



Designation: F 1707 – 96 (Reapproved 2002)

Standard Practice for Determining Energy Consumption of Facsimile Machines¹

This standard is issued under the fixed designation F 1707; 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 procedure provides a method by which electrophotographic, direct-thermal, thermal transfer, or ink-jet facsimile machines can be tested for energy consumption.

1.2 *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:*

F 335 Terminology Relating to Electrostatic Copying²

F 757 Test Method for Determining Energy Consumption of Copier and Copier-Duplicating Equipment²

2.2 *ANSI Standard:*

C 12.10 Electromechanical Watthour Meters³

3. Terminology

3.1 For definitions of terms used in this practice, see Terminology **F 335** and Test Method **F 757**.

3.2 *cycle out*—the condition that exists when the machine has finished sending or receiving a page, and has returned to a stand-by mode.

3.3 *idle time*—the amount of time that the machine is not sending or receiving when testing sending or receiving energy.

3.4 *job*—receiving or sending one or more pages without interruption or delay between pages.

3.5 *machine energy*—the energy consumed by a facsimile machine that is plugged in 24 h/day and turned on 10.5 h (see **Note 1**), but is not sending, receiving, or making copies.

NOTE 1—Some users may want to adjust this time if they do not turn off their facsimile machines. Therefore, the test should be performed for the plug-in and warm-up modes, but won't be included in the calculations. If

the user wants to include these modes in the calculations, the tester should recalculate the numbers used in Section 10.

3.6 *nominal facsimiles received per day*—the number of standard facsimiles received on a single machine during a standard work day.

3.7 *nominal facsimiles sent per day*—the number of standard facsimiles sent on a single machine during a standard work day.

3.8 *receiving*—the machine condition that exists from the beginning to the end of the cycle that receives a page from an outside source and prints that page while receiving.

3.9 *receiving energy*—the energy consumed during a designated receiving mode exclusive of stand-by and plug-in energy.

3.10 *sending*—the machine condition that exists from the beginning to the end of the cycle that sends a page to an outside source.

3.11 *sending energy*—the energy consumed during a designated sending mode exclusive of stand-by and plug-in energy.

3.12 *sending receiving time*—the amount of time that the nominal jobs are run when testing sending and receiving energy.

3.13 *stand-by*—the condition that exists when the machine is not sending, receiving, or copying, has reached operating conditions, but has not yet entered into energy-saver mode.

3.14 *warm-up mode*—the condition that exists when the machine is turned on from a plug-in mode and prior to sending, receiving, or copying.

4. Summary of Test Method

4.1 The standard energy consumption rating is determined for a facsimile machine while the machine is in a simulated customer installation performing one eighth of a typical day's jobs (using a watt-hour meter). The typical day's jobs (size and number of pages) are based on a standard volume (see **Table 1**). The simulated customer installation can be calculated with actual usage data, or can be based on the following assumptions, that the printer will typically:

4.1.1 Be plugged in to a live power line for thirty 24-h days (720 h)/month.

4.1.2 Never be turned on and off (see **Note 1**).

¹ This practice is under the jurisdiction of ASTM Committee F05 on Business Imaging Products and is the direct responsibility of Subcommittee F05.04 on Electrostatic Imaging Products.

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² *Annual Book of ASTM Standards*, Vol 15.09.

³ Available from American National Standards Institute, 11 W. 42nd St., 13th Floor, New York, NY 10036.



TABLE 1 Nominal Parameters for Each Standard Volume

Nominal Monthly Volume, Pages per Month	Nominal Day's Pages	Nominal Jobs (1/8 day) n^A		
		Number of Jobs	Number of Pages per Job	Job Interval
200	8	1	1	60 min
500	24	3	1	20 min
1 000	48	3	2	20 min
2 500	112	7	2	8.6 min
5 000	224	14	2	8.6 min
10 000	432	18	3	3.3 min
25 000	1152	36	4	1.6 min
40 000	1824	57	4	62 s

^A n = number of jobs $\times$ number of originals $\times$ number of pages per original.

4.1.3 Be left on 24 h/day for 30 days of each standard work month.

4.1.4 Be in an energy-saver mode some amount of time depending on the nominal volume and use from Table 1, the sending receiving time from Table 2, and the energy-saver delay time.

