

# ENERGY STAR® Qualified Imaging Equipment Typical Electricity Consumption (TEC) Test Procedure

*This document presents a test procedure for the **Typical Electricity Consumption (TEC)** method for the Version 1.0 ENERGY STAR Imaging Equipment (IE) specification. The procedure is to be used to evaluate the TEC of standard-size IE products such as copiers, digital duplicators, fax machines, multifunction devices (MFDs), and printers that use high-temperature technologies such as electrophotography and solid ink, and those that provide comparable functionality. It is not intended for low-temperature technologies such as ink jet, dot matrix, or impact, nor for large format devices. The key result of this test procedure is a value for typical weekly electricity consumption.*

This test procedure document describes the following:

1. Types of products covered;
2. Test parameters;
3. Job structure;
4. Measurement procedures;
5. Calculation method; and
6. References

The full TEC test procedure consists of this narrative document and the accompanying files:

- **ENERGY STAR TEC Data Collection Worksheet** – Provides a format for reporting values and performs the TEC calculations; and
- **Test Conditions and Equipment for Determining the ENERGY STAR Qualification Status of IE Products** – Provides the ambient test conditions and equipment requirements that should be established when performing the energy or power measurements to determine a product’s ENERGY STAR qualification status.

## 1. Types of Products Covered

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The TEC test procedure is designed for use as a method of measurement for the following standard-size products, regardless of color capability, which use the below designated marking technologies:

**Table 1.** Products and Marking Technologies Evaluated with TEC

| Products Covered by TEC                   | Marking Technologies Covered by TEC                |
|---|--|
| Digital duplicators <sup>1</sup>          | Direct Thermal                                     |
| Stand-alone copiers <sup>2</sup>          | Dye Sublimation                                    |
| Stand-alone printers                      | Electrophotographic (laser, LED, LCD) <sup>3</sup> |
| Stand-alone fax machines                  | Solid Ink  |
| Multifunction devices (MFDs) <sup>4</sup> | Thermal Transfer                                   |

<sup>1</sup> Digital duplicators use a marking technology not reflected in the list of technologies covered by TEC; however, these products are still treated by TEC

<sup>2</sup> Includes standard and upgradeable

<sup>3</sup> Includes both serial and parallel color

<sup>4</sup> Includes printer/fax combination units

## 2. Test Parameters

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This section describes the test parameters to use when measuring a product under the TEC test procedure. This section does *not* cover test conditions, which are outlined in **Test Conditions and Equipment for Determining the ENERGY STAR Qualification Status of Imaging Equipment Products**.

### Testing in Simplex

Products shall be tested in simplex mode. Originals for copying shall be simplex images.

### Test Image

The test image is Test Pattern A from ISO/IEC standard 10561:1999. It shall be rendered in 10 point size in a fixed-width Courier font (or nearest equivalent); German-specific characters need not be reproduced if the product is incapable of doing so. The image shall be rendered on an 8.5" x 11" or A4 sheet of paper, as appropriate for the intended market. For printers and MFDs that can interpret a page description language (PDL) (e.g., PCL or Postscript), images shall be sent to the product in a PDL.

### Testing in Monochrome

Color-capable products shall be tested making monochrome images unless incapable of doing so.

### Auto-off and Network Enabling

The product shall be configured **as-shipped and recommended for use**, particularly for key parameters such as power-management default-delay times and resolution (except as specified below). All information from the manufacturer about recommended delay times shall be consistent with the as-shipped configuration, including those in operating manuals, on Web sites, and that provided by installation personnel. If a printer, digital duplicator or MFD with print-capability, or fax machine has an auto-off capability and it is enabled as shipped, it shall be disabled prior to the test. Printers and MFDs that are capable of being network-connected as-shipped<sup>5</sup> shall be connected to a network. The type of network connection (or other data connection if not capable of being networked) is at the discretion of the manufacturer, and the type used shall be reported. Print jobs can be sent over non-network connections (e.g., USB), even on those units that are network-connected.

