LEUPOLD®

# TACTICAL SUPPLEMENT

## FOR THE MIL DOT RETICLE

LEUPOLD®

Leupold & Stevens, Inc., PO Box 688, Beaverton, OR 97075-0688
14400 NW Greenbrier Parkway, Beaverton, OR 97006-5790 USA
Customer Service: (503) 526-1400
www.leupold.com



P/N 54517

# [ The Leupold® Mil Dot Reticle ]

The Leupold Mil Dot Reticle uses two distinct dot shape variations—round and "football." Both styles employ a system based on the subtension of one milliradian (mil) from the center of one dot to the center of the next. This is also the distance between the crosshairs and the first dot.

The subtension of 1 mil equals 3.6 inches at 100 yards or 36 inches at 1,000 yards. In metric units, the correspondence is 1 mil equals 10 centimeters at 100 meters or 1 meter at 1,000 meters. Knowing this subtension and knowing the size of the target (or a reference object near the target) allows the distance to the target to be estimated with considerable accuracy.

## First Versus Second Focal Plane

In variable-magnification optics, the magnification setting for the use of the mil dot reticle is determined by whether the reticle is in the first or second focal plane. The easiest way to determine if the mil dot reticle is in the first focal plane is to view the reticle through the

scope while changing the magnification setting. If the size of the reticle appears to change as the magnification setting is changed, the reticle is in the first focal plane. If it does not appear to change size, it is in the second focal plane.

If the reticle is in the first focal plane, no specific magnification setting is required to obtain the proper subtension to yield accurate range estimating results.

When the Leupold® Mil Dot reticle is installed in the second focal plane of an optic, it is calibrated to a specific magnification for range estimating purposes. In a variable-magnification scope, this is generally the highest magnification setting and all range estimating must be performed at this setting. However, in certain scopes it may be calibrated for a different setting. If you are uncertain to what setting your scope is calibrated, contact Leupold Customer Service.

## The Use of a Mil Dot Reticle

To use the mil dot reticle, you must know the actual size of the target.

1. View the target through the scope
2. Place the edge of one post against one edge (top, bottom, or either side) of the target so that the crosshair extends along either its width or height
3. Using the dots, measure along the crosshair to the opposite edge of the target

If the center of the crosshair is against one edge of the target and the opposite edge of the target is positioned behind the center of the second dot, the target measures 2 mils. If it is exactly between the second and third dot, it measures 2.5 mils, etc. The more specific you are in your estimation of the size of the target in mils (2.75 mils, etc.), the more accurate your results will be. This is especially important in estimating the range of a small target or in estimating the range of a target at a great distance (i.e. beyond 500 yards).

Once the measurement of the target has been determined in mils, the range can be estimated. This can be done in two ways—either by consulting the charts in this manual or by using the following formula:

*(Height of Target in Yards x 1,000) ÷ Height of Target in Mils = Range of the Target in Yards*

This formula will also give results in metric terms if meters instead of yards are used in the equation.

For your convenience, Leupold has included range estimating tables (see Tables 1-6). Four of these tables are calculated to the nearest 0.5 mil and two (a special sub-yard and a special sub-meter target size tables) are calculated to the nearest 0.25 mil. To use these tables, locate the actual size of the target along the top of the table and the apparent size of the target, as measured in mils, along the side of the table. Follow both until they converge. This is the estimated distance to the target.

# [ Using the Data Obtained With the Mil Dot Reticle ]

Once you have estimated the distance to the target with the mil dot reticle, there are two primary methods of using this information. Both require that you know the specific bullet drop of the ammunition you are using.

## Dialing the Correction into the Scope

The most effective way to use the estimated distance is to dial the necessary correction into the scope using the elevation adjustment. (If your scope features a bullet drop compensation dial, simply dial the correction directly according to the distance marked on the elevation dial.)

**1**. Calculate the "drop to adjustment increment" ratio of your scope.

To do this, use the equation:

*Distance to the target in yards ÷ 100 = Inch value of each minute of angle*

**2.** Determine the correction necessary for the target using:

*Known bullet drop for distance to target ÷ Inch value of each minute of angle = Correction to be dialed in minutes of angle*

# Holding Over Using the Mil Dots

Sometimes there isn't time for correction using the scope's adjustment mechanisms. In these cases, holding over the target and using the reticle's mil dot markings as an aiming point is useful. It must be remembered that holding over is not as exact as dialing elevation.

For ease in calculation, assume that the distance from the center of one mil dot to the center of the next is 3.6 inches at 100 yards.

