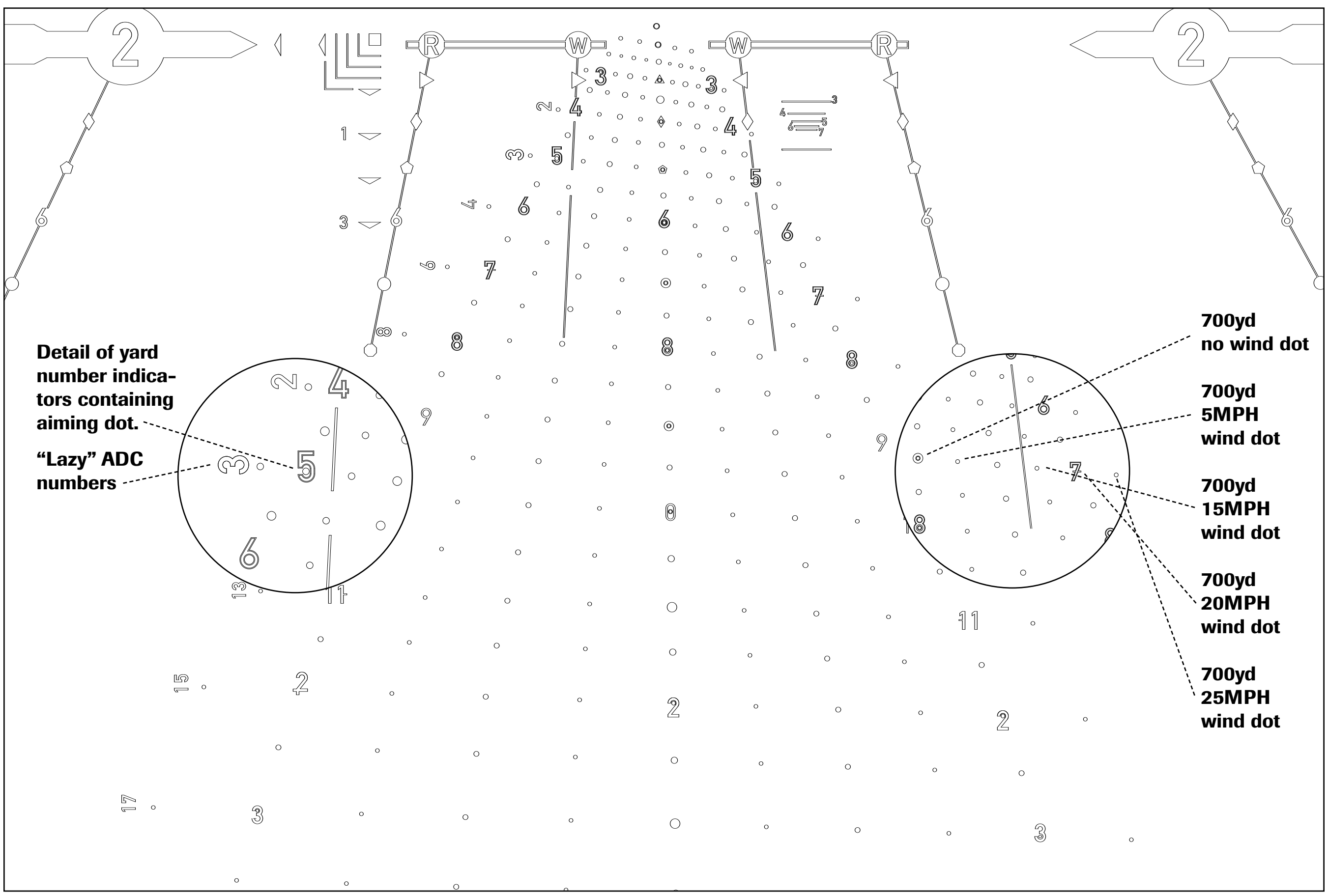


2 DTR Overview

Aiming Dots / Spin Drift

Each DTR is a bullet-drop compensated reticle. The DTR in this manual was designed for a 175gr .308. It is perfectly useable with other combinations, and adapting your DTR to accommodate another combination is discussed later in this manual. The aiming references are displayed in YARDS of range and MPH of cross wind rather than angles (MOA or MILS). The primary objects are the aiming dots arrayed in a column marked with yard markers at 100 yard intervals with 50 yard dots in between as shown. Rifling produces gyroscopic stability. The spin imparted to a bullet is kind of like a curve ball thrown by a pitcher in that the direction of rotation influences its flight. Notice that the central column of aiming dots does not go down in a straight line (as in other reticles). This line slants toward the right to correct for Spin Drift of the bullet (the reticle is designed for right-hand rifling twist). This correction is important at ranges as close as 500 yards. At maximum range, this correction can equal several MOA. No other reticle provides Spin Drift correction. Spin Drift is crucial in accounting for your TRUE “No Wind Zero” (no wind conditions) at distance. The bullet drifts in the direction of the rifling twist. Right twist = Right drift.

Starting at 250 yards, windage hold points are placed in 5 mph increments, each 50 yard increment. Numbers, starting at 3, represent the 100s of yards for a given row of aiming dots; these also function as



Spin Drift curve is a parabolic curve. The longer the Time of Flight (TOF) the greater the lateral drift of the bullet. A .308 Sierra 175gr at 2600 fps in a 12-twist barrel has approximately 10 inches of lateral movement at 1000 yards from spin drift alone.

the 20 mph crosswind dots. Each number contains a dot or cross which is the aiming point.
There are 25 mph aiming dots each 100 yards; these dots are outside the yard number. (**Note:** Central dots subtend 1/2 MOA; wind dots subtend 3/8 MOA.)

Placement of the windage hold points in the DTR address two other phenomenon which are not included in any other reticle; Crosswind Jump (CJ) and Dissimilar Wind Drift (DWD).

Crosswind Jump (CJ) — Gyroscopic and aerodynamic effects together cause a right-hand spinning bullet to strike higher in a right crosswind and lower in a left crosswind; the higher the wind velocity the larger the CJ. A ten mph crosswind at 200 yards will give an impact shift of 3/8 moa, which is 0.75 inches change of the point of impact. Increase wind velocity to 20 mph and the CJ increases to 3/4 moa, which is an impact point change of 1.5 inches. Thus, the wind drift hold points are high on the left and low on the right resulting in a tilted or angulated array.
(References: Harold Vaughn "Accuracy Facts," and McCoy "Applied Ballistics," plus our own tests.)

Dissimilar Wind Drift (DWD) — Based on rigorous testing, it can be authoritatively stated that right-hand spinning bullets are deflected more by a right crosswind than by a left crosswind; and conversely for left-hand-twist barrels. Exhaustive, precise firing data have recently reconfirmed this phenomenon. Simultaneous (volley) firings were used to evaluate both left and right crosswind conditions using paper targets with both right-twist and left-twist barrels on otherwise identical TUBB 2000 rifles at long ranges. Thus the windage dot placement on the reticle is not symmetrical. With a right-twist rifle, right wind deflections (on the left side of the reticle) are significantly larger than left wind deflections (virtually all rifles have right-twist barrels). To put this in perspective, say we are shooting a .308 in a 10 MPH crosswind at 1000 yards. For this right-twist barrel, if it's a left wind rather than a right wind, the difference is equivalent to having +200 FPS muzzle velocity increase or the target being 100 yds closer. The Dissimilar Wind Drift phenomenon is **completely** independent of spin drift.

The DTR provides an additional targeting aid found on no other reticle: aiming references for moving targets that are located along a horizontal line adjacent to the central 200 yard aiming dot. These are for 3MPH (walking); 9MPH (running); and also 20MPH, 30MPH, 40MPH, 50MPH lead aiming points.

Range Measurement

Managing range requires three steps:

1. Determine the Measured Distance (Slant Range). (It may help to think of this as the *perceived target distance.*) Use a laser rangefinder for best accuracy, or MIL it using the system provided within your DTR.

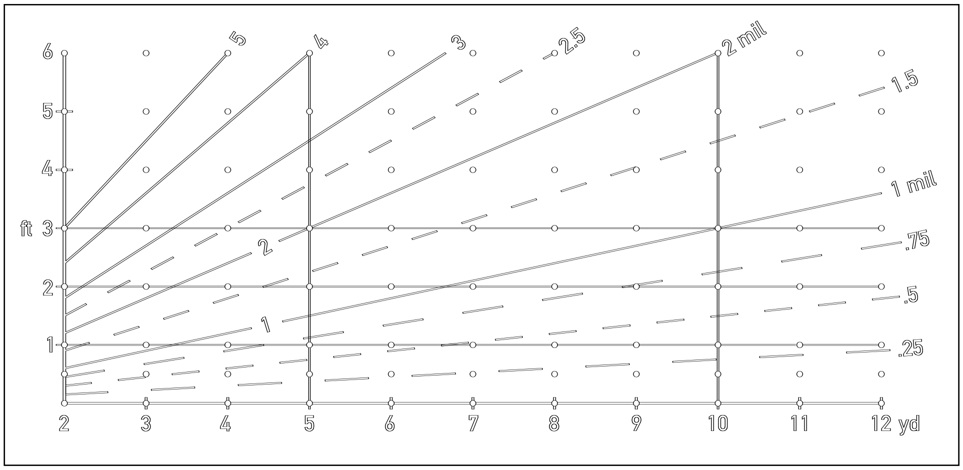
2. Determine the Density Corrected Hold Point which is the Measured Distance (Slant Range) adjusted for off-nominal air density (ADC#). This is discussed in Section 3.

3. If there is a measurable uphill or downhill angle, determine the Hold Closer Distance which is the Density Corrected Hold Point adjusted for the effects of the slope on the bullet path. (It may be helpful to think of this also as the *true ground range.*) Use your AFS Template (shown on the next page). This, in conjunction with your wind hold, then becomes the Effective Hold Point (EHP).