### Product Configuration

Paper source and finishing hardware shall be present and configured as-shipped and recommended for use; however, their use in the test is at the manufacturer's discretion (e.g., any paper source may be used). Anti-humidity features may be turned off if user-controllable.

### Digital Duplicators

Digital duplicators should be set up and used in accordance with their design and capabilities. For example, each job should include only one original image. Digital duplicators shall be tested at maximum claimed speed, which is also the speed that should be used to determine the job size for performing the test, not at the default speed as-shipped, if different. Digital duplicators shall be otherwise treated as printers, copiers, or MFDs, depending on their capabilities as shipped.

## 3. Job Structure

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This section describes how to determine the number of **images per job** to use when measuring a product under the TEC test procedure.

For purposes of this test procedure, the speed of the product that is used to determine the job size for performing the test shall be the manufacturer's reported maximum claimed simplex speed for making

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<sup>5</sup> The type of network connection shall be reported. Common types are Ethernet, 802.11, and Bluetooth. Other data connection types are USB, serial, and parallel.

monochrome images on standard-sized paper (8.5" x 11" or A4), rounded to the nearest integer. A single sheet printed/copied on one side in a minute is equal to 1 image per minute (ipm). If the maximum claimed speeds differ when producing images on 8.5" x 11" or A4 paper, the higher of the two shall be used. The default output speed of the product, which shall be used in the actual testing, is not measured and may differ from the maximum claimed speed due to factors such as settings for resolution, image quality, printing modes, document scan time, job size and structure, and paper size and weight.

Fax machines should always test with one image per job. The number of images per job to be used for all other IE products shall be computed according to the following three steps. For convenience, Table 5 at the end of this document provides the resultant images per job computation for each integral unit-speed up through 100 ipm.

1. Calculate the number of *jobs per day*. The number of jobs per day varies with the unit-speed of the product:
  - For units with a speed of eight ipm or less, use eight jobs per day.
  - For units with a speed between eight and 32 ipm, the number of jobs per day is equal to the speed. For example, a 14 ipm unit shall use 14 jobs per day.
  - For units with a speed of 32 ipm and above, use 32 jobs per day.
2. Calculate the nominal amount of *images per day*<sup>6</sup> from Table 2 below. For example, a 14 ipm unit shall use  $0.50 \times 14^2$ , or 98 images per day.

**Table 2. Imaging Equipment Job Table**

| Product type            | Rating to use    | Formula (images per day)   |
|-------------------------|------------------|----------------------------|
| Monochrome (except fax) | monochrome speed | $0.50 \times \text{ipm}^2$ |
| Color (except fax)      | monochrome speed | $0.50 \times \text{ipm}^2$ |

3. Calculate the number of *images per job* by dividing the number of images per day by the number of jobs per day. Round down (truncate) to the nearest integer. For example, a figure of 15.8 indicates that 15 images should be made per job, rather than rounding to 16 images per job.

For copiers below 20 ipm, there shall be one original per required image. For jobs with large numbers of images, such as those for machines greater than 20 ipm, it may not be possible to match the number of required images, particularly with limits on the capacity of document feeders. Therefore, copiers 20 ipm and above may make multiple copies of each original as long as the number of originals is at least ten. This may result in more images being made than required. As an example, for a 50 ipm unit that requires 39 images per job, the test may be done with four copies of ten originals or three copies of 13 originals.

#### 4. Measurement Procedures

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To measure time, an ordinary stopwatch and timing to a resolution of one second is sufficient. All energy figures are to be recorded as watt-hours (Wh). All time is to be recorded in seconds or minutes as specified in the **ENERGY STAR TEC Data Collection Worksheet**. "Zero meter" references are to the "Wh" readout of the meter. Tables 3 and 4 below outline the steps of the TEC procedure.

Service/maintenance modes (including calibration) should generally not be included in TEC measurements. Any such modes that occur during the test shall be noted. If a service mode occurs during a job (other than the first), that job can be dropped and a substitute job added to the test. If this is done, the 15-minute job interval shall be maintained at all times, including for the job that is dropped. Color calibration is the most common service mode.

