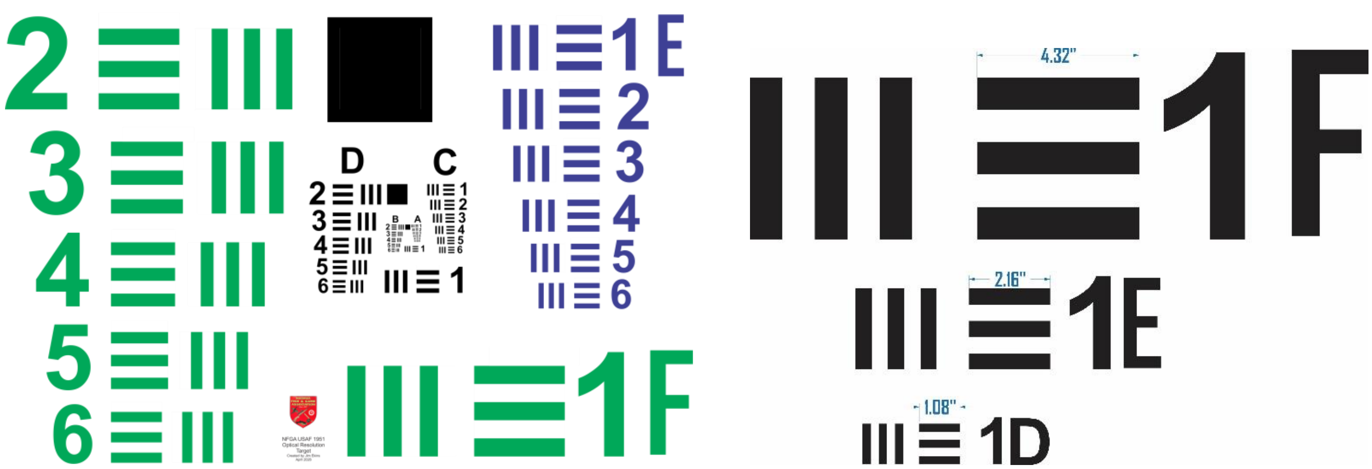
How Good Is Your Optic?
Find Out - Using the USAF 1951 Resolution Chart

Do you ever wonder how good your scope really is and how it compares to other optics? Most of us judge glass by feel, by how sharp it looks, or by how well we can see targets at distance. The problem is that those impressions can change with lighting, terrain, or even how your eyes feel that day, and it is difficult to remember how clear the other image looked.

The USAF 1951 Resolution Chart gives you a simple way to cut through that and make a more consistent, side-by-side comparison. The USAF developed it in 1951 to calibrate aerial reconnaissance and spy satellite cameras. Various locations in the United States still have ground installations where this chart remains visible.

A NFGA version of the USAF 1951 chart was placed just under target marker #15 at Leveridge Range. It has pairs of vertical and horizontal lines, called elements, numbered 1–6 in decreasing size. The elements are divided into lettered groups. The chart also has a reflector attached for laser ranging.

Below is a depiction of the chart, with the **"F"** group in green and the **"E"** group in blue to illustrate placement; groups D, C, B, and A follow the same format. Each numbered element is ½ the size of the same-numbered element in the letter group above it and 2x the size of the one below it. For example, the **"E1"** elements (2.16 inches sq.) are ½ the size of the **"F1"** elements (4.32 inches sq.) and 2x the size of the **"D1"** elements (1.08 inches sq.). This relationship is handy because if you see **"E1"** at 4x and zoom to 8x, you should see **"D1"** clearly.



Using the chart is straightforward. Set up your optic and look for the smallest set of lines you can clearly resolve both vertically and horizontally. Note the group letter and element number. That point serves as your reference; use it to compare one optic to another. If you're comparing two optics, view each at the same magnification and see which one allows you to resolve the smallest line element. It's also a great way to evaluate how your optic performs across its magnification range. Some optics look great at low magnification but start to lose clarity at the top end. Viewing the chart at different magnifications can show you where that drop-off occurs.

Now for the technical side. A person with 20/20 vision can resolve approximately 1 MOA. At 100 yards, 1 MOA corresponds to 1.047 inches, meaning a line of that width should be distinguishable to the naked eye under ideal conditions.