The DTR provides ranging capability with two features: the MIL Scale (shown on right) and the MIL Range Graph (shown in detail on the next page). With the scope set at a medium power (8X) the MIL

2 DTR Overview

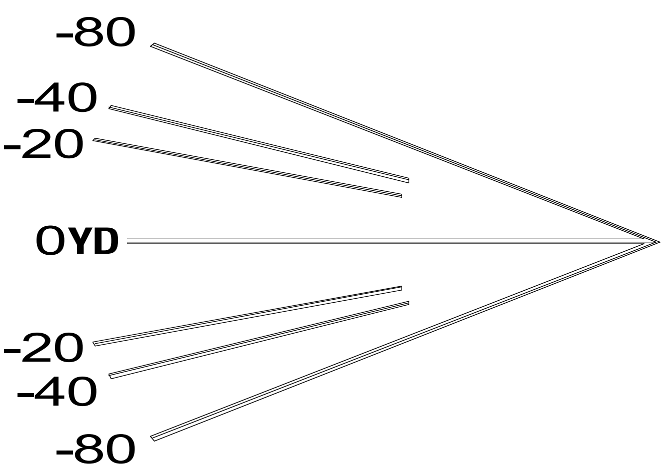
Scale is visible to the left of the horizontal stadia line. The triangle markers are separated by one MIL (3.6 moa) and the lines are 1/4 MIL. Then once the subtended angle of the object of known size is determined, the MIL Range Graph, visible at low power above the aiming dots, is used to determine Measured Distance.



Angle Firing Solutions

The DTR provides all the solutions to correct for the effect of elevated or depressed targets — angle firing. The Angle Firing Solutions Template (AFS) engraved on your scope simplifies angle shooting by eliminating any need for cosine calculations. No other reticle offers this feature. The AFS Template is all that is ever needed for 99-percent of shots (up to 1000 yards, up to 30°). For shots between 300-1000 yards (.308 x 175gr), this built-in reference estimates the uphill or downhill angle and the effect of that slope on the bullet. The slope can be quickly and accurately estimated using the AFS Template ("Hold Closer Distances") marks etched into each side of the riflescope tube simply by picking the level AFS Template line when aiming at the target. More efficient calibers allow AFS usage through 1200 yards.

The Hold Closer Distances approach lets you quickly see the effect your firing angle will have on your Effective Hold Point (EHP). Each line represents an angle shot wherein you must "hold closer" by the amount indicated on the level line — -20, -40, -80 yards. For example, if one of the "20" lines is horizontal, reduce your EHP by 20 yards — whether shooting uphill or down. If one of the "40" lines is level, reduce by 40 yards. Sighting level between lines allows you to interpolate other hold points. If the horizon is between the "0" and "20" lines, subtract 10 yards from the EHP, and so on. If the angle is less than 10 degrees, simply hold the degree. For example, 6° = 6 yards Hold Closer Distance up to the effective range.



At first glance this approximation may seem incorrect since we all know that the correction depends on the range to the target. However, this unique AFS feature is based on the fact that the CORRECTION FOR ANGLE at a given range changes surprisingly little as the ANGLE changes. This concept is developed more completely by an error analysis included in this manual on pages 15-16.

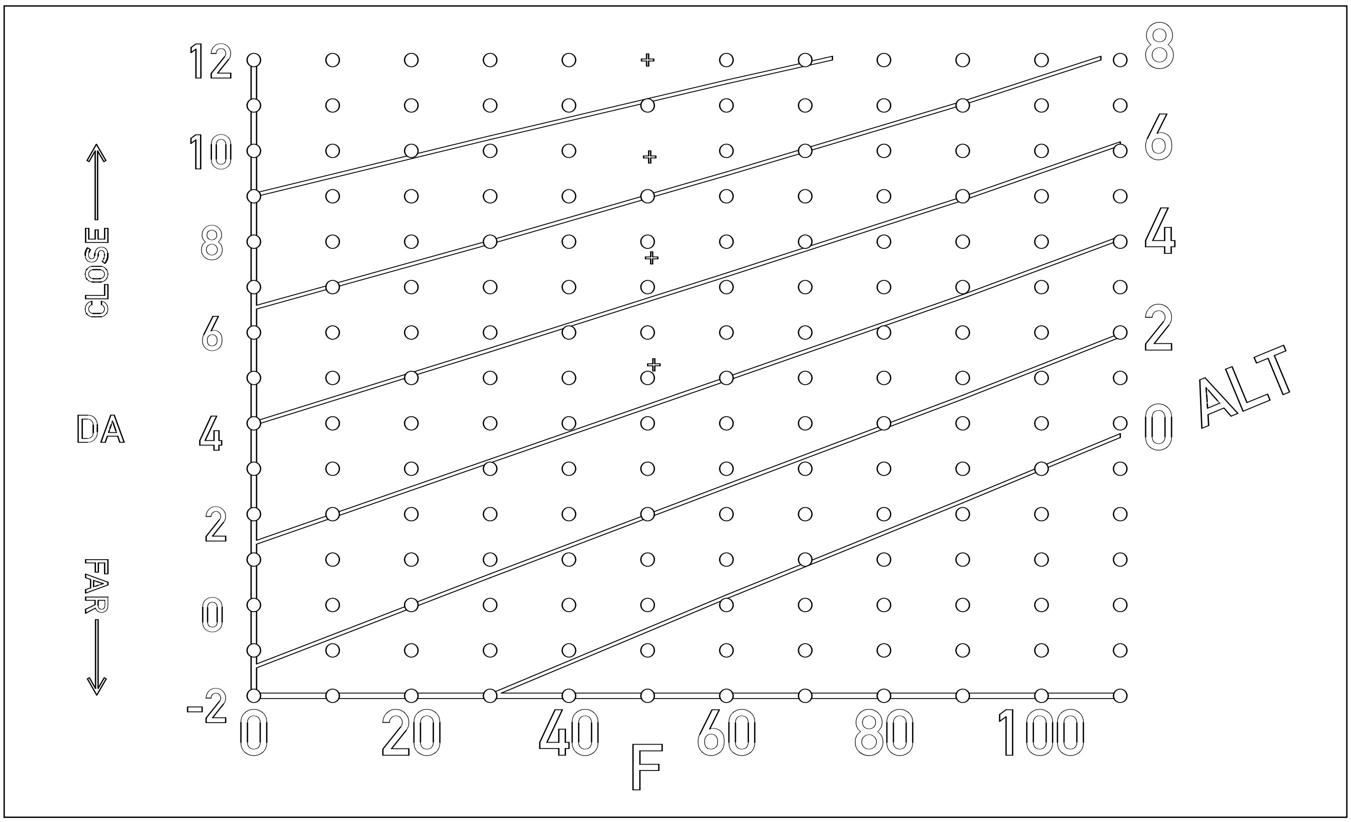
A DTR Angle Firing Solutions Card is included with your scope for shots over 1000 yards and/or angles greater than 30°.

2 DTR Overview

Air Density

A good understanding of air density is necessary to get the best performance from your DTR because density variations dramatically affect the bullet path. We recommend the use of a portable electronic weather station such as the Kestrel 4250 to determine the air density. However, if none is available, the Density Altitude Graph shown below allows you to estimate the density of the air.

As noted, your DTR will provide accurate targeting over a large range of density and muzzle velocity combinations so operating in air of different density is no problem. If you know the geographic altitude and the temperature, you can approximate Density Altitude with the graph. The next section, Section 4 “Usage Examples,” contains more detail plus an example. There is also more information in the *DTR Reference Materials* publication.



Dissimilar Loads

While each DTR is optimized for a specific bullet and velocity range, any of our reticles will provide excellent results when used with any combinations of ballistic coefficient and muzzle velocity. This reticle is useable with any bullet. The trajectory on which each reticle is based is shown on the 9-o’clock side of your scope; thus, infinite compatible sets of BC, velocity, and air density can be easily determined using the DTR Ballistic Program.

Now that you are familiar with the components contained in the DTR, and their function, following the next section guides you through their use. We’ll also describe a few other features built into your DTR.

This section describes in complete detail the steps required to develop a field-expedient firing solution.

3 Using Your DTR

We assume that you are going to be in a dynamic environment where the conditions change rapidly especially the range as often happens in hunting situations. Additionally, wind and sometimes slope change quickly. Factors which don't normally change quickly are bullet type, velocity, and air density.

The need for accuracy is a given; it's probably the most talked about characteristic of any weapon. However, of equal importance and less often discussed is the need for speed. Prior to the development of the Dynamic Targeting Reticle, the requirement for extreme accuracy and speed were usually mutually exclusive.

Preparation

The following describes the process of defining the correct aiming dot for a complex firing solution. Assuming that you have become familiar with your rifle's velocity and have assigned the reticle a value based on that velocity and current temperature if using a temperature-sensitive propellant, the sequence is:

1. Know the *current* air density (DA). This is likely to be different than your reticle Nominal Assigned Value (NAV).

2. Determine the Measured Distance to the target, in YARDS (Slant Range, perceived target distance).

3. Determine the Density Corrected Hold Point by correcting for air density (DA):

DISTANCE IN YARDS = (**NOMINAL DA** or **NAV – CURRENT DA**) x **ADC#** ["Lazy Numbers" next to yd.# indicators]

YD = (**FACTOR#**) x **ADC#**

Simplified: YD = FACTOR# x ADC# **Factor Number can be positive or negative!**

4. Determine the wind hold in miles per hour (MPH) corrected for vector (fractional) angle if wind direction is not 90° (true crosswind).