4.1.5 Perform a typical day's jobs for each of the 30 workdays each month.

4.2 The energy consumption per page or the typical month's energy consumption rating (kilowatt hour (kWh) per month) are determined using calculations based on the test data.

5. Significance and Use

5.1 This practice provides a procedure for measuring the energy consumption of the product and associated accessories in various operating modes. It does not reflect the total energy required to produce a page. It does not, for example, include the energy required to manufacture the paper or the machine. It is intended to permit rating the energy requirements of products by a method that will permit accurate energy efficiency comparisons with similar products.

6. Apparatus and Supplies

6.1 *Watt-Hour Meter*, one per phase, accurate to three figures and compliant with ANSI C12.10, performance tables 5.1.8.⁴

6.2 *Timer*—A timing device accurate to 1 s and ± 0.5 %.

6.3 *Test Target*—A ten-pitch pica; 45 lines of lower case "k" character; 65 characters per line (2925 total characters) with a 1-in. (25-mm) clear border around the typed area on white paper. This target is prepared by the user. Alternatively the ITU-TS Target #1⁵ or equivalent with 4 % coverage may be used.

6.4 *Paper for Plain Paper Machines*, 8½ by 11 in. (216 by 280 mm), 20-lb bond or machine manufacturer's recommended midpoint range of paper weight.

6.4.1 *Paper for Other Than Plain Paper Machines*—The paper should be the manufacturer's recommended midpoint range of paper weight.

⁴ The series 1000 Kilowatt Hour Meter is available from National Meter Industries, Inc., P.O. Box 462, Stamford, CT 06907.

⁵ Available from the Omnicom Institute, 115 Park Street SE, Vienna, VA. The ITU-TS is the International Telecommunications Union-Telecommunications Standardization Sector.

TABLE 2 Calculation for Sending/Receiving Time

Nominal Monthly Volume, pages per month	Number of Jobs, j	Number of Pages per Job	Printing Time, min/h (S/R_j)
200	1	1	1/X
500	3	1	3/X
1 000	3	2	3/X + 3/Y
2 500	7	2	7/X + 14/Y
5 000	14	2	14/X + 14/Y
10 000	18	3	18/X + 36/Y
25 000	36	4	36/X + 108/Y
40 000	57	4	57/X + 171/Y

6.5 *Facsimile Machines*—Two identical facsimile machines are to be used, one as the test sample and a second sample to act as the transmitter or receiver as required.

6.6 *PBX Line Simulator*—A two-way telephone line simulator⁶

6.7 *Telephone Wire*—Two lengths of exactly 6 ft should be used.

7. Sampling

7.1 The energy testing should be for a device representative of the commercially available equipment. Any modification of the product or additional configurations that significantly alter energy consumption will require additional testing.

7.2 The facsimile machine(s) to be evaluated should be setup within the manufacturers operating specifications.

7.3 If the facsimile machine has more than one rate of transmission, it should be tested for each transmission rate.

7.4 The facsimile machines equipped with more than one resolution setting should be tested at the standard resolution setting and optionally at other resolution settings.

7.5 *Optional*—The facsimile machines equipped with the machine proprietary transmission protocols should be tested twice, once with the proprietary transmission protocol active, and once with the proprietary transmission protocol inactive. Both image quality and energy consumption should be compared at each protocol setting so optimal settings may be determined.

8. Preparation of Apparatus

8.1 Test Conditions:

8.1.1 The room ambient temperature shall be within a range of $21 \pm 3^\circ\text{C}$; from 40 to 60 % relative humidity.

8.1.2 The working voltage shall be machine-rated voltage ± 2 %.

8.1.3 The machine shall be at least 2 ft (610 mm) from any wall, obstacle, or air vent.

8.1.4 All supplies used shall be those specified by the facsimile machine manufacturer and preconditioned for a minimum of 24 h at room ambient temperature and humidity prior to evaluating the facsimile machine energy consumption.

8.1.5 The alternating current power shall be supplied as a true sine wave with no more than 3 % harmonic distortion.

⁶ The Phantom Central Office Simulator, or equivalent has been found suitable for use. The Phantom Central Office Simulator is manufactured by Command Communications, Aurora, CO, and is available from Fleetmasters in California (310)539-7900.