



Designation: F1443 – 93 (Reapproved 2003)

Standard Practice for Using 0.008-in. (0.203-mm) Aperture Reflectometers as Test Instruments for Measuring Visual Image Quality of Business Copy Images¹

This standard is issued under the fixed designation F1443; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers the use of the reflectance-type optical character testers with a 0.008-in. (0.203-mm) aperture as test instruments for measuring image quality.

1.2 Although other systems may be available, this practice covers two of the most commonly used instruments; the Clearwave 082 Optical Character Tester² and the Macbeth Print Contrast Meter.³

1.3 These instruments also have the capability of predicting machine readability of documents. This practice does not address this capability.

1.4 The values stated in inch-pound units are to be regarded as the standard. The SI units given in parentheses are for information only.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*⁴

F497 Practice for Use of the Electric and Electronic Typewriter as a Test Instrument⁴

F597 Practice for Evaluation of One-Time Carbon Paper in Carbon-Interleaved Business Forms by Use of an Electric Typewriter⁴

¹ This practice is under the jurisdiction of ASTM Committee F05 on Business Imaging Products and is the direct responsibility of Subcommittee F05.03 on Research.

Current edition approved April 15, 1993. Published August 1993. Originally published as F1443 – 92. Last previous edition F1443 – 92. DOI: 10.1520/F1443-93R03.

² Formerly manufactured by Moore, this tester is currently available from Clearwave Inc., 8701 Buffalo Ave., Niagara Falls, NY 14304.

³ Available from Macbeth, Division of Kollmorgen Instruments Corp., 405 Little Britain Rd., New Windsor, NY 12553-6148.

⁴ *Annual Book of ASTM Standards*, Vol 15.09.

F686 Practice for Evaluation of Image Quality Produced by Carbonless Copy Paper with an Electric or Electronic Typewriter⁴

F1033 Test Method for Comparing Lift-Off Correction Media⁴

F1125 Terminology of Image Quality in Impact Printing Systems⁴

F1174 Practice for Using a Personal Computer Printer as a Test Instrument⁴

F1175 Practice for Using the Computer Impact Print-Out Unit as a Test Instrument for Manifold Comparison

3. Terminology

3.1 *Definitions*—Refer to Terminology **F1125** for definitions of terms applicable to this practice.

4. Summary Of Practice

4.1 This practice describes the use of small-aperture (0.008-in.) (0.203-mm) reflectance meters in evaluating business copy images from any source including but not limited to copiers, printers, typewriters, and facsimile machines. Image quality characteristics common to all systems include reflectance, sharpness, cleanliness, and character width. Other characteristics may be evaluated depending on the imaging method.

4.2 The 0.008-in. (0.203-mm) optical character testers equipped with a one-to-one lens option have the ability to examine large areas for average reflectance in the 1× mode and make measurements of small localized spots within these areas in the 20× mode. The graduated projection viewing screen allows accurate measurements of objects within the viewing area in the 5× or 20× mode.

4.3 Place the sample so that the image to be measured is over the 0.008-in. (0.203-mm) target area as observed on the viewing screen or in the viewing port. Reflectance values can be read out directly on the digital meter. This capability may be used to measure reflectance of printed characters, base paper, or areas in which characters have been corrected, or combination thereof.

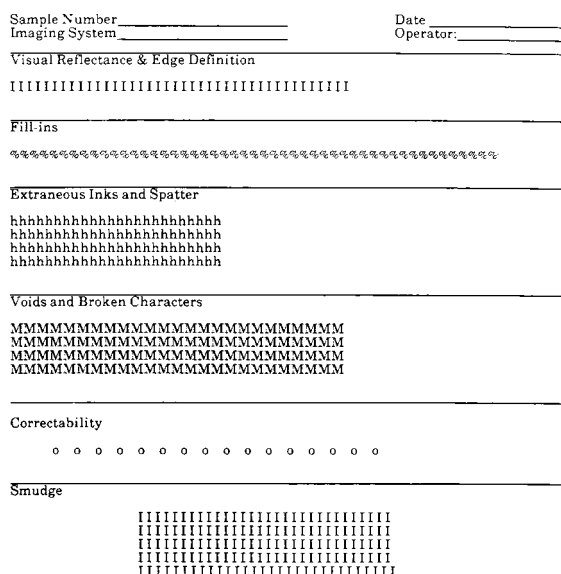


FIG. 1 Test Pattern for Image Quality Evaluation

4.4 Images for evaluation are produced by various systems using ASTM standards where available. When standards are not available, knowledge of the imaging system and its characteristics should be applied. Although the test pattern used will depend on the ASTM standard being used, a typical pattern is shown in **Fig. 1**.