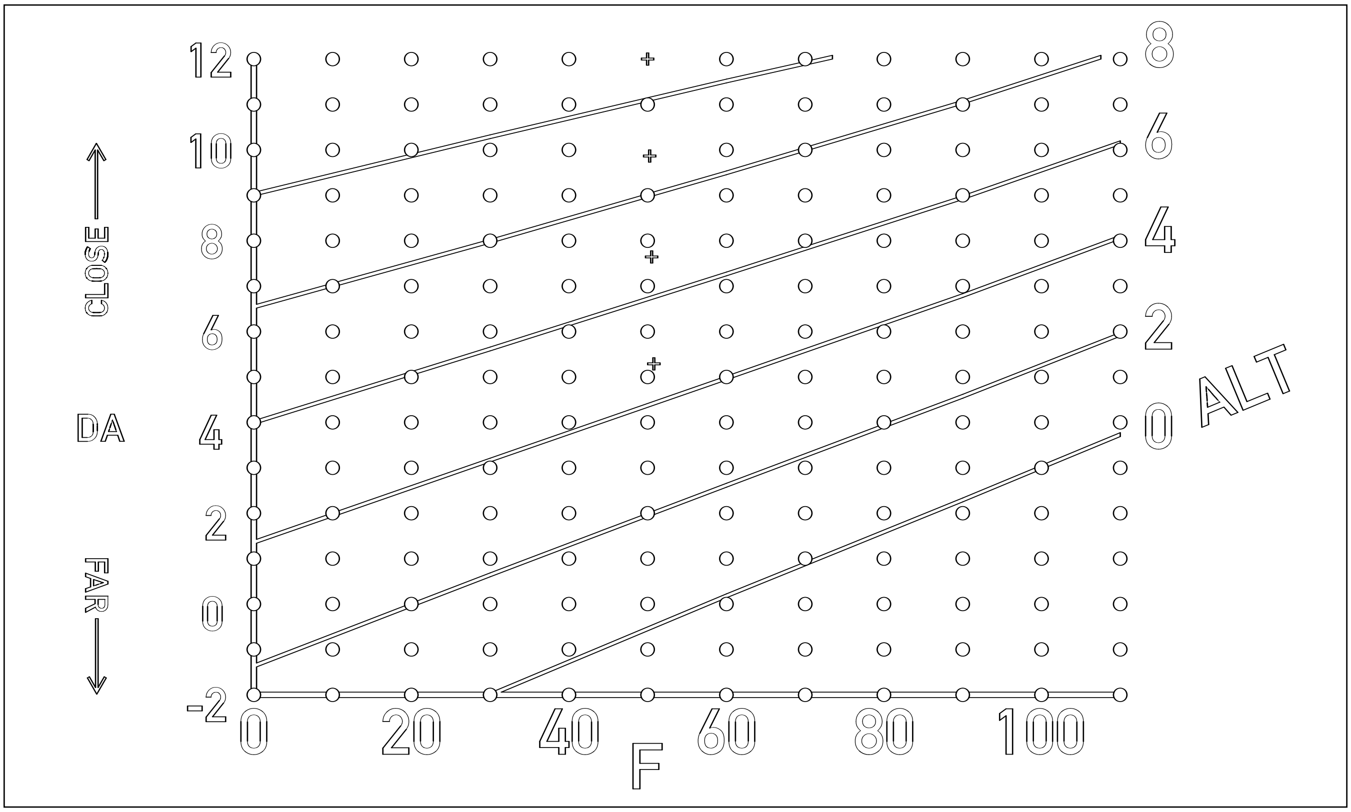
5. If there is a measurable uphill/downhill angle, use the AFS Template to determine your Hold Closer Distance.

6. Select the Effective Hold Point (EHP) aiming/hold location and release the shot.

The reticle will *automatically* compensate for Spin Drift, Crosswind Jump, Dissimilar Wind Drift, and Boundary Layers of wind flow. Further, the DTR eliminates the need to make adjustments with the elevation and windage knobs so time is saved and a major source of errors is totally eliminated. Elevation and windage knob adjustments contribute errors: 1) The range has to be converted to either MOA or MILS, 2) the knob has to be set to the desired value, 3) all adjustment mechanisms have errors due to both non-linearity's and hysteresis, and 4) all reticles have to be reset to zero after the shot — which can be either forgotten or reset improperly, especially when the returned zero is mistakenly set one revolution off. External knob adjustment is a liability from several aspects of zero stop slipping, to being damaged by impact, to leaking moisture from a bad seal. DTR can utilize capped knobs since once your scope is sighted in there is NO NEED for external adjustments, removing external knobs removes chance of damage. This is one of the major advantages to the DTR system.

Density Altitude Graph

To accurately employ the DTR, you must be aware of current air density because it affects the bullet path, especially at intermediate and long ranges. You should determine the air density before taking the field so you will be ready to shoot immediately. You should monitor the air density during the day and make appropriate corrections to your firing solutions. We recommend the use of a Kestrel 4250 "Pocket Weather Station," or similar device. Should you not have one or it becomes inoperative, we have developed the Density Altitude Graph (shown below) which provides an adequate estimation of the current air density. This graph is etched into the body of your scope for easy reference.



The Density Altitude Graph will read air density in ICAO Standard Atmosphere which reads density in thousands of feet of altitude, abbreviated as DA (Density Altitude). The density of sea level air at 59F is 0KDA. The density of air at 4,000 ft. and 43° F is 4KDA, etc.

To use the Density Altitude Graph, locate the current temperature along the bottom axis (in degrees Fahrenheit) then move straight UP until you come to your current geographical elevation above sea level (SL) as depicted by the angled lines. These are drawn every 2000 feet of elevation, so just interpolate between these lines to estimate your specific elevation. You now move straight across to the left axis to read the air density in Density Altitude (KDA, in thousands of feet). In the early mornings the air will be more dense because the air temperature is lower. Then as the temperature increases the density altitude will increase. True air density will decrease. The air density should be determined prior to getting ready to shoot and should be monitored throughout the day.

Every 15 degrees temperature = +/- 1KDA movement.

3 Using Your DTR

If the local air density is substantially different than that for which your rifle system is set up, the bullet path will not match the reticle; the point of impact will be higher in less dense air and lower in heavier air. The reticle provides Air Density Corrections (ADC) that are easy to use. The ADC's are located to the left of the range numbers on the left side of the reticle. They stand out visually because they are oriented vertically (i.e., rotated 90 degrees, a "lazy number"). The ADC is the compensation in yards for the error caused by the air being one one thousand feet of density altitude from Nominal Assignment Value (NAV). The ADC in yards is then either added to or subtracted from the Measured Range in order to determine the Density Corrected Hold Point. Subtract the ADC from the Measured Range if the air is less dense than nominal assigned value / add if the air is more dense.

Elevation Range

Once you have determined the density the next step is determining which range dot to select. There are three intermediate steps involved: **1)** Determine the Measured Distance (Slant Range) (the perceived target distance), **2)** Determine the Density Corrected Hold Point which is the Measured Distance (Slant Range) compensated for off-nominal air density, and, **3)** If there is a measurable uphill or downhill angle, determine the Hold Closer Distance (determined by using the AFS template) which, in conjunction with your wind hold, becomes your Effective Hold Point (EHP).

A laser rangefinder will provide the most accurate Measured Distance (Slant Range). If none is available, the DTR provides a way to estimate range without the use of an electronic range finder by using the MIL Scale and the Mil Range Graph. First use the MIL Scale to measure the subtended angle of an object of known size near the target. A MIL is an angular measure and subtends 3.6 inches for every 100 yards of range. Thus, 1 MIL at 200 yards subtends 2 x 3.6 = 7.2 inches. 1 MOA subtends 1.047 inches for every 100 yards, so 1 MIL equals 3.438 MOA. There are a couple of points that will help you range more accurately:

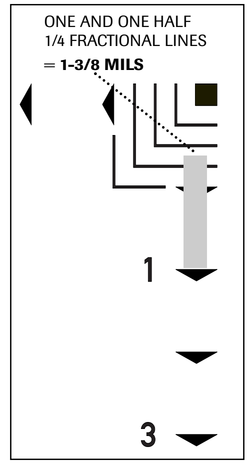
1. **Always MIL as large of an object of known size as you can.** For example, if your target is a coyote with a chest height of ten inches, but he is next to a fence you know is four feet tall, then you will be more accurate if you MIL the fence post rather than the coyote

2. **Always try to MIL a vertical target rather than a horizontal target.** This is because, usually, the uphill/downhill angle is less of a factor than whether the target angle is perpendicular to you. For example, let's say you have a windmill and you know the diameter of the blades is 6 feet. Thus, we know the object we are going to MIL is 6 feet tall and 6 feet wide. Suppose the wind is coming over your right shoulder. This turns the blades so we see it being taller than it is wide. Thus, the width of an object in a perspective view is not the true dimension. A severe uphill or downhill target will present the same problem in a vertical direction.

The DTR provides a MIL Scale for measuring the subtended angle of an object (space it covers) in MILS which is accurate to approximately 1/8 MIL. Each axis has four lines, each of which is spaced in 1/4 MIL increments which allow measurement your target to 1/8 MIL resolution, or better (in between 1/4 MILS = 1/8 MIL resolution).