MFDs without print capability are to be treated as copiers for all purposes of this test procedure.

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<sup>6</sup> Interim Images/Day in Table 5

#### 4.a. Procedure for Printers, Digital Duplicators and MFDs with Print Capability, and Fax Machines

**Table 3. The TEC Test Procedure — Printers, Digital Duplicators and MFDs with Print Capability, and Fax Machines**

| Step | Initial State | Action  | Record (at end of step)      | Possible States Measured       |
|------|---------------|---|------------------------------|--------------------------------|
| 1    | Off           | Plug the unit into meter. Zero the meter; wait test period (five minutes or more).  | Off <i>energy</i>            | Off                            |
|      |               |   | Testing Interval <i>time</i> |                                |
| 2    | Off           | Turn on unit. Wait until unit indicates it is in ready mode.  | -                            | -                              |
| 3    | Ready         | Print a job of at least one output image but no more than a single job per Job Table. Record time to first sheet exiting unit. Wait until the meter shows that the unit has entered its final sleep mode. | Active0 <i>time</i>          | -                              |
| 4    | Sleep         | Zero meter; wait one hour.  | Sleep <i>energy</i>          | Sleep                          |
| 5    | Sleep         | Zero meter and timer. Print one job per Job Table. Record time to first sheet exiting unit. Wait until timer shows that 15 minutes have elapsed.  | Job1 <i>energy</i>           | Recovery, Active, Ready, Sleep |
|      |               |   | Active1 <i>time</i>          |                                |
| 6    | Ready         | Repeat Step 5.  | Job2 <i>energy</i>           | Same as above                  |
|      |               |   | Active2 <i>time</i>          |                                |
| 7    | Ready         | Repeat Step 5 (without Active time measurement).  | Job3 <i>energy</i>           | Same as above                  |
| 8    | Ready         | Repeat Step 5 (without Active time measurement).  | Job4 <i>energy</i>           | Same as above                  |
| 9    | Ready         | Zero meter and timer. Wait until meter and/or unit shows that unit has entered its final sleep mode.  | Final <i>time</i>            | Ready, Sleep                   |
|      |               |   | Final <i>energy</i>          | -                              |

**Notes:**

- Before beginning the test, it is helpful to check the power management default-delay times to ensure they are as-shipped, and to confirm that there is plenty of paper in the device.
- “Zero meter” references may be accomplished by recording the accumulated energy consumption at that time rather than literally zeroing the meter.
- Step 1 – The off measurement period can be longer if desired to reduce measurement error. Note that the off power is not used in the calculations.
- Step 2 – If the unit has no ready indicator, use the time at which the power consumption level stabilizes to the ready level.
- Step 3 – After recording the Active0 time, the remainder of this job can be canceled.
- Step 5 – The 15 minutes is from the job initiation. The unit must show increased energy consumption within five seconds of zeroing the meter and timer; it may be necessary to initiate the printing before zeroing to assure this.
- Step 6 – A unit that is shipped with short default-delay times might begin Steps 6-8 from sleep.
- Step 9 – Units may have multiple sleep modes so that all but the last sleep mode are included in the Final period.

Each image shall be sent separately; they all may be part of the same document, but shall not be specified in the document as multiple copies of a single original image (unless the product is a digital duplicator, as specified in Section 2).

For fax machines, which only use one image per job, the page shall be fed into the unit’s document feeder for convenience copying, and may be placed in the document feeder before the test begins. The unit need not be connected to a phone line. If the unit does not provide for convenience copying, then

sending the job via a phone connection is allowed. On fax machines without a document feeder, the page should be placed on the platen.

