



# Standard Practice for Using the Computer Impact Print-Out Unit as a Test Instrument for Manifold Comparison<sup>1</sup>

This standard is issued under the fixed designation F1175; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

## 1. Scope

1.1 This practice covers a standardized procedure utilizing the computer impact print-out unit as an imaging device where the performance properties of carbonless paper, carbon paper, and similar image-producing products are measured. The printer can be either a high speed printer connected to a mainframe computer or a printer connected to a personal or mini-computer.

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

1.3 *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:*<sup>2</sup>

[D585 Practice for Sampling and Accepting a Single Lot of Paper, Paperboard, Fiberboard, and Related Product \(Withdrawn 2010\)](#)<sup>3</sup>

[D685 Practice for Conditioning Paper and Paper Products for Testing](#)

[F221 Terminology Relating to Carbon Paper and Inked Ribbon Products and Images Made Therefrom](#)

[F549 Terminology Relating to Carbonless Copy Products](#)

[F909 Terminology Relating to Printers](#)

## 3. Terminology

3.1 *Definitions:*

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee F05 on Business Imaging Products and is the direct responsibility of Subcommittee F05.06 on Carbonless and Thermal Imaging Products.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

3.1.1 For definitions of terms used in this practice, refer to Terminology [F221](#), [F549](#), and [F909](#).

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *continuous envelopes*—product for tests, produced with control punched margins so that they can be used on equipment with pinfeed platens. A horizontal perforation (between set perf) allows the forms to be folded, and subsequently separated into individual envelopes (see [Fig. 1](#) and [Fig. 2](#)).

## 4. Summary of Practice

4.1 This practice consists of using a computer print-out unit under specified conditions to prepare images which are used to evaluate carbon paper, carbonless paper and other types of manifold sets on a comparative basis.

## 5. Significance and Use

5.1 This practice is intended to provide a means of evaluating comparative image quality relative to carbonless paper, carbon paper, and similar image-producing products.

## 6. Interferences

6.1 Some printers vary in their impact pressure and printing speed. Comparison tests must be run on the same printer and program or portion of program for each part of the test. Some smaller printers will not be able to image multiple set forms.

6.2 Caliper variations between test manifold sets can affect image intensity and sharpness. If possible, measure caliper of manifold sets and set printer adjustments accordingly. Different caliper settings should be used when running a four-part as opposed to a six-part set. All similar multiple part sets should be gaged and printed in the same run. Record caliper and printer adjustment data.

NOTE 1—Some printers (for example, the IBM Model 3211) automatically establish the printing pressure by means of a “forms thickness sensor” button. See [13.1.1](#) to ensure that the test manifold set is properly positioned for evaluation.

6.3 Fluctuations of temperature and humidity will affect the paper used for image reception. Tests run on different days could show variations in results. All tests should be dated and temperature and relative humidity data recorded. Control sets should be included in all runs.