3 Using Your DTR

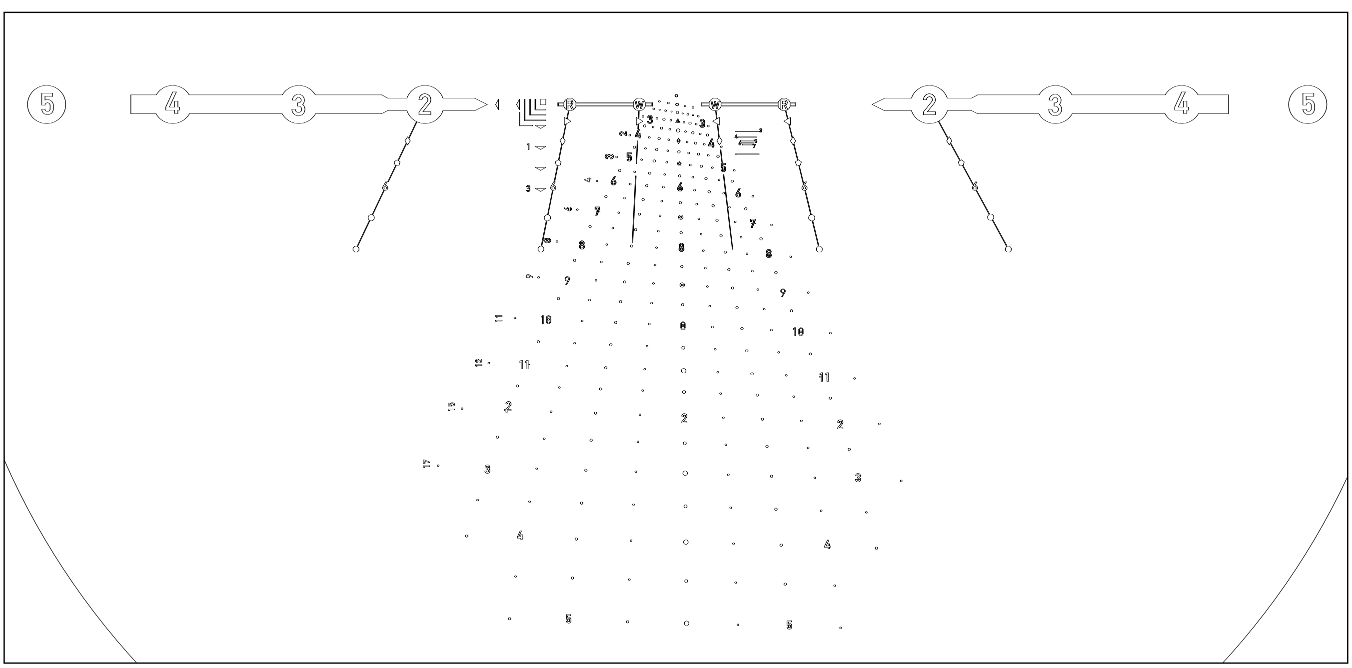
Position the bottom of your object (vertical orientation) or left edge (horizontal orientation) on a whole MIL mark so that the object extends up into the 1/4 MIL stadia lines; these are the L-shaped marks, each space is 1/4 MIL (a half space is 1/8 MIL). Read the fractional portion of your MIL measurement at the top or left edge, as shown.



Take the subtended angle of the object measured in MILS to the MIL Range Graph which is located directly above the central aiming dots. Find the known size of the object on the left vertical axis and then follow that horizontal line to the right until you intersect the subtended angle in MILS (these are indicated by the angled lines). You may or may not be directly on a MIL reference line so you must use your judgment to interpolate the correct point. From this point go straight down to read the distance in hundreds of yards to the target. Again, judgment is necessary to estimate location along the scale and determine the reading.

An additional lateral aiming device is included for moving targets. Above the central horizontal stadia line you will see an "R" and a "W" in circles. These are approximate hold points for a running (R) or walking (W) target out to 800 yards. DTRs have a third pair of lead lines which are for a sprinting target. Actual target movement speed, angle of target movement (whether perpendicular to the shot) and your reaction time all affect how accurate these will be. Along with the bold leveling stadia, these also help to engage close targets at lower power settings. Included are W(alk) = 3MPH, R(un) = 9MPH, plus 2(0), 3(0), 4(0), 5(0)MPH lead points.

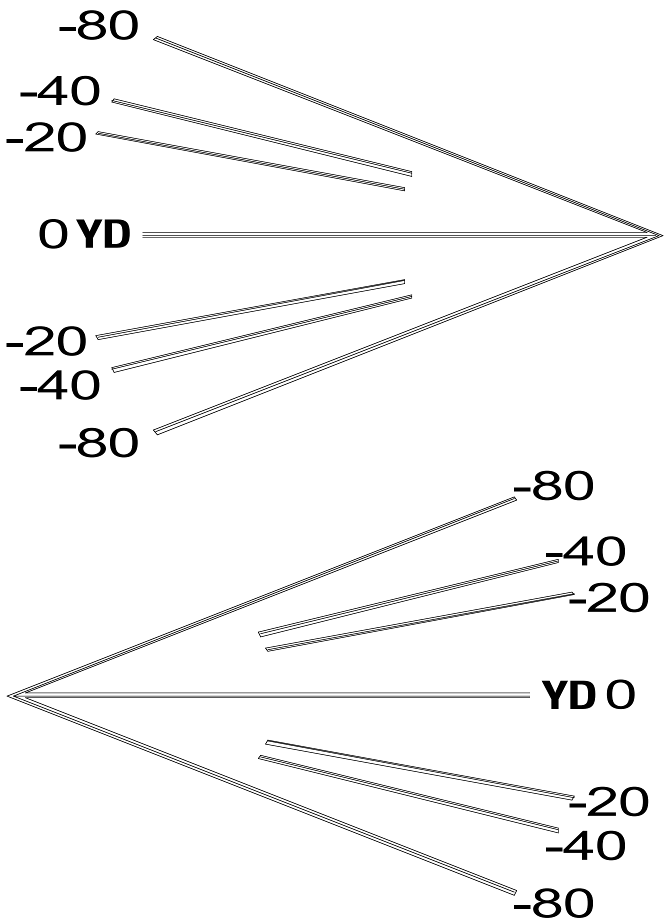
DTRs provide an indication of the maximum reliable range in several ways. The range dots are not numbered past the transonic region. In others, the leading number "1" is dropped so that at 1200 yards the hundreds of yards value reads "2" instead of "12". The rows of dots are still spaced in 100 yard increments for use as desired.



3 Using Your DTR

Angle Firing – Determined by using AFS Template

The most accurate method of measuring slope (firing angle) is with an electronic range finder that has a slope angle feature. If none is available there are lines etched into both sides of the exterior tube of the DTR riflescope that can be used as an angle reference to estimate the slope (Hold Closer Distance). Simply determine which line appears the most nearly level when the target is viewed through the scope from firing position. You then have the necessary information to make quick and easy hold adjustments using the aiming dots. “-20, -40, -80” are the compensations in yards that correspond with slope angles of 15, 20, 30 degrees.



Note: AFS Template is for shots up to 1000 yards and/or 30° angle using a .308. Determine which line is level and interpolate the Hold Closer Distance number if in between lines. Tests have shown that experienced users can estimate to within a few degrees.

Depending on caliber (ballistic performance), if greater than 1200 yards or greater than 30° angle, use the DTR Angle Firing Solutions Card included with your scope.

Following is an error analysis of the effect of slope using this **20/40/80** approximation using a .308 with a muzzle velocity of 2600 fps and a 175gr Sierra bullet, which would be the Nominal Assignment Value (NAV) on the DTR at 3KDA.

Referring to the tables on the following page —

1. First column is the true range (Measured Distance) in yards, “R nom”
2. Second column is the range adjustment in yards, “R adj”
3. Third column is the resulting adjusted range in yards, “R adjstd”
4. Fourth column is the come up in MOA for the adjusted range, “Y adjstd” using the normal Y equation and zero slope
5. Fifth column is the slope angle “A” which results from using the Y adjstd and the true range range adjustment -20y. This process was repeated for each range adjustment; the fourth table is based on -10y.
6. Sixth column “IMPACT” shows the impact change “error” from the actual angle being shot in inches on target.

15 DEGREE (up or down)
Computing first the -20y adjustment by solving the Y equation for A.

R nom	R adj	R adjstd	Y adjstd	A	IMPACT
300	20	280	3.4	19.9	.6 " LOW
400	20	380	6.4	18.6	.8 " LOW
600	20	580	13.6	16.5	.6" LOW
800	20	780	22.5	15.2	EXACT
1000	20	980	33.7	14.4	1 " HIGH

20 DEGREE (up or down)
Computing the -40y adjustment by solving the Y equation for A.

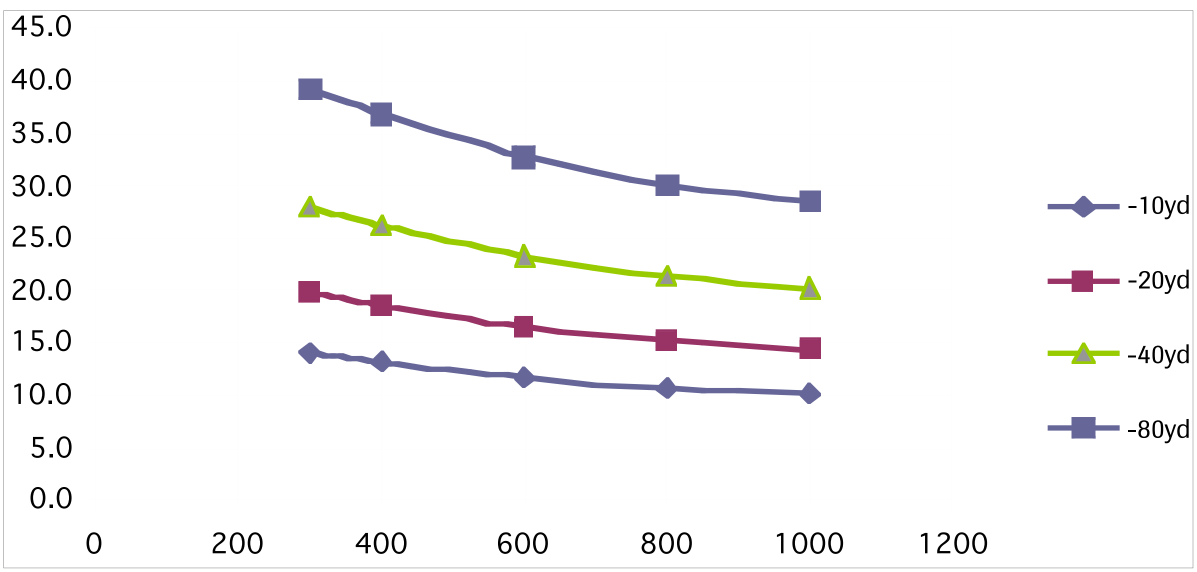
R nom	R adj	R adjstd	Y adjstd	A	IMPACT
300	40	260	2.8	28	1.5 " LOW
400	40	360	5.7	26.2	2 " LOW
600	40	560	12.7	23.3	2.4" LOW
800	40	760	21.5	21.4	2.4" LOW
1000	40	960	32.4	20.3	EXACT

30 DEGREE (up or down)
Computing the -80y adjustment by solving the Y equation for A.

R nom	R adj	R adjstd	Y adjstd	A	IMPACT
300	80	220	1.9	39.2	2.1" LOW
400	80	320	4.5	36.9	2.8" LOW
600	80	520	11.2	32.8	3" LOW
800	80	720	19.6	30.1	EXACT
1000	80	920	30	28.5	6" HIGH

10 DEGREE (up or down) (Illustration only, no line in AFS Template)
Adding a -10y curve

R nom	R adj	R adjstd	Y adjstd	A	IMPACT
300	10	290	3.7	14.1	.3" LOW
400	10	390	6.7	13.2	.4" LOW
600	10	590	14	11.7	.6" LOW
800	10	790	23	10.7	EXACT
1000	10	990	34.3	10.2	EXACT



Crosswind Correction

The DTR crosswind correction method is faster than any reticle because the wind is observed and held in wind velocity, MPH, rather than minutes of angle or MILs. The wind hold angle changes with range so with all traditional reticles, a different range requires a different MOA or MIL hold, but with the DTR, a 10 MPH wind hold at 800 yards is still a 10 MPH hold at 1000 yards.