**1.** Calculate the hold over value of each dot for the distance to the target:

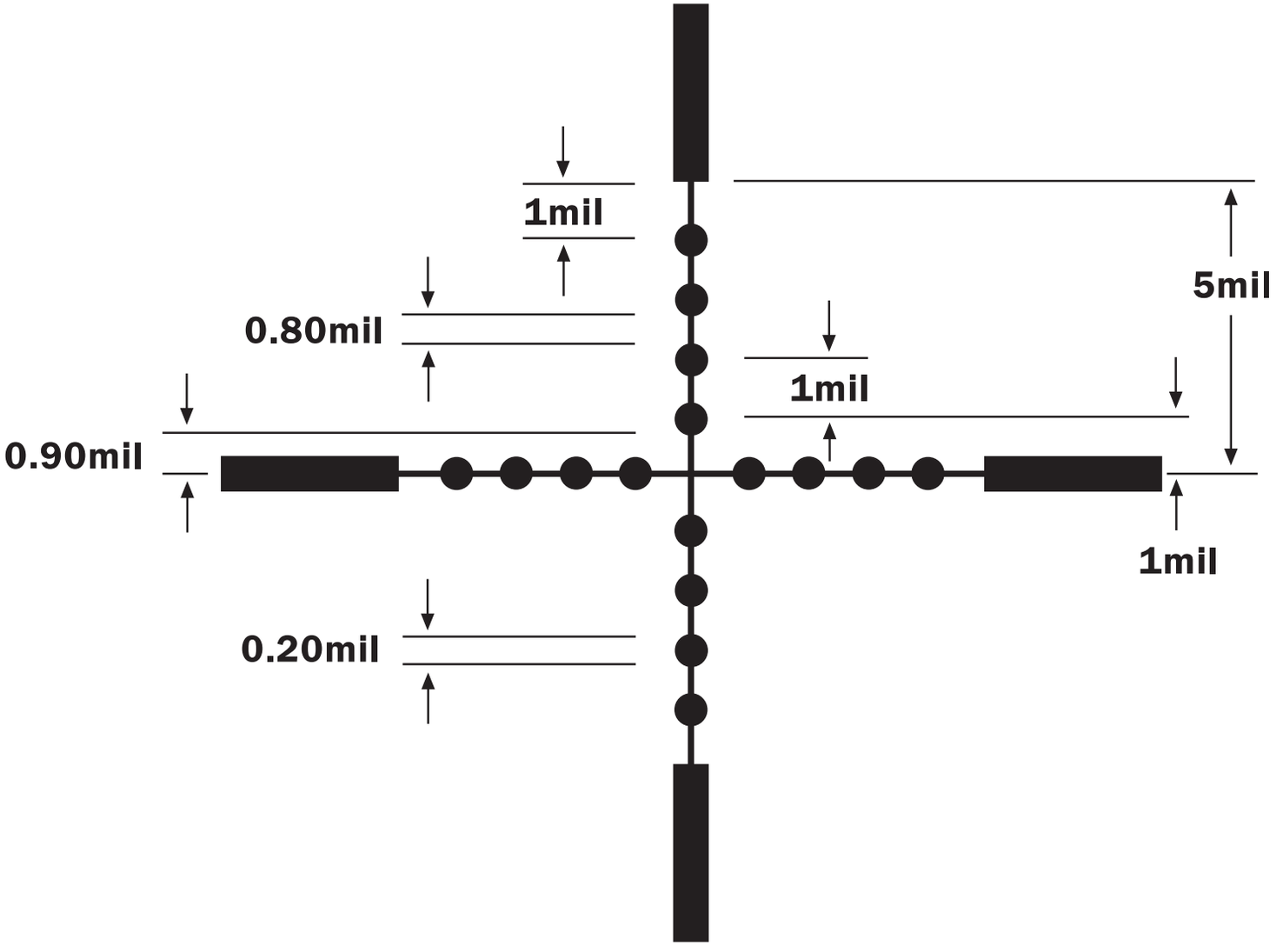
*(Distance to the target in yards ÷ 100) x 3.6 =*
*Inch value from the center of one mil dot to the center of the next at that distance*

**2.** Calculate the correct hold over:

*Known bullet drop at target distance ÷*
*Inch value from the center of one mil dot to the center of the next at that distance =*
*Correct hold over for target distance*

For quick reference on the value of mils at different distances, consult Tables 7 and 8.