#### 4.b. Procedure for Copiers, Digital Duplicators, and MFDs without Print Capability

**Table 4. The TEC Test Procedure — Copiers, Digital Duplicators, and MFDs without Print Capability**

| Step | Initial State | Action  | Record (at end of step)      | Possible States Measured                 |
|------|---------------|---|------------------------------|--|
| 1    | Off           | Plug the unit into meter. Zero the meter; wait test period (five minutes or more).  | Off <i>energy</i>            | Off                                      |
|      |               |   | Testing Interval <i>time</i> |  |
| 2    | Off           | Turn on unit. Wait until unit indicates it is in ready mode.  | -                            | -  |
| 3    | Ready         | Copy a job of at least one image but no more than a single job per Job Table. Record time to first sheet exiting unit. Wait until the meter shows that the unit has entered its final sleep mode. | Active0 <i>time</i>          | -  |
| 4    | Sleep         | Zero meter; Wait one hour. If unit turns off in less than one hour, record time and energy in sleep, but wait full hour before moving to Step 5.  | Sleep <i>energy</i>          | Sleep                                    |
|      |               |   | Testing Interval <i>time</i> |  |
| 5    | Sleep         | Zero meter and timer. Copy one job per Job Table. Record time to first sheet exiting unit. Wait until timer shows that 15 minutes has elapsed.  | Job1 <i>energy</i>           | Recovery, Active, Ready, Sleep, Auto-off |
|      |               |   | Active1 <i>time</i>          |  |
| 6    | Ready         | Repeat Step 5.  | Job2 <i>energy</i>           | Same as above                            |
|      |               |   | Active2 <i>time</i>          |  |
| 7    | Ready         | Repeat Step 5 (without Active time measurement).  | Job3 <i>energy</i>           | Same as above                            |
| 8    | Ready         | Repeat Step 5 (without Active time measurement).  | Job4 <i>energy</i>           | Same as above                            |
| 9    | Ready         | Zero meter and timer. Wait until meter and/or unit shows that unit has entered its auto-off mode.   | Final <i>energy</i>          | Ready, Sleep                             |
|      |               |   | Final <i>time</i>            |  |
| 10   | Auto-off      | Zero the meter; wait test period (five minutes or more).  | Auto-off <i>energy</i>       | Auto-off                                 |

Notes.

- Before beginning the test, it is helpful to check the power management default-delay times to ensure they are as-shipped, and to confirm that there is plenty of paper in the device.
- “Zero meter” references may be accomplished by recording the accumulated energy consumption at that time rather than literally zeroing the meter.
- Step 1 – The off measurement period can be longer if desired to reduce measurement error. Note that the off power is not used in the calculations.
- Step 2 – If the unit has no ready indicator, use the time at which the power consumption level stabilizes to the ready level.
- Step 3 – After recording the Active0 time, the remainder of this job can be canceled.
- Step 4 – If the unit turns off within this hour, record the sleep energy and time at that point in time, but wait until a full hour has elapsed since the final sleep mode was initiated before beginning Step 5. Note that the sleep power measurement is not used within the calculation, and the unit may enter auto-off within the full hour.
- Step 5 – The 15 minutes is from the job initiation. In order to be evaluated by this test procedure, products must be able to complete the required job per the Job Table within the 15-minute job interval.
- Step 6 – A unit that is shipped with short default-delay times might begin Steps 6-8 from sleep or auto-off.

- Step 9 – If the unit has already entered auto-off before the start of Step 9, then the values for final energy and final time are zero.
- Step 10 – The auto-off testing interval may be longer to improve accuracy.

Originals may be placed in the document feeder before the test begins. Products without a document feeder may make all images off of a single original placed on the platen.

#### 4.c. Additional Measurement for Products with a Separately-Powered Controller

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This step applies only to products that have a controller (often called a Digital Front End (DFE)) that has a separate mains power cord, regardless of whether the cord and controller are internal or external to the imaging equipment product. A five-minute energy measurement of the controller alone shall be made while the main product is in ready mode. The unit must be connected to a network if network-capable as shipped.