5. Significance and Use

5.1 This practice enables image quality evaluation on samples generated by various imaging systems. It can be used to conduct investigations, including image reflectance, sharpness, voids, character width, and degradation of materials. The test instruments can be used for research and development projects as well as for manufacturing control.

6. Interferences

6.1 Variations in paper surfaces and thickness will affect some print quality parameters. If sheeted paper is used, the user should be aware that sheet to sheet smoothness and brightness variations within a ream may have a significant effect, particularly on reflectance readings. Most papers contain a felt and a wire side that have different surface smoothness levels and this in turn can also affect test results.

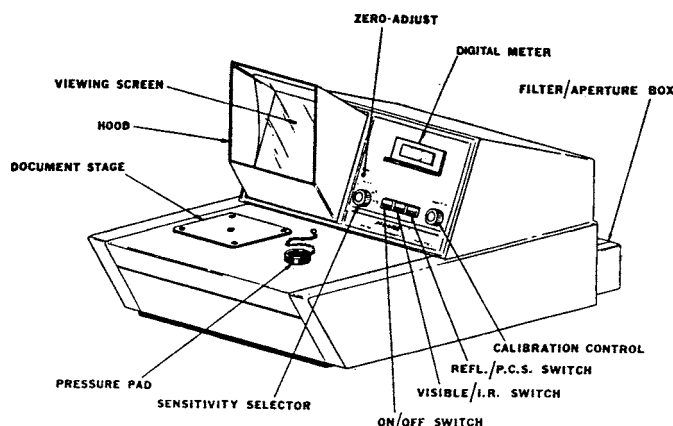
6.2 The frequency between calibration may affect reflectance readings. The use of a voltage regulator for those not having one built in will minimize drift and eliminate variations in line voltage which could affect reflectance measurements.

6.3 Evaluation equipment cleanliness is important for accurate readings. Users should follow manufacturer's recommended cleaning procedures.

6.4 Imaging system used, and the various settings on it can affect the results.

6.5 Differences in the skill level of the tester and differences between instruments may affect the measurements.

6.6 Some reflectance type optical character testers contain optical filters. The spectral response of filters can change with

FIG. 2 Clearwave Optical Character Tester (082)²

time. Although the calibration procedure guarantees calibration when reading black/white images, it does not on colored images.

6.7 Heat generated by the lamps of both the 082A² and PCM II³ can damage samples that contain thermally sensitive materials such as direct thermal paper and samples employing toners for the image. Reflectance readings can be taken but care must be employed to prevent damage or alteration to the samples during the measurement.

6.8 Care must be maintained when moving the imaged specimen on the instrument, so as not to mar the image.

7. Apparatus and Materials

7.1 Clearwave Optical Character Tester:

7.1.1 *Clearwave 082A*,⁵ with the 20 $\times$ magnification and one-to-one lens options (see [Fig. 2](#)),

7.1.2 *Voltage Regulator* (115 or 230 V), for the available line voltage (optional), and

7.1.3 Barium Sulfate Calibration Standard and White Ceramic Tile

7.2 Macbeth Print Contrast Meter:

7.2.1 *Macbeth PCM II* ⁶(see **Fig. 3**), and

7.2.2 Barium Sulfate Calibration Standard.

8. Test Specimens

8.1 Prepare the test specimens using the procedure outlined in 10.2 for the imaging system. A type font should be selected so the 0.008-in. (0.203-mm) aperture area will fit within the printed character boundaries.

8.2 Generate the test specimen in accordance with the instructions given in the test procedure chosen for the printing system concerned. A printing systems self test pattern may be used or a standard test pattern as shown in Fig. 1.

9. Calibration

9.1 Clearwave 082:

9.1.1 The “visual neutral” filter and “0.008-in. (0.203-mm) aperture” should be in the appropriate holders in the filter/

⁵ “Clearwave Model 082A Optical Tester Instruction Manual,” available from Clearwave Inc.