If you know the crosswind component in MPH, you simply find the appropriate wind dot and shoot. If your estimate is off, your point of impact indicates the true crosswind component. So, once you observe the crosswind component at any range, the reticle will give you the correct wind hold for any other range without the need for calculations or estimating. Instead of calling wind in MPH and then holding in increments of MILs or MOA, by using the DTR you call wind in MPH and hold wind in MPH (vectored percentage depending on direction).

This attribute is truly huge when it comes down to a second shooting opportunity in the general direction that you took the first shot. If you have any feedback from your first shot you already know the amount of wind you will be holding on the next shot. This is true obviously for two shots at the same distance but it is also applicable to any other target distance you will be engaging. In other words, if you held 5 MPH of left wind on a 500 yard shot and made a hit, then when a 900 yard shot presents itself in the same general direction you already know your wind hold.

So, to develop the wind hold solution, make your estimate and determine the appropriate wind dot or proportional holding point between wind dots. Remember to hold the center column of dots into the wind.

Aiming Dot Selection

To summarize the process of selecting the aiming dot:

1. Determine the Measured Distance (Slant Range) with a range finder or the built-in means (MIL Measuring Stadia and MIL Graph) provided by the reticle.

2. Determine the Density Corrected Hold Point by correcting the Measured Distance (Slant Range) by factoring in the Air Density Correction (ADC#).

3. Determine the wind hold. (Remember that the reticle *automatically* compensates for any elevation change caused by varying wind speeds at all ranges.)

4. If measurable uphill/downhill angle, determine the Hold Closer Distance using the AFS Template. This, in conjunction with your wind hold, becomes the EHP (Effective Hold Point).

With the Effective Hold Point determined, place appropriately on the target and release the shot. Notice that knob dialing errors, including failing to return to zero are completely eliminated. This is one of the most significant advantages of the DTR.

Wind Values / Boundary Layers

Most all ballistics program's wind drift tables for centerfire rifles are pretty good out to 500 yards. This is because the flight of the bullet is at most 4 feet off of the ground from muzzle to target. For longer shots the apex of the bullet's flight is significantly higher and encountering a higher velocity wind than is present 4 feet off of the ground.

The DTR solves for this by taking into account the "boundary layers" of wind flow values and factoring in increased wind speed percentages into the longer range 5, 10, 15, 20, 25 mph incremental wind dots. What this means is if you shoot a target at 500 yards and hold the 5mph left wind dot and connect, and a 900 yard target at the same wind vector angle is then engaged you will hold the 900 yard 5mph left wind dot. This wind velocity effect on this shot is based on the higher trajectory of the longer distance bullet flight and greater than 5mph wind speed, but by holding the same 5mph dot (which is factored for increased crosswind value) the user can score a hit with ease. (The preceding has nothing to do with Dissimilar Wind Drift which has also been factored into the DTR reticle.)

Options for determining wind values in the field include:

1. Observing direction off of the mirage movement on the horizon through one's scope will indicate where the true wind direction is coming from or going away. When the heat waves "boil" or appear to move straight upward, you are looking dead into the wind.

2. Interpreting the movement of elements (dust, leaves, brush, etc.) from wind flow or feeling its direction and velocity on your face or back of your hand.

3. Using a wind meter by holding it above your head. The wind meter will give large percentage of difference in velocity readings depending on how far off of the ground it is held.

Transition Zone — Factoring Air Density Correction Number (ADC#)

Past 800 yards, if the effective hold point is greater than + *or* - 50 yards difference from measured distance, which means the factoring number is greater than +5 or -5, then use the next ascending or descending range ADC# (closest 100 yds.) wherein the effective hold point will be occurring. In other words, use appropriate ADC# for the actual hold distance.

Example: 1100yd shot with a factoring number of + or - 5KDA change, use the closest ADC# wherein that the shot will be impacting. The factoring number of +5 would use the 1200yd ADC# of 15 so the 5x15=75 yards so the solution would be a 1175yd hold point. Conversely a factoring number of -5 would use the 1000yd ADC# of 11 so the -5x11=55 yards so the solution would be a 1045yd hold point.

Both of these solutions have the bullet impacting greater than +/- 50 yards difference from the measured distance.

Using Your DTR

Sequence

For the vast majority of shots in the field, taking the steps as instructed provides the fastest, easiest means to hit the target. That is, first determine the Measured Distance to the target, factor ADC to determine Density Corrected Hold Point, determine the wind hold, and then, if needed, determine the Hold Closer Distance using the AFS Template. This will yield your Effective Hold Point (EHP).

However, there certainly may be times when determining the Slope Angle should come before determining the ADC correction. For shots at steep angles (greater than 30°) and long distances (over 1000 yd), there can be enough influence on Measured Distance to warrant making the ADC correction after determining the Slope Angle. This is when use of the DTR Angle Firing Solutions Card included with the scope is warranted. You could also use the DTR Ballistics Program.

Angle Firing and Intuition

The same kind of logic we can apply for over 1000 yards firing can similarly be intuitively applied in angle firing as will be illustrated in the upcoming usage example starting on page 23.

As a matter of fact, there are many times when the user's intuition comes into play using the DTR. One beauty of this overall system is that applying logic and interpolating points on graphs and the aiming dots themselves is not only worthwhile but also very simple and straightforward. It's one of the keys to getting the most from your DTR.

Indicating Nominal Assignment Value (NAV)

Take a marker out with you to the range and once you determine your Nominal Assignment Value (NAV) for your rifle ammo combination, write the nominal assigned value (NAV) on your rifle. If you a get new batch of ammo you should recheck the Nominal Assignment Value (NAV). This number is literally your "navigation point" for using the DTR.

If you are using a temperature-sensitive powder (as contained in M118LR, AB39, A191, and *all* U.S. Military 5.56x45mm NATO ammunition) and the temperature is now + or - 30 degrees of temperature change from where you assigned the Nominal Assignment Value (NAV), you will want to reassign the nominal value based off the resulting 25 fps velocity change.

Example: Nominal assignment value (NAV) of 4KDA and temp goes up 30+ degrees. Reassign the nominal value to a 3KDA since the ammo is going 25 fps faster. When the temperature goes back down, reassign. The same goes for colder temperature (ammo is going 25 fps slower at -30° from NAV), so assign a 5KDA to a slower/colder velocity.

Elevation vs. Wind

What is most important, elevation or wind call? If you look at all the targets on a typical range all are about twice as tall as they are wide. *Wind is absolutely the most important call* because it requires at least double the defining call or hold ability. The best solution is to call wind in MPH and hold wind in MPH (allowing for angled wind value, or vectoring percentages).

3 Using Your DTR

Edge Clearance Points (ECP)

ECP are designed for shooting from cover and having obstacles in front of the muzzle which could affect bullet flight. This could be a rise in height of the ground in front of your firing position or shooting out of an opening on an opposite side of a room/ structure or even shooting with your rifle turned 90 degrees and firing out of a flat rooftop drain.

Your DTR is easily useable in determining bullet clearance from the ECP (obstacles).

Center line over the bore scope height is very important in having accurate data. The following data is for 2.75" over the bore scope height and is given in MOA as well as yardage dots (the data is designed for the bullet to clear the edge by 1/2 of an inch).

The best solution would be to shoot at small black dots at 5, 10, 15, 20, and 25 yards (with your rifle zeroed at distance) and determine exactly what your ECP points are with your particular rifle/scope combination.

Below are holding parameters for ECP using DTR 1 with 2.75" scope height (308-175gr@2450-2700fps).

Distance to ECP from muzzle	MOA	Corresponding dot which must clear the edge
5 yards	58 MOA	1250 YARD DOT
10 yards	26 MOA	850 YARD DOT
15 yards	17 MOA	650 YARD DOT
20 yards	11 MOA	500 YARD DOT
25 yards	8 MOA	450 YARD DOT

ECP protocol —
1. Solve for effective hold point.
2. Hold firing solution on the target.
3. Check appropriate ECP (dot) for clearance. You must know the distance from end of muzzle to ECP.

Edge Correction Points are unaffected by changes in the slope angle.

The DTR reticle is designed as a Time Of Flight reticle (TOF)

This is important to keep in mind when considering how all the automatic compensations that are built into the DTR serve you. They all influence a bullet's time of flight and, therefore, the shot location. One picks an appropriate ADC multiple to determine the holdover/hold under distance in yards. When doing so all of the other atmospheric factors associated with the wind (DWD and boundary layer air flow) as well as the spin drift and Crosswind Jump come into synchronization. Additionally, the Angle Firing Solutions (AFS) Template laser engraved on both sides of the scope bell cuts a WIDE swath into shooting up or downhill by leaving cosines "on the curb" so to speak. This allows one to determine the Effective Hold Point (EHP) in a short amount of time. (Example on page 29.)

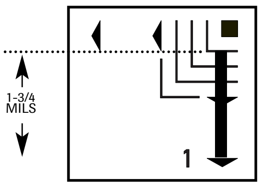
Usage Example

Circumstances and Conditions

We are shooting a 175gr Sierra Match King bullet in .308 Winchester at 2575 FPS. Therefore our reticle Nominal Assignment Value (NAV) equals 4K DA with this muzzle velocity (from the table on Page 5). We are in New Mexico hunting coyotes at 4600 feet elevation. The shade temperature is 95° F. We see a coyote next to a fence we know is 4 feet tall, and we are on a hill looking down at the animal.