### 5. Calculation Method

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The TEC value reflects assumptions about how many hours a day the product is in general use, the pattern of use during those hours, and the delay times that the product uses to transition to lower power modes. All electricity measurements are made as accumulated energy over time, and then converted to power by dividing by the length of the time period.

The calculations are based on imaging jobs being in two clusters each day with the unit going to its lowest power mode in between (as during a lunch break), as illustrated in Figure 2, which can be found at the end of this document. It is assumed that weekends have no usage, and no manual switching-off is done.

Final time is the time from the last job being initiated to the start of the lowest power mode (auto-off for copiers, digital duplicators and MFDs without print-capability; and sleep for printers, digital duplicators and MFDs with print-capability, and fax machines) minus the 15-minute job interval time.

The following two equations are used for all product types:

$$\begin{aligned} \text{Average Job Energy} &= (\text{Job2} + \text{Job3} + \text{Job4}) / 3 \\ \text{Daily Job Energy} &= (\text{Job1} \times 2) + [(\text{Jobs per Day} - 2) \times \text{Average Job Energy}] \end{aligned}$$

The calculation method for **printers, digital duplicators and MFDs with print-capability, and fax machines** also uses the following three equations:

$$\begin{aligned} \text{Daily Sleep Energy} &= [24 \text{ hours} - ((\text{Jobs per day} / 4) + (\text{Final Time} \times 2))] \times \text{Sleep Power} \\ \text{Daily Energy} &= \text{Daily Job Energy} + (2 \times \text{Final Energy}) + \text{Daily Sleep Energy} \\ \text{TEC} &= (\text{Daily Energy} \times 5) + (\text{Sleep Power} \times 48) \end{aligned}$$

The calculation method for **copiers, digital duplicators, and MFDs without print-capability** also uses the following three equations:

$$\begin{aligned} \text{Daily Auto-off Energy} &= [24 \text{ hours} - ((\text{Jobs per day} / 4) + (\text{Final Time} \times 2))] \times \text{Auto-off Power} \\ \text{Daily Energy} &= \text{Daily Job Energy} + (2 \times \text{Final Energy}) + \text{Daily Auto-off Energy} \\ \text{TEC} &= (\text{Daily Energy} \times 5) + (\text{Auto-off Power} \times 48) \end{aligned}$$

The specifications of the metering equipment and ranges used in each measurement shall be reported. Measurements must be conducted so as to result in a total potential error of the TEC value of no more than 5%. Accuracy does not need to be reported for cases where the potential error is below 5%. When the potential measurement error is equal, above, or close to 5%, manufacturers should perform the

calculations included in the TEC Data Collection Worksheet to ensure that it complies with the 5% limit. Details of the accuracy calculation method for TEC are presented in the TEC Data Collection Worksheet.

The **ENERGY STAR TEC Data Collection Worksheet** lists all reporting requirements of this test procedure and automatically performs the calculations provided above when test values are inputted by the user.

## 6. References

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ISO/IEC 10561:1999. Information technology — Office equipment — Printing devices — Method for measuring throughput — Class 1 and Class 2 printers.