# Reticle Measurements




| | | |
|---|---|---|
| @ 100 Yards | 1 mil = 3.600"<br>0.9 mil = 3.240"<br>0.8 mil = 2.880" | 0.5 mil = 1.800"<br>0.2 mil = 0.720"<br>1 mil = 3.438 Minutes of Angle = 3.600" |

# YIELDS ESTIMATED TARGET DISTANCE IN YARDS

| APPARENT SIZE OF THE TARGET IN MILS | ACTUAL SIZE OF THE TARGET IN INCHES OR YARDS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | INCHES | 9 | 12 | 16 | 18 | 20 | 22 | 24 | 28 | 32 |
| | YARDS | 0.250 | 0.333 | 0.444 | 0.500 | 0.556 | 0.611 | 0.667 | 0.778 | 0.889 |
| | 1.00 MIL | 250 | 333 | 444 | 500 | 556 | 611 | 667 | 778 | 889 |
| | 1.25 MIL | 200 | 267 | 356 | 400 | 444 | 489 | 533 | 622 | 711 |
| | 1.50 MIL | 167 | 222 | 296 | 333 | 370 | 407 | 444 | 519 | 593 |
| | 1.75 MIL | 143 | 190 | 254 | 286 | 317 | 349 | 381 | 444 | 508 |
| | 2.00 MIL | 125 | 167 | 222 | 250 | 278 | 306 | 333 | 389 | 444 |

Table 1

# YIELDS ESTIMATED TARGET DISTANCE IN YARDS

| APPARENT SIZE OF THE TARGET IN MILS | ACTUAL SIZE OF THE TARGET IN INCHES OR YARDS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| INCHES | 9 | 12 | 16 | 18 | 20 | 22 | 24 | 28 | 32 |
| YARDS | 0.250 | 0.333 | 0.444 | 0.500 | 0.556 | 0.611 | 0.667 | 0.778 | 0.889 |
| 2.0 MIL | 125 | 167 | 222 | 250 | 278 | 306 | 333 | 389 | 444 |
| 2.5 MIL | 100 | 133 | 178 | 200 | 222 | 244 | 267 | 311 | 356 |
| 3.0 MIL | 83 | 111 | 148 | 167 | 185 | 204 | 222 | 259 | 296 |
| 3.5 MIL | 71 | 95 | 127 | 143 | 159 | 175 | 190 | 222 | 254 |
| 4.0 MIL | 63 | 83 | 111 | 125 | 139 | 153 | 167 | 194 | 222 |
| 4.5 MIL | 56 | 74 | 99 | 111 | 123 | 136 | 148 | 173 | 198 |
| 5.0 MIL | 50 | 67 | 89 | 100 | 111 | 122 | 133 | 156 | 178 |
| 5.5 MIL | 45 | 61 | 81 | 91 | 101 | 111 | 121 | 141 | 162 |
| 6.0 MIL | 42 | 56 | 74 | 83 | 93 | 102 | 111 | 130 | 148 |
| 6.5 MIL | 38 | 51 | 68 | 77 | 85 | 94 | 103 | 120 | 137 |
| 7.0 MIL | 36 | 48 | 63 | 71 | 79 | 87 | 95 | 111 | 127 |
| 7.5 MIL | 33 | 44 | 59 | 67 | 74 | 81 | 89 | 104 | 119 |
| 8.0 MIL | 31 | 42 | 56 | 63 | 69 | 76 | 83 | 97 | 111 |
| 8.5 MIL | 29 | 39 | 52 | 59 | 65 | 72 | 78 | 92 | 105 |
| 9.0 MIL | 28 | 37 | 49 | 56 | 62 | 68 | 74 | 86 | 99 |
| 9.5 MIL | 26 | 35 | 47 | 53 | 58 | 64 | 70 | 82 | 94 |
| 10.0 MIL | 25 | 33 | 44 | 50 | 56 | 61 | 67 | 78 | 89 |