Step One

If you have a range finder, use it. If not use the MIL Scale and the MIL Graph.



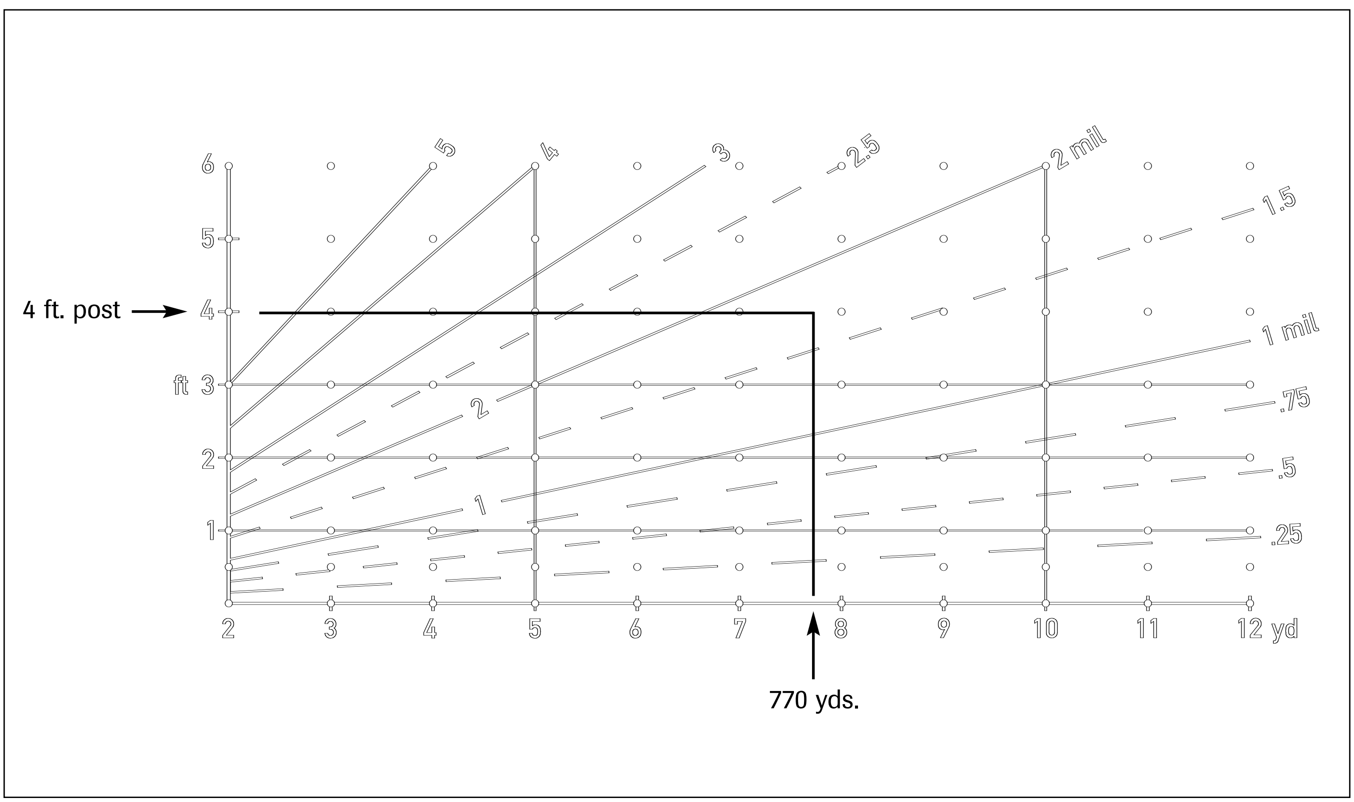
The fence is bigger than the coyote so range the fence posts.

MIL the fence… = approximately 1-3/4 MIL

Fence post = 4 ft. tall
1. Put bottom of post directly on next whole MIL line, in this case "1MIL line."
2. Put top of post into fractional measuring stadia.
3. Read fractional measurement plus whole measurement = **1-3/4 MIL**

Step Two

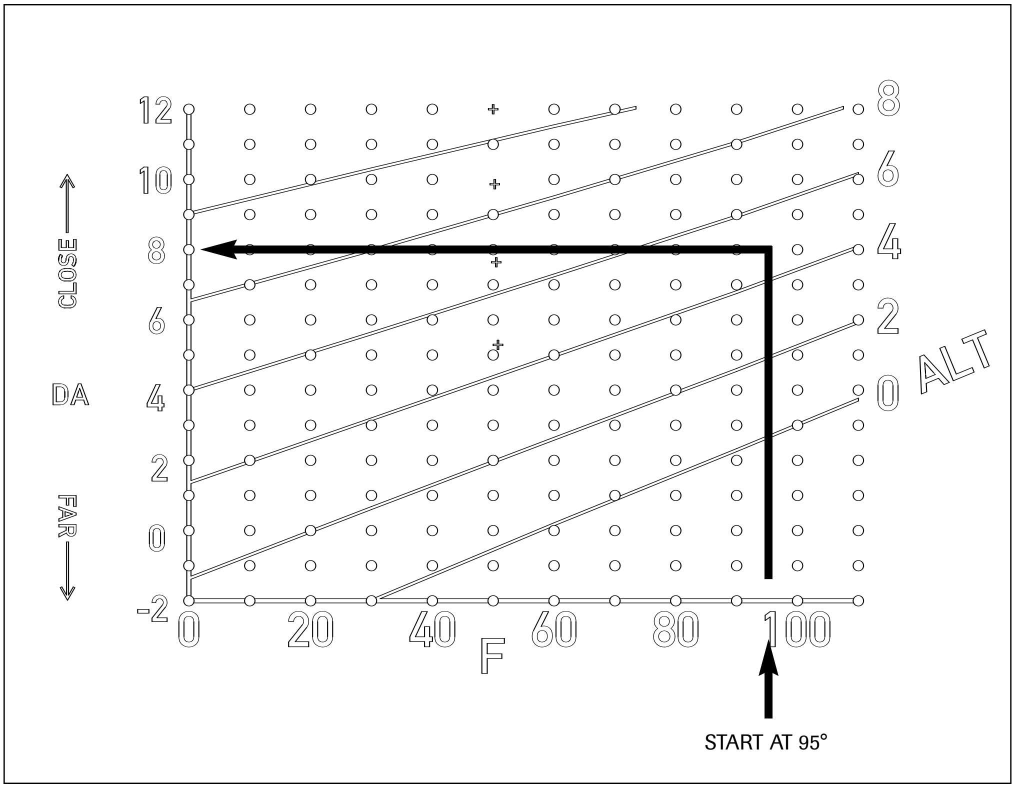
Determine the range to the fence (see MIL Range Graph). Find 4 feet (height of fence post) on the vertical axis and go horizontally to the right until you are at 1-3/4 MIL location found in Step One, which is halfway between the 1-1/2 MIL line and the 2 MIL line. Then go straight down to read the Measured Distance (Slant Range) — 770 yards.



4 Usage Example

Step Three

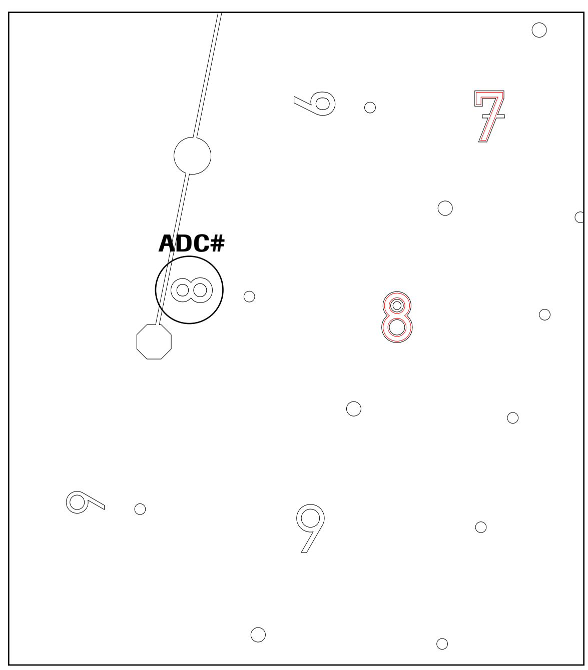
Determine Air Density. If you have a Kestrel 4250, or similar, it reads density altitude directly. Otherwise, go to the Air Density Graph on your DTR. You should have determined the DA before starting your hunt! DA changes should be monitored and mentally noted throughout the day.



- Temp. is 95° so find that on the bottom of the Air Density Graph.
- Now go straight up to the slanted line representing your actual altitude — 4600 feet
- Then go straight left to read the density altitude — 8KDA

Step Four

Determine current factor number, which is the Nominal Assignment Value (NAV) in KDA subtract the current atmospheric conditions. Here it is 4-8 = -4 current factor number. [4KDA (nominal) - 8KDA (current) = -4KDA]. Always remember to start an equation with the Nominal Assignment Value (NAV). In other words, since the Nominal Assignment Value (NAV) of the DTR used in our examples is 4KDA, after determining that current DA is 8K, the equation is 4K - 8K = -4K. If current DA was 2K, then it's 4K - 2K = 2K. Negative numbers mean the air is less dense, positive numbers mean it's more dense, relative to the reticle Nominal Assignment Value (NAV).



Step Five

Now find the Air Density Correction (ADC) number. These are the numbers at 90-degree angles located to the left of the left row of the reticle aiming dots yard line indicators. Estimate the value of the ADC to the nearest yard line. In this example it's necessary to use intuition to determine the best ADC match.

Usage Example

The 800 yard line ADC is 8, so assign the ADC number of 8. Remember that an ADC of 8 yards means that you adjust the Measured Distance by 8 yards per 1KDA atmospheric change from NAV. Negative value, hold closer / Positive value, hold further.