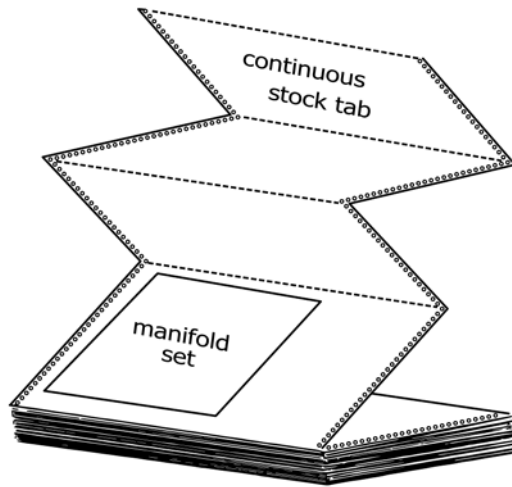


FIG. 1 Manifold Set Position

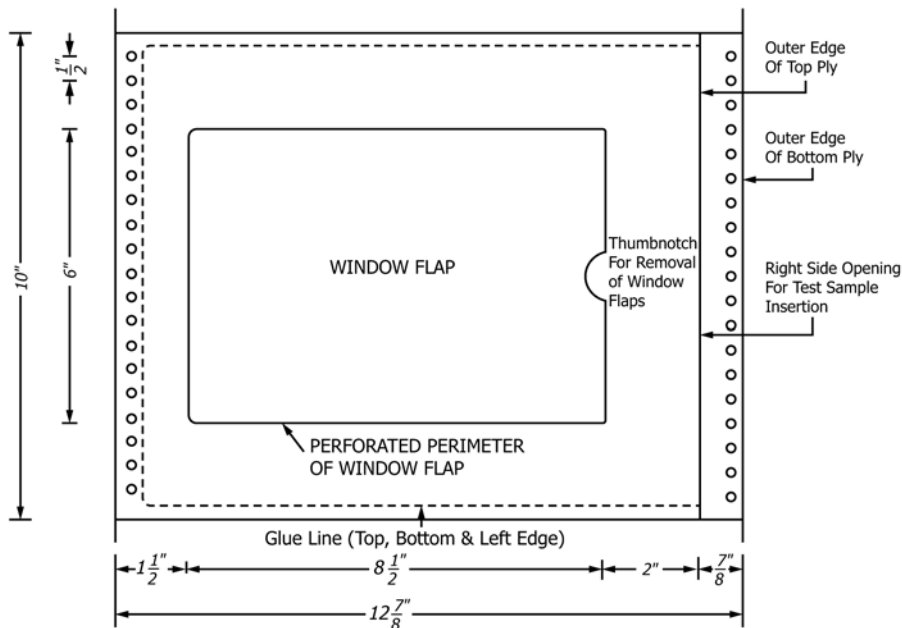


FIG. 2 Envelopes for Imaging Tests

6.4 Carbonless copy products image intensity development may vary with time depending on manufacture. Comparison tests, therefore, must include a control from the same manufacturer printed in the same run.

6.5 Image performance is a function of the number of plies, basis weight and type of paper used in the manifold sets. Form sets with differences in caliper would be expected to yield differences in image performance.

## 7. Apparatus

7.1 *Printer*, to be used to prepare images; a computer impact printer in normal use and adjusted to the manufacturer's specifications.

## 8. Materials

8.1 Use 15# (17 in. by 22 in. (500 sheets)) (56.4 g/m<sup>2</sup>) single-ply continuous computer stock tab forms bond (standard size 11 by 14 7/8 in. (279.4 by 377.8 mm)) or continuous forms test envelopes.

8.2 Test and control manifold sets cut to 8 1/2 by 9 in. (216 by 229 mm) or alternative convenient size, grain long. Sets must contain the same number of parts. Four or six-part sets are typically employed in tests.

8.3 *Transparent Adhesive Tape*—1/2 in. recommended but wider tape can be employed.

## 9. Sampling

9.1 Sample the carbonless paper, carbon paper, or other materials to be tested in accordance with Practice D585.

## 10. Preparation of Apparatus

10.1 Using manifold set caliper data, adjust the printer to the proper caliper setting and record this setting.

## 11. Standardization

11.1 Establish a print-out test program utilizing both characters and numerals. It is preferable to print at six lines/in. and double space. This test program is to be printed on all manifold sets to establish a comparison standard.

## 12. Conditioning

12.1 Testing shall be conducted in an environment with stable conditions of temperature and relative humidity. It is suggested that test material (manifold sets) be conditioned for 24 h in the area in which testing will be conducted. If available, standard conditions of  $50.0 \pm 2.0$  % relative humidity and  $23.0 \pm 1.0^\circ\text{C}$  should be used (see Practice D685). If other conditions are used, record the temperature and percent relative humidity.

## 13. Procedure for Preparing Image

13.1 Assemble the test and control manifold sets. Once assembled, check the sets by making a small mark on one edge to verify that each sheet has been properly inserted. For carbon sets check that each carbon is facing the correct way and that the proper number of carbons have been used. For carbonless sets check that a “coated back” (CB) is in the first position and a “coated front” (CF) is in the last with the internal sheets all being “coated front and back” (CFB). Check that each sheet has been inserted with CF facing up and CB down. Prepare the test manifold samples by one of the following two methods. For both methods, arrange the manifold sets such that the machine direction of the grain feeds in the direction of travel through the computer impact printer. All dimensions stated are approximate and should be used as a guide.

NOTE 2—The carrier sheet tape-on method would be expected to give poorer imaging results since the forms set has a higher overall caliper. In the continuous envelope method a window is cut behind the test set.

13.1.1 *Carrier Sheet Tape-On Method*—The continuous computer stock tab forms bond 15-pound ( $17 \times 22$  in. (500 sheets)) ( $56.4 \text{ g/m}^2$ ) as the carrier system. Allow at least five sheets of the computer stock tab forms bond for lead-in.

13.1.1.1 Position the manifold set (normally  $8\frac{1}{2}$  by 9 in. (216 by 229 mm) grain long) on top of the computer stock tab forms bond with the  $8\frac{1}{2}$ -in. (216-mm) edge  $1\frac{1}{16}$  (27 mm) from stock tap perforations and the 9-in. (229-mm) edge  $1\frac{1}{2}$  in. (23.1 mm) from the left hand punched end as the stock tab feeds through the printer (see Fig. 1).

NOTE 3—When evaluating forms on printers which automatically adjust the unit to the form caliper, the test manifold set must be positioned so its left hand edge is  $\frac{1}{4}$  to  $\frac{3}{4}$  in. (6.35 to 19.05 mm) from the tractor pin holes along the left-hand side as the stock tab forms are fed into the printer. This allows the test manifold set to activate the forms thickness sensor button.