**Table 5. Job Table Calculated**

| Speed | Interim      |                |                |                |                | Interim      |                |                |                |                |      |
|-------|--------------|----------------|----------------|----------------|----------------|--------------|----------------|----------------|----------------|----------------|------|
|       | Jobs/<br>Day | Images/<br>Day | Images/<br>Job | Images/<br>Job | Images/<br>Day | Jobs/<br>Day | Images/<br>Day | Images/<br>Job | Images/<br>Job | Images/<br>Day |      |
| 1     | 8            | 1              | 0.06           | <b>1</b>       | 8              | 51           | 32             | 1301           | 40.64          | <b>40</b>      | 1280 |
| 2     | 8            | 2              | 0.25           | <b>1</b>       | 8              | 52           | 32             | 1352           | 42.25          | <b>42</b>      | 1344 |
| 3     | 8            | 5              | 0.56           | <b>1</b>       | 8              | 53           | 32             | 1405           | 43.89          | <b>43</b>      | 1376 |
| 4     | 8            | 8              | 1.00           | <b>1</b>       | 8              | 54           | 32             | 1458           | 45.56          | <b>45</b>      | 1440 |
| 5     | 8            | 13             | 1.56           | <b>1</b>       | 8              | 55           | 32             | 1513           | 47.27          | <b>47</b>      | 1504 |
| 6     | 8            | 18             | 2.25           | <b>2</b>       | 16             | 56           | 32             | 1568           | 49.00          | <b>49</b>      | 1568 |
| 7     | 8            | 25             | 3.06           | <b>3</b>       | 24             | 57           | 32             | 1625           | 50.77          | <b>50</b>      | 1600 |
| 8     | 8            | 32             | 4.00           | <b>4</b>       | 32             | 58           | 32             | 1682           | 52.56          | <b>52</b>      | 1664 |
| 9     | 9            | 41             | 4.50           | <b>4</b>       | 36             | 59           | 32             | 1741           | 54.39          | <b>54</b>      | 1728 |
| 10    | 10           | 50             | 5.00           | <b>5</b>       | 50             | 60           | 32             | 1800           | 56.25          | <b>56</b>      | 1792 |
| 11    | 11           | 61             | 5.50           | <b>5</b>       | 55             | 61           | 32             | 1861           | 58.14          | <b>58</b>      | 1856 |
| 12    | 12           | 72             | 6.00           | <b>6</b>       | 72             | 62           | 32             | 1922           | 60.06          | <b>60</b>      | 1920 |
| 13    | 13           | 85             | 6.50           | <b>6</b>       | 78             | 63           | 32             | 1985           | 62.02          | <b>62</b>      | 1984 |
| 14    | 14           | 98             | 7.00           | <b>7</b>       | 98             | 64           | 32             | 2048           | 64.00          | <b>64</b>      | 2048 |
| 15    | 15           | 113            | 7.50           | <b>7</b>       | 105            | 65           | 32             | 2113           | 66.02          | <b>66</b>      | 2112 |
| 16    | 16           | 128            | 8.00           | <b>8</b>       | 128            | 66           | 32             | 2178           | 68.06          | <b>68</b>      | 2176 |
| 17    | 17           | 145            | 8.50           | <b>8</b>       | 136            | 67           | 32             | 2245           | 70.14          | <b>70</b>      | 2240 |
| 18    | 18           | 162            | 9.00           | <b>9</b>       | 162            | 68           | 32             | 2312           | 72.25          | <b>72</b>      | 2304 |
| 19    | 19           | 181            | 9.50           | <b>9</b>       | 171            | 69           | 32             | 2381           | 74.39          | <b>74</b>      | 2368 |
| 20    | 20           | 200            | 10.00          | <b>10</b>      | 200            | 70           | 32             | 2450           | 76.56          | <b>76</b>      | 2432 |
| 21    | 21           | 221            | 10.50          | <b>10</b>      | 210            | 71           | 32             | 2521           | 78.77          | <b>78</b>      | 2496 |
| 22    | 22           | 242            | 11.00          | <b>11</b>      | 242            | 72           | 32             | 2592           | 81.00          | <b>81</b>      | 2592 |
| 23    | 23           | 265            | 11.50          | <b>11</b>      | 253            | 73           | 32             | 2665           | 83.27          | <b>83</b>      | 2656 |
| 24    | 24           | 288            | 12.00          | <b>12</b>      | 288            | 74           | 32             | 2738           | 85.56          | <b>85</b>      | 2720 |