If we use a 10x optic, resolution improves proportionally. In effect, this reduces the minimum resolvable line-width at 100 yards to 0.1047 inches (1.047 ÷ 10 power = 0.1047). Extending this to 600 yards, 1 MOA is about 6.282 inches. With a 10x optic, the resolvable line size becomes 0.628 inches. Referring to Table 1, we go to the next larger element, **"F3"**, at 0.686 inches. Keep in mind that this assumes ideal conditions: a perfect eye and a high-quality optic. In real-world use, you may only be able to distinguish the next larger element.

The two tables below can be used to evaluate the resolving capability of your optic. Table 1 lists line-widths for each element on the test chart. You can use this to calculate what an ideal optic can see under the best conditions. What is handy about Table 1 is that the line-width indicates the distance at which you can see an element with the naked eye. For example, element **"F1"** can be seen at 86.4 yards. Table 2 shows how some common optic magnifications and distances relate to the test chart elements; it will save some time if you don't want to do the calculations above.

Table 1 Line-Width for Each Element

Grp/Elm	Line Width	Grp/Elm	Line Width
F / 1	0.864	C / 1	0.108
F / 2	0.770	C / 2	0.096
F / 3	0.686	C / 3	0.086
F / 4	0.611	C / 4	0.077
F / 5	0.545	C / 5	0.068
F / 6	0.485	C / 6	0.061
E / 1	0.432	B / 1	0.054
E / 2	0.385	B / 2	0.048
E / 3	0.343	B / 3	0.043
E / 4	0.306	B / 4	0.038
E / 5	0.272	B / 5	0.034
E / 6	0.243	B / 6	0.030
D / 1	0.216	A / 1	0.027
D / 2	0.193	A / 2	0.024
D / 3	0.172	A / 3	0.022
D / 4	0.153	A / 4	0.019
D / 5	0.136	A / 5	0.017
D / 6	0.121	A / 6	0.015

Table 2
Chart Group / Element for Selected Scope Power

Mag X	Dist. Yards	1 MOA Line Width	Best Line Size	Chart Grp/Elm	Mag X	Dist. Yards	1 MOA Line Width	Best Line Size	Chart Grp/Elm	Mag X	Dist. Yards	1 MOA Line Width	Best Line Size	Chart Grp/Elm
3x	100	1.047	0.349	**E/3**	3x	200	2.094	0.698	**F/2**	3x	600	6.282	2.094	-------
4x	100	1.047	0.262	**E/5**	4x	200	2.094	0.524	**F/5**	4x	600	6.282	1.571	-------
8x	100	1.047	0.131	**D/5**	8x	200	2.094	0.262	**E/5**	8x	600	6.282	0.785	**F/2**
10x	100	1.047	0.105	**C/1**	10x	200	2.094	0.209	**D/1**	10x	600	6.282	0.628	**F/4**
12x	100	1.047	0.087	**C/2**	12x	200	2.094	0.175	**D/3**	12x	600	6.282	0.524	**F/5**
14x	100	1.047	0.075	**C/4**	14x	200	2.094	0.150	**D/4**	14x	600	6.282	0.449	**E/1**
20x	100	1.047	0.052	**B/1**	20x	200	2.094	0.105	**C/1**	20x	600	6.282	0.314	**E/4**
30x	100	1.047	0.035	**B/5**	30x	200	2.094	0.070	**C/4**	30x	600	6.282	0.209	**E/6**
40x	100	1.047	0.026	**A/1**	40x	200	2.094	0.052	**B/1**	40x	600	6.282	0.157	**D/3**
60x	100	1.047	0.017	**A/4**	60x	200	2.094	0.035	**B/5**	60x	600	6.282	0.105	**C/1**

Author's notes:
I tested my spotting scope, a Fujinon 20-60x 57mm, at 600 yards using the 1951 chart. Set to 20x, the spotting scope should be able to see a line-width of 0.3141 inches (6.282 ÷ 20 power), which corresponds to element **"E3"** but I could only see the next larger element **"E2"**, which measures 0.385 inches. Not bad for my mid-price scope during the early afternoon with a mirage.

Range Chart and Info provided by NFGA Member Jim Ekins