Table 2

# YIELDS ESTIMATED TARGET DISTANCE IN YARDS

| APPARENT SIZE OF THE TARGET IN MILS | ACTUAL SIZE OF THE TARGET IN FEET OR YARDS | | | | |
|---|---|---|---|---|---|
| FEET | 3 | 4 | 5 | 6 | 7 |
| YARDS | 1.0 | 1.3 | 1.7 | 2.0 | 2.3 |
| 2.0 MIL | 500 | 667 | 833 | 1000 | 1167 |
| 2.5 MIL | 400 | 533 | 667 | 800 | 933 |
| 3.0 MIL | 333 | 444 | 556 | 667 | 778 |
| 3.5 MIL | 286 | 381 | 476 | 571 | 667 |
| 4.0 MIL | 250 | 333 | 417 | 500 | 583 |
| 4.5 MIL | 222 | 296 | 370 | 444 | 519 |
| 5.0 MIL | 200 | 267 | 333 | 400 | 467 |
| 5.5 MIL | 182 | 242 | 303 | 364 | 424 |
| 6.0 MIL | 167 | 222 | 278 | 333 | 389 |
| 6.5 MIL | 154 | 205 | 256 | 308 | 359 |
| 7.0 MIL | 143 | 190 | 238 | 286 | 333 |
| 7.5 MIL | 133 | 178 | 222 | 267 | 311 |
| 8.0 MIL | 125 | 167 | 208 | 250 | 292 |
| 8.5 MIL | 118 | 157 | 196 | 235 | 275 |
| 9.0 MIL | 111 | 148 | 185 | 222 | 259 |
| 9.5 MIL | 105 | 140 | 175 | 211 | 246 |
| 10.0 MIL | 100 | 133 | 167 | 200 | 233 |

Table 3

# YIELDS ESTIMATED TARGET DISTANCE IN METERS

| APPARENT SIZE OF THE TARGET IN MILS | ACTUAL SIZE OF THE TARGET IN CENTIMETERS | | | | | | |
|---|---|---|---|---|---|---|---|
| CENTIMETERS | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
| 1.00 MIL | 300 | 400 | 500 | 600 | 700 | 800 | 900 |
| 1.25 MIL | 240 | 320 | 400 | 480 | 560 | 640 | 720 |
| 1.50 MIL | 200 | 267 | 333 | 400 | 467 | 533 | 600 |
| 1.75 MIL | 171 | 229 | 286 | 343 | 400 | 457 | 514 |
| 2.00 MIL | 150 | 200 | 250 | 300 | 350 | 400 | 450 |

Table 4

# YIELDS ESTIMATED TARGET DISTANCE IN METERS

| APPARENT SIZE OF THE TARGET IN MILS | ACTUAL SIZE OF THE TARGET IN CENTIMETERS | | | | | | |
|---|---|---|---|---|---|---|---|
| CENTIMETERS | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
| 2.0 MIL | 150 | 200 | 250 | 300 | 350 | 400 | 450 |
| 2.5 MIL | 120 | 160 | 200 | 240 | 280 | 320 | 360 |
| 3.0 MIL | 100 | 133 | 167 | 200 | 233 | 267 | 300 |
| 3.5 MIL | 86 | 114 | 143 | 171 | 200 | 229 | 257 |
| 4.0 MIL | 75 | 100 | 125 | 150 | 175 | 200 | 225 |
| 4.5 MIL | 67 | 89 | 111 | 133 | 156 | 178 | 200 |
| 5.0 MIL | 60 | 80 | 100 | 120 | 140 | 160 | 180 |
| 5.5 MIL | 55 | 73 | 91 | 109 | 127 | 145 | 164 |
| 6.0 MIL | 50 | 67 | 83 | 100 | 117 | 133 | 150 |
| 6.5 MIL | 46 | 62 | 77 | 92 | 108 | 123 | 138 |
| 7.0 MIL | 43 | 57 | 71 | 86 | 100 | 114 | 129 |
| 7.5 MIL | 40 | 53 | 67 | 80 | 93 | 107 | 120 |
| 8.0 MIL | 38 | 50 | 63 | 75 | 88 | 100 | 113 |
| 8.5 MIL | 35 | 47 | 59 | 71 | 82 | 94 | 106 |
| 9.0 MIL | 33 | 44 | 56 | 67 | 78 | 89 | 100 |
| 9.5 MIL | 32 | 42 | 53 | 63 | 74 | 84 | 95 |
| 10.0 MIL | 30 | 40 | 50 | 60 | 70 | 80 | 90 |