13.1.1.2 Remove trapped air from within the test manifold set by positioning a board 8 in. by  $7\frac{1}{2}$  by  $\frac{3}{4}$  in. (203 by 191 by 19.1 mm) weighing approximately 14.1 oz (400 g) in the center on top of the form set.

13.1.1.3 With the board in place and using  $\frac{1}{2}$  in. (12.7 mm) wide transparent tape (2.5 mils or 0.064 caliper), tape all four edges of the test manifold set securely to the continuous stock tab sheet.

### 13.1.2 *Continuous Envelope Method:*

13.1.2.1 See Fig. 2 for detail and dimensions of a continuous envelope system that can be used for this test. A perforation is used between the individual envelopes for purpose of folding and subsequent separation. Perforations are provided for removal of windows from the front and back of the envelope.

13.1.2.2 Use two empty envelopes for leading and two empty envelopes for finishing the run through the printer. Apply tape to avoid catching and tearing at the horizontal perforations of the perforated window areas of the leading and finishing envelopes, as it is being run through the printer. Use  $\frac{1}{2}$  in. (12.7 mm) wide transparent tape, that is 0.0025 in. (0.064 mm) in thickness, cut to approximately 1 in. (25.4 mm) longer than the width of the window areas. Apply tape to both the front and back, and to the top and bottom of the window area horizontal perforations. Locate the strips of tape so that they extend the window widths by approximately  $\frac{1}{2}$  in. on each side, and so that the top half of the tape is above and the bottom half of the tape is below the horizontal perforations.

13.1.2.3 Remove the perforated window flaps from the top ply of a sufficient number of consecutive envelopes to accommodate the number of test and control sets to be run.

13.1.2.4 When working with right-hand opening envelopes, insert the manifold test and control sets with the right hand, using the left hand to guide the sets into the individual envelopes. Make sure sets are properly inserted.

13.1.2.5 With the test and control manifold sets properly inserted in the individual envelopes, apply strips of transparent tape to the bottom of the window areas. Use tape that is in. (12.7 mm) wide and 0.0025 in. (0.064 mm) thick. The tape should be cut to approximately 1 in. longer than the width of the window area. Locate the strips of tape so that they extend the window widths approximately  $\frac{1}{2}$  in. on each side, and so that the top half of the tape is on the copy ply of a stuffed set and the bottom half of the tape is on the top envelope ply.

13.1.2.6 Reposition the complete system so that the fronts are now down on a smooth work surface.

13.1.2.7 With the test and control sets securely in position, remove the perforated back of each envelope.

13.1.2.8 Fasten the lower edge of the window areas on the reverse side in the same manner as 13.1.2.5.

13.1.2.9 Carefully force any air that could be occluded between the plies out of the opened side of each envelope.

13.2 For control purposes, include manifold sets from the same manufacturer which, from previous experience, have been found to have known performance qualities in normal use.

13.3 Refold the test manifold sets and condition according to 12.1.

13.4 After conditioning, feed the lead-in into the printer and running at normal speed, image the manifold sets in accordance with 10.1 and 11.1.

13.5 Remove the printed test manifold sets from the printer taking precautions not to fold or otherwise cause smudge or pressure damage. Test manifold sets can then be separated from the stock tab or envelope using a paper cutter or other suitable means.

#### **14. Procedure for Comparative Image Quality Evaluations**

14.1 Deleave the plies and visually compare the test and control manifold set images. The images on corresponding manifold copy should be compared for relative values of the following characteristics:

- 14.1.1 Image intensity,
- 14.1.2 Image sharpness,
- 14.1.3 Image granularity,
- 14.1.4 Image fill-in,
- 14.1.5 Image spread,
- 14.1.6 Cleanliness, and
- 14.1.7 Hammer shadow.

NOTE 4—When using continuous envelopes, evaluate copy that appears in the window area only. In addition, do not consider images that are affected by the additional thickness contributed by tape and the envelopes frame itself.

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#### **15. Report**

15.1 Report the relative image quality produced from the test manifold sets as equal to, greater than or less than the image quality produced from the control manifold sets. The following features of images can be considered:

- 15.1.1 Intensity,
- 15.1.2 Sharpness,
- 15.1.3 Granularity,
- 15.1.4 Fill-in,
- 15.1.5 Spread, and
- 15.1.6 Cleanliness.

#### **16. Precision and Bias**

16.1 Repeatable ranking order results or a repeatable relationship to a control can be obtained with this practice provided that:

- 16.1.1 The same printer in the same condition is operated with similar voltages.
- 16.1.2 Sample conditioning procedures are similar and,
- 16.1.3 Ambient conditions are similar.
- 16.1.4 Equivalent parts from the manifold sets are compared.

#### **17. Keywords**

17.1 carbon paper; carbonless paper; computer impact print-out; continuous printing; imaging device; impact printer; manifold set