Large Size Resolution Targets

Revised Product

Rochester Institute of Technology, Printing Applications Laboratory

Rochester Institute of Technology has been producing the large size Air Force Targets for some 30 years. They used to be screen printed at a local printer who however went out of business a few years ago. Other printers were sought, but without success.

Finally it was decided to switch to a different production method, using wide format ink jet printing. This meant that a new original had to be made which, in this case, is a digital file. Fortunately we had developed skills in the design and production of resolution targets for other applications. We were able to hand code a PostScript file that permits fine tuning of bar widths, image size, and density of the bars.

The basic design of the target is identical to the previous analog targets. The specifications published by RIT[1] which were based on a report by the Naval Surface Weapons Center[2] were followed. The new technique assures a close adherence to the theoretical design specifications of the target.

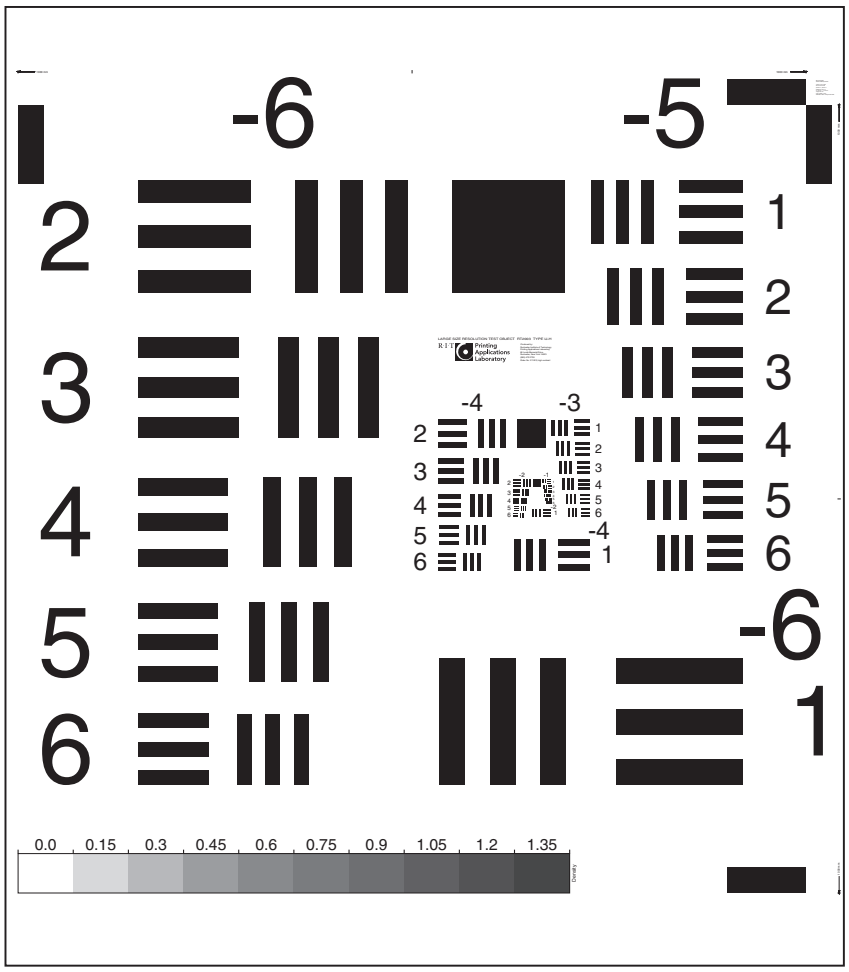

Figure 1, Large Size Resolution Test Object RT2003 Type IJ

New features

Using the capabilities of the new production technique, we realized that it was now possible to add a gray scale to the basic design. A gray scale is important because resolving power depends very much on exposure, and relative exposure can be verified using a gray scale. An additional change in the design was done by adding bars in the corners of the target that are exactly 1000.0 millimeters apart. This facilitates determination of magnification.

Contrast

We have communicated with previous users of these targets and they all indicated that the targets should not be glossy and not laminated. We researched and found matte inks that are also light fast and water resistant. The targets are printed on a 9 mil Tyvek® based material which also has a matte surface.

There are three contrast ratios available, (corresponding to the following densities):

High contrast	22.4:1	(1.35)
Medium contrast	6.3:1	(0.80)
Low contrast	1.6:1	(0.20)

The highest density we were able to reliably achieve is 1.35. This density would be higher if glossy inks could be used, or if the targets were gloss laminated. The Tyvek material is not totally opaque, it makes a difference what color backing material is used for viewing or measurements of contrast.

Target design

Image width	40.2 inches,	1045 mm;	height 42 inches,	1066 mm
Substrate width	42 inches,	1066 mm;	height 47.9 inches,	1217 mm

The target is based on the design of the "USAF-1951" resolution target. There are 36 target elements decreasing in spatial frequency as the sixth root of two ($\sqrt[6]{2}$) which is about 12.2% change from element to element.

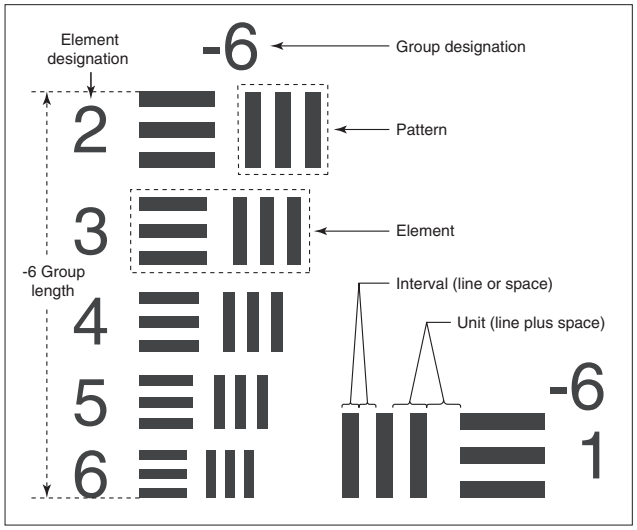

Figure 2, Applicable terminology using example of resolution group -6

The resolution R of any pattern can be computed using the formula: $R = 2^{(K+(N-1)/6)}$ Where K is the group designation and N is the element designation. R is in terms of lines per millimeter. (The distance from one line to the next is one unit width, or the width of one line plus one space.)

For example, for group -3 and element 5:

$R = 2^{(-3+(5-1)/6)} = 2^{(-2.3333)} = 0.1984$ lines per mm, which is 5.040 mm for one unit (line and space), or 2.520 mm for one interval (line or space).

The above mentioned RIT publication also contains tables to facilitate calculation of magnification and resolution on the basis of measurements of group -6 length, image distance and lens focal length.

Custom features

If you as a user of these targets would need some special features, please contact RIT Printing Applications Laboratory at (585) 475 2739. We may be able to accommodate your needs.

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[1] Graphic Arts Research Center at Rochester Institute of Technology, "Instruction Manual for the use of the Large Size Resolution Test Object", 1977, Rochester NY, 14623

[2] Naval Surface Weapons Center (formerly Naval Ordnance Laboratories), Report #NOLTR 72-18, White Oak, Maryland.