Table 5

# YIELDS ESTIMATED TARGET DISTANCE IN METERS

| APPARENT SIZE OF THE TARGET IN MILS | ACTUAL SIZE OF THE TARGET IN METERS | | | | | |
|---|---|---|---|---|---|---|
| | METERS | 1.00 | 1.25 | 1.50 | 1.75 | 2.00 |
| | 2.0 MIL | 500 | 625 | 750 | 875 | 1000 |
| | 2.5 MIL | 400 | 500 | 600 | 700 | 800 |
| | 3.0 MIL | 333 | 417 | 500 | 583 | 667 |
| | 3.5 MIL | 286 | 357 | 429 | 500 | 571 |
| | 4.0 MIL | 250 | 313 | 375 | 438 | 500 |
| | 4.5 MIL | 222 | 278 | 333 | 389 | 444 |
| | 5.0 MIL | 200 | 250 | 300 | 350 | 400 |
| | 5.5 MIL | 182 | 227 | 273 | 318 | 364 |
| | 6.0 MIL | 167 | 208 | 250 | 292 | 333 |
| | 6.5 MIL | 154 | 192 | 231 | 269 | 308 |
| | 7.0 MIL | 143 | 179 | 214 | 250 | 286 |
| | 7.5 MIL | 133 | 167 | 200 | 233 | 267 |
| | 8.0 MIL | 125 | 156 | 188 | 219 | 250 |
| | 8.5 MIL | 118 | 147 | 176 | 206 | 235 |
| | 9.0 MIL | 111 | 139 | 167 | 194 | 222 |
| | 9.5 MIL | 105 | 132 | 158 | 184 | 211 |
| | 10.0 MIL | 100 | 125 | 150 | 175 | 200 |

Table 6

# Value of Mils in Inches at Distances Meausured in Yards

| MILS \ DISTANCE TO THE TARGET IN YARDS | 100 | 150 | 200 | 250 | 300 | 350 | 400 | 450 | 500 |
|---|---|---|---|---|---|---|---|---|---|
| 1.0 MIL | 3.6 | 5.4 | 7.2 | 9.0 | 10.8 | 12.6 | 14.4 | 16.2 | 18.0 |
| 1.5 MIL | 5.4 | 8.1 | 10.8 | 13.5 | 16.2 | 18.9 | 21.6 | 24.3 | 27.0 |
| 2.0 MIL | 7.2 | 10.8 | 14.4 | 18.0 | 21.6 | 25.2 | 28.8 | 32.4 | 36.0 |
| 2.5 MIL | 9.0 | 13.5 | 18.0 | 22.5 | 27.0 | 31.5 | 36.0 | 40.5 | 45.0 |
| 3.0 MIL | 10.8 | 16.2 | 21.6 | 27.0 | 32.4 | 37.8 | 43.2 | 48.6 | 54.0 |
| 3.5 MIL | 12.6 | 18.9 | 25.2 | 31.5 | 37.8 | 44.1 | 50.4 | 56.7 | 63.0 |
| 4.0 MIL | 14.4 | 21.6 | 28.8 | 36.0 | 43.2 | 50.4 | 57.6 | 64.8 | 72.0 |
| 4.5 MIL | 16.2 | 24.3 | 32.4 | 40.5 | 48.6 | 56.7 | 64.8 | 72.9 | 81.0 |
| 5.0 MIL | 18.0 | 27.0 | 36.0 | 45.0 | 54.0 | 63.0 | 72.0 | 81.0 | 90.0 |

Table 7

# Value of Mils in Centimeters at Distances Meausured in Meters

| MILS | DISTANCE TO THE TARGET IN METERS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| METERS | 100 | 150 | 200 | 250 | 300 | 350 | 400 | 450 | 500 |
| 1.0 MIL | 10.0 | 15.0 | 20.0 | 25.0 | 30.0 | 35.0 | 40.0 | 45.0 | 50.0 |
| 1.5 MIL | 15.0 | 22.5 | 30.0 | 37.5 | 45.0 | 52.5 | 60.0 | 67.5 | 75.0 |
| 2.0 MIL | 20.0 | 30.0 | 40.0 | 50.0 | 60.0 | 70.0 | 80.0 | 90.0 | 100.0 |
| 2.5 MIL | 25.0 | 37.5 | 50.0 | 62.5 | 75.0 | 87.5 | 100.0 | 112.5 | 125.0 |
| 3.0 MIL | 30.0 | 45.0 | 60.0 | 75.0 | 90.0 | 105.0 | 120.0 | 135.0 | 150.0 |
| 3.5 MIL | 35.0 | 52.5 | 70.0 | 87.5 | 105.0 | 122.5 | 140.0 | 157.5 | 175.0 |
| 4.0 MIL | 40.0 | 60.0 | 80.0 | 100.0 | 120.0 | 140.0 | 160.0 | 180.0 | 200.0 |
| 4.5 MIL | 45.0 | 67.5 | 90.0 | 112.5 | 135.0 | 157.5 | 180.0 | 202.5 | 225.0 |
| 5.0 MIL | 50.0 | 75.0 | 100.0 | 125.0 | 150.0 | 175.0 | 200.0 | 225.0 | 250.0 |

Table 8