So the net Air Density Correction is 8 yards per factor number or -4 x 8 = -32 yards; this is subtracted from the Measured Range. 770 - 32 = 738 Density Corrected Hold Point.

Step Six

Determine the Hold Closer Distance (Angle Firing Solution). Determine the line on the scope tube that is most nearly level when you are aiming at the target. The best estimate shows a 20 degree angle. That corresponding line says hold -40 yards closer, so subtract that from Density Corrected Hold Point so it's 738 -40 = 698 yards, the Effective Hold Point (EHP) is 698 for distance and 738 for wind.

Step Seven

Estimate wind and use correct windage hold point. Each wind dot along each yard line is worth 5 MPH, so 10 MPH means use the second dot either side of the central aiming dot. You estimate that the wind is 10 MPH moving from right to left. Remember that the wind hold is based on the Measured Distance (Slant Range) not the Effective Hold Point. So the wind deflection is based on 770 yards minus 32 yards or 738 yards at 10 MPH. Use this wind deflection with an Effective Hold Point of 698 yards to make the shot.

This reticle sometimes requires you to interpolate between 2 or 3 hold points to accommodate such "in between" shots. It's easy, very fast, and remarkably accurate with just a little practice.

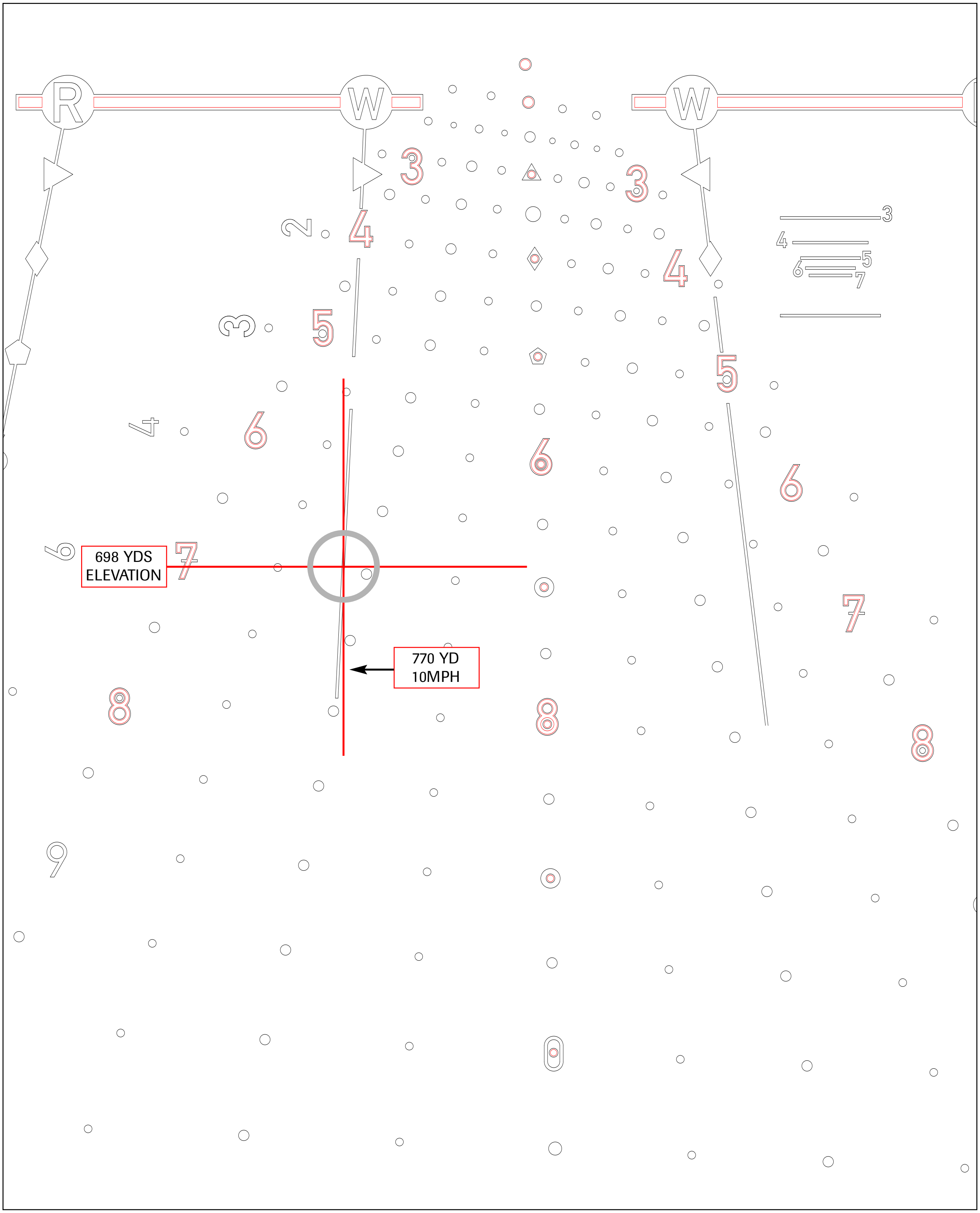
Pick the closest dot to your aiming range hold point for elevation. Also give a quick glance at the 10 MPH hold for 738 yards. Estimate that amount of wind for your 698 windage hold to be the same amount as your 738 yard 10 MPH hold and release the shot. Remember to always hold the central set of dots into the wind.

Remember: Due to the dimensions of most targets, your windage call is more important than elevation.

Always know your factor number (nominal DA minus current DA). It changes every 15 degrees temperature. It is the most important number you need to know. You need this factor number to calculate everything else you'll need to make an accurate shot. **Remember, this number can be negative or positive.**

Hold for the wind based on Measured Distance (Slant Range) and the elevation based on AFS Hold Closer Distance.

Usage Example



5 Density Adaptability

Density Adaptability and Dissimilar Cartridge/Bullet Combinations

As you know by now, the DTR as seen through the scope will support firing solutions from below sea level to as high as anyone shoots a rifle. The following data show 12 sets of density altitudes and muzzle velocity which matches the reticle for the .308 Sierra 175 gr Sierra Match King bullet.

0k DA = 2675 FPS
1k DA = 2650 FPS
2k DA = 2625 FPS
3k DA = 2600 FPS
4k DA = 2575 FPS
5k DA = 2550 FPS
6k DA = 2525 FPS
7k DA = 2500 FPS
8k DA = 2475 FPS
9k DA = 2450 FPS

Nominal Assignment Values (NAV)

Barrel length, powder load and type, bullet weight and type and other variables set the muzzle velocity. The bullet path is controlled by bullet velocity, bullet weight and shape, height of the scope above the bore, the zeroed range, and other variables. Remember that ammunition temperature can change the muzzle velocity as much as 200 FPS for non-temperature stabilized powder and 50 FPS for even the best temperature-stabilized powder.

If you are using commercially loaded ammunition and know the bullet BC and its velocity in your rifle assign a Nominal Assigned Value (NAV) DA# for which the path will match the reticle. Shooting in air of different density requires using the Air Density Corrections (ADC) provided in the reticle, or the use of a DTR Ballistics Program.

If you are handloading, you can adjust the velocity of your selected bullet in your rifle to match the reticle at a specific density altitude. Referring to the chart above, if you expect to be hunting in an area where the density altitude is 4KDA you would load for a muzzle velocity of 2575 FPS. Thus the Nominal Assigned Value (NAV) would be 4KDA and the nominal velocity would be 2575 FPS. You can determine the desired velocity using a DTR Ballistics Program.

On the following pages are tables that detail the changes in flight based on varying air densities.

Compare **VELOCITY** and **BULLET PATH** (these have been highlighted in each table) to see the effect of different air densities that result in Nominal Assigned Values.

0K

Trajectory for Sierra Bullets .308 dia. 175 gr. HPBT MatchKing at 2675 Feet per Second
At an Elevation Angle of: 0 degrees
Ballistic Coefficients of: 0.505 0.496 0.485 0.485 0.485
Velocity Boundaries (Feet per Second) of: 2800 1800 1800 1800
Wind Direction is: 0.0 o'clock and a Wind Velocity of: 0.0 Miles per hour
Wind Components are (Miles per Hour): Down Range: 0.0 Cross Range: 0.0 Vertical: 0.0
The Firing Point speed of sound is: 1123.51 fps
The bullet drops below the speed of sound on the trajectory (1123.69 fps) at: 1110 yards
Altitude: 0 Feet Humidity: 50 Percent Pressure: 30.2 in/Hg
Temperature: 62 F
Data Printed in English Units

Range (Yards)	VELOCITY (Ft/Sec)	Energy (Ft/Lbs)	Bullet Path (inches)	BULLET PATH (1 MoA)	Wind Drift (inches)	Wind Drift (1 MoA)	Time of Flight (Seconds)
0	2675	2780	-2.5	0	0	0	0
100	2492.6	2413.8	0	0	0	0	0.1162
200	2317.3	2086.2	-3.1	-1.5	0	0	0.241
300	2149	1794.2	-12.7	-4	0	0	0.3755
400	1987.9	1535.3	-29.83	-7.1	0	0	0.5206
500	1834.3	1307.3	-55.78	-10.7	0	0	0.6777
600	1686.8	1105.4	-92.08	-14.7	0	0	0.8483
700	1548.5	931.6	-140.64	-19.2	0	0	1.034
800	1421.7	785.3	-203.72	-24.3	0	0	1.2363
900	1308.3	665	-284.04	-30.1	0	0	1.4564
1000	1210.5	569.3	-384.69	-36.7	0	0	1.6951
1100	1130.2	496.3	-509.1	-44.2	0	0	1.9521
1200	1067.1	442.4	-660.73	-52.6	0	0	2.2258
1300	1017	401.8	-842.94	-61.9	0	0	2.5144