| 25    | 25           | 313            | 12.50          | <b>12</b>      | 300            | 75           | 32             | 2813           | 87.89          | <b>87</b>      | 2784 |
| 26    | 26           | 338            | 13.00          | <b>13</b>      | 338            | 76           | 32             | 2888           | 90.25          | <b>90</b>      | 2880 |
| 27    | 27           | 365            | 13.50          | <b>13</b>      | 351            | 77           | 32             | 2965           | 92.64          | <b>92</b>      | 2944 |
| 28    | 28           | 392            | 14.00          | <b>14</b>      | 392            | 78           | 32             | 3042           | 95.06          | <b>95</b>      | 3040 |
| 29    | 29           | 421            | 14.50          | <b>14</b>      | 406            | 79           | 32             | 3121           | 97.52          | <b>97</b>      | 3104 |
| 30    | 30           | 450            | 15.00          | <b>15</b>      | 450            | 80           | 32             | 3200           | 100.00         | <b>100</b>     | 3200 |
| 31    | 31           | 481            | 15.50          | <b>15</b>      | 465            | 81           | 32             | 3281           | 102.52         | <b>102</b>     | 3264 |
| 32    | 32           | 512            | 16.00          | <b>16</b>      | 512            | 82           | 32             | 3362           | 105.06         | <b>105</b>     | 3360 |
| 33    | 32           | 545            | 17.02          | <b>17</b>      | 544            | 83           | 32             | 3445           | 107.64         | <b>107</b>     | 3424 |
| 34    | 32           | 578            | 18.06          | <b>18</b>      | 576            | 84           | 32             | 3528           | 110.25         | <b>110</b>     | 3520 |
| 35    | 32           | 613            | 19.14          | <b>19</b>      | 608            | 85           | 32             | 3613           | 112.89         | <b>112</b>     | 3584 |
| 36    | 32           | 648            | 20.25          | <b>20</b>      | 640            | 86           | 32             | 3698           | 115.56         | <b>115</b>     | 3680 |
| 37    | 32           | 685            | 21.39          | <b>21</b>      | 672            | 87           | 32             | 3785           | 118.27         | <b>118</b>     | 3776 |
| 38    | 32           | 722            | 22.56          | <b>22</b>      | 704            | 88           | 32             | 3872           | 121.00         | <b>121</b>     | 3872 |
| 39    | 32           | 761            | 23.77          | <b>23</b>      | 736            | 89           | 32             | 3961           | 123.77         | <b>123</b>     | 3936 |
| 40    | 32           | 800            | 25.00          | <b>25</b>      | 800            | 90           | 32             | 4050           | 126.56         | <b>126</b>     | 4032 |
| 41    | 32           | 841            | 26.27          | <b>26</b>      | 832            | 91           | 32             | 4141           | 129.39         | <b>129</b>     | 4128 |
| 42    | 32           | 882            | 27.56          | <b>27</b>      | 864            | 92           | 32             | 4232           | 132.25         | <b>132</b>     | 4224 |
| 43    | 32           | 925            | 28.89          | <b>28</b>      | 896            | 93           | 32             | 4325           | 135.14         | <b>135</b>     | 4320 |
| 44    | 32           | 968            | 30.25          | <b>30</b>      | 960            | 94           | 32             | 4418           | 138.06         | <b>138</b>     | 4416 |
| 45    | 32           | 1013           | 31.64          | <b>31</b>      | 992            | 95           | 32             | 4513           | 141.02         | <b>141</b>     | 4512 |
| 46    | 32           | 1058           | 33.06          | <b>33</b>      | 1056           | 96           | 32             | 4608           | 144.00         | <b>144</b>     | 4608 |
| 47    | 32           | 1105           | 34.52          | <b>34</b>      | 1088           | 97           | 32             | 4705           | 147.02         | <b>147</b>     | 4704 |
| 48    | 32           | 1152           | 36.00          | <b>36</b>      | 1152           | 98           | 32             | 4802           | 150.06         | <b>150</b>     | 4800 |
| 49    | 32           | 1201           | 37.52          | <b>37</b>      | 1184           | 99           | 32             | 4901           | 153.14         | <b>153</b>     | 4896 |
| 50    | 32           | 1250           | 39.06          | <b>39</b>      | 1248           | 100          | 32             | 5000           | 156.25         | <b>156</b>     | 4992 |



**Figure 1. TEC Measurement Procedure**