4K

Trajectory for Sierra Bullets .308 dia. 175 gr. HPBT MatchKing at 2575 Feet per Second
At an Elevation Angle of: 0 degrees
Ballistic Coefficients of: 0.505 0.496 0.485 0.485 0.485
Velocity Boundaries (Feet per Second) of: 2800 1800 1800 1800
Wind Direction is: 0.0 o'clock and a Wind Velocity of: 0.0 Miles per hour
Wind Components are (Miles per Hour): Down Range: 0.0 Cross Range: 0.0 Vertical: 0.0
The Firing Point speed of sound is: 1123.51 fps
The bullet drops below the speed of sound on the trajectory (1123.73 fps) at: 1188 yards
Altitude: 0 Feet Humidity: 50 Percent Pressure: 26.83 in/Hg
Temperature: 62 F
Data Printed in English Units

Range (Yards)	VELOCITY (Ft/Sec)	Energy (Ft/Lbs)	Bullet Path (inches)	BULLET PATH (1 MoA)	Wind Drift (inches)	Wind Drift (1 MoA)	Time of Flight (Seconds)
0	2575	2576.1	-2.5	0	0	0	0
100	2416	2267.8	0	0	0	0	0.1203
200	2262.7	1989.1	-3.46	-1.7	0	0	0.2486
300	2114.8	1737.6	-13.73	-4.4	0	0	0.3857
400	1972.7	1511.9	-31.77	-7.6	0	0	0.5326
500	1836.6	1310.5	-58.77	-11.2	0	0	0.6903
600	1705	1129.5	-96.09	-15.3	0	0	0.8598
700	1580.4	970.4	-145.39	-19.8	0	0	1.0426
800	1464.6	833.4	-208.63	-24.9	0	0	1.2399
900	1358.8	717.4	-288.11	-30.6	0	0	1.4527
1000	1264.5	621.2	-386.44	-36.9	0	0	1.6818
1100	1183.3	544	-506.54	-44	0	0	1.9273
1200	1116.1	483.9	-651.5	-51.8	0	0	2.1888
1300	1062.1	438.3	-824.39	-60.6	0	0	2.465

8K

Trajectory for Sierra Bullets .308 dia. 175 gr. HPBT MatchKing at 2475 Feet per Second
At an Elevation Angle of: 0 degrees
Ballistic Coefficients of: 0.505 0.496 0.485 0.485 0.485
Velocity Boundaries (Feet per Second) of: 2800 1800 1800 1800
Wind Direction is: 0.0 o'clock and a Wind Velocity of: 0.0 Miles per hour
Wind Components are (Miles per Hour): Down Range: 0.0 Cross Range: 0.0 Vertical: 0.0
The Firing Point speed of sound is: 1123.51 fps
The bullet drops below the speed of sound on the trajectory (1123.77 fps) at: 1271 yards
Altitude: 0 Feet Humidity: 50 Percent Pressure: 23.76 in/Hg
Temperature: 62 F
Data Printed in English Units

Range (Yards)	VELOCITY (Ft/Sec)	Energy (Ft/Lbs)	Bullet Path (inches)	BULLET PATH (1 MoA)	Wind Drift (inches)	Wind Drift (1 MoA)	Time of Flight (Seconds)
0	2475	2379.9	-2.5	0	0	0	0
100	2337	2121.9	0	0	0	0	0.1247
200	2203.4	1886.3	-3.87	-1.8	0	0	0.2569
300	2074.2	1671.5	-14.91	-4.7	0	0	0.3973
400	1949.5	1476.5	-34.04	-8.1	0	0	0.5465
500	1829.6	1300.5	-62.32	-11.9	0	0	0.7053
600	1713	1140	-101.01	-16.1	0	0	0.8748
700	1601.8	996.8	-151.56	-20.7	0	0	1.056
800	1497.3	871	-215.68	-25.7	0	0	1.2497
900	1400.4	762	-295.32	-31.3	0	0	1.457
1000	1312	668.8	-392.72	-37.5	0	0	1.6785
1100	1233.3	590.9	-510.34	-44.3	0	0	1.9146
1200	1165.2	527.5	-650.84	-51.8	0	0	2.1653
1300	1108	477	-816.99	-60	0	0	2.4298

5 Density Adaptability

Another facet to contemplate: Let us imagine you shot all your M118LR (175 gr. Sierra) and all that is left is G.I. M80 147-150 grain ball ammunition. Assigning a 4 DA to this round at 2740 fps we see it is useable to 900 yards with the DTR, other Nominal Assigned Value (NAV) DA numbers also match.

Trajectory for Sierra Bullets .308 dia. 150 gr. HPBT MatchKing at 2740 Feet per Second
At an Elevation Angle of: 0 degrees
Ballistic Coefficients of: 0.417 0.397 0.355 0.355 0.355
Velocity Boundaries (Feet per Second) of: 2800 1800 1800 1800
Wind Direction is: 0.0 o'clock and a Wind Velocity of: 0.0 Miles per hour
Wind Components are (Miles per Hour): DownRange: 0.0 Cross Range: 0.0 Vertical: 0.0
The Firing Point speed of sound is: 1102.86 fps
The bullet does not drop below the speed within the max range specified.
Altitude: 0 Feet Humidity: 0 Percent Pressure: 25.84 in/Hg
Temperature: 43 F
Data Printed in English Units

Range (Yards)	VELOCITY (Ft/Sec)	Energy (Ft/Lbs)	Bullet Path (inches)	BULLET PATH (1 MoA)	Wind Drift (inches)	Wind Drift (1 MoA)	Time of Flight (Seconds)
0	2740	2500.1	-2.5	0	0	0	0
100	2536.6	2142.7	0	0	0	0	0.1138
200	2342.2	1826.9	-2.91	-1.4	0	0	0.2369
300	2156.4	1548.5	-12.18	-3.9	0	0	0.3704
400	1979	1304.3	-28.94	-6.9	0	0	0.5156
500	1810.8	1091.9	-54.6	-10.4	0	0	0.6741
600	1635.9	891.2	-90.92	-14.5	0	0	0.8484
700	1474.4	723.9	-140.28	-19.1	0	0	1.0417
800	1330.5	589.5	-205.69	-24.6	0	0	1.256
900	1207.8	485.8	-290.78	-30.9	0	0	1.493

Application

Two shooters with .308s and DTR V1's and same Lot of AB 39 which chronographed 100 FPS difference in velocity in their respective rifles. Wind is 5 MPH from the left. Firing is on a level plane.

The Nominal Assignment Values (NAVs) for the DTR v1 are as follows:

Rifle1, 2600 fps = 3KDA
Rifle2, 2500 fps = 7KDA

Shot is 812 yds Measured Distance. Current Atmospheric is 5KDA.

Rifle1 = -2 factor# x ADC# and **Rifle2** = +2 factor# x ADC#
ADC# for 800 yards = 8 (ADC# is the sideways number in the reticle)
812-16 (-2x8=-16) = 796 yds Density Corrected Hold Point for Rifle1
812+16 (2x8=16) = 838 yds Density Corrected Hold Point for Rifle2

So in order to hit the target for elevation they will hold a total of 42 yards difference in elevation.
In order to hit the target for the wind value, both will hold the same corresponding 5 mph value at their Effective Hold Point (EHP). This is significant since both Rifle1 and Rifle2 can now work together when holding wind velocity correction values.

Since Rifle2 shot 42 yards further, the corresponding wind drift dots are synchronized to the bullet's additional Time Of Flight (TOF). There is a difference of .0082 seconds in the TOF between Rifle1 and Rifle2.

Ultimate Value

Why Using the DTR Increases Your First Round Hit Probability

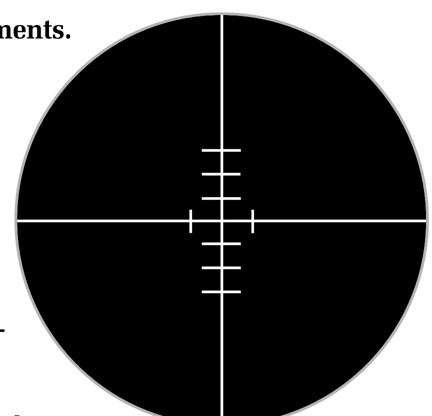
(This is also applicable to the Dynamic Targeting RangeCard.)

After reading either of the *DTR Instruction Manual(s)* and *Reference Materials* publications you will have increased your percentage of first round hits by having knowledge of:

1. **Crosswind (CJ) Jump** (sometimes referred to as Aeronautical Jump)
   Knowing the need to hold either higher or lower in a Crosswind that can change your point of impact a full 1 MOA up or down in a 20+ MPH crosswind is quite important.
2. **Spin Drift**
   Having a TRUE no wind zero at each yard line is additionally crucial.
3. **Wind Flow**
   Boundary layers of air flow factored into the incremental 5 MPH wind dots for the bullet's flight allows you to gather data at your firing position and hold the same wind speed correction from close to far distances (on a level plane).
4. **Dissimilar Wind Drift (DWD)**
   The bullet's lateral movement downrange caused by crosswinds is not an equal amount when comparing right and left winds. This phenomenon is COMPLETELY independent of Spin Drift.
5. **Zeroing your rifle**
   You now understand the need to adjust for the vertical component of the wind since downrange data will be influenced by your range zero.

Your DTR will increase your FIRST ROUND hit probability, as well as increasing your follow-up shot hit probability with moving target leads to 800 yards.

IF THE TARGET IS BIG ENOUGH it doesn't matter about the above statements. Hence the square-to-the-world crosshair in every scope you pick up. These designs are patently blind to the real world as it actually exists.



Shooting to continually hit a postage stamp (one square inch) at 250 yards is a much more difficult shot than hitting an E-Type silhouette (about 700 square inches) at 1000 yards. The 250 yard postage stamp hit probability is greatly enhanced by knowledge of the above bullet flight phenomenon whereas the E-type silhouette can basically ignore these phenomena because of its large size.

The postage stamp requires attaining less than 1/2 MOA deviation to score hits in evironmentaly changing conditions while the E-Type silhouette barely taxes the shooter, who needs only a 4 MOA vertical and 2 MOA horizontal performance.

"All truth passes through three stages. First, it is ridiculed. Second, it is violently opposed. Third, it is accepted as being self-evident."
— Arthur Schopenhauer, German philosopher (1788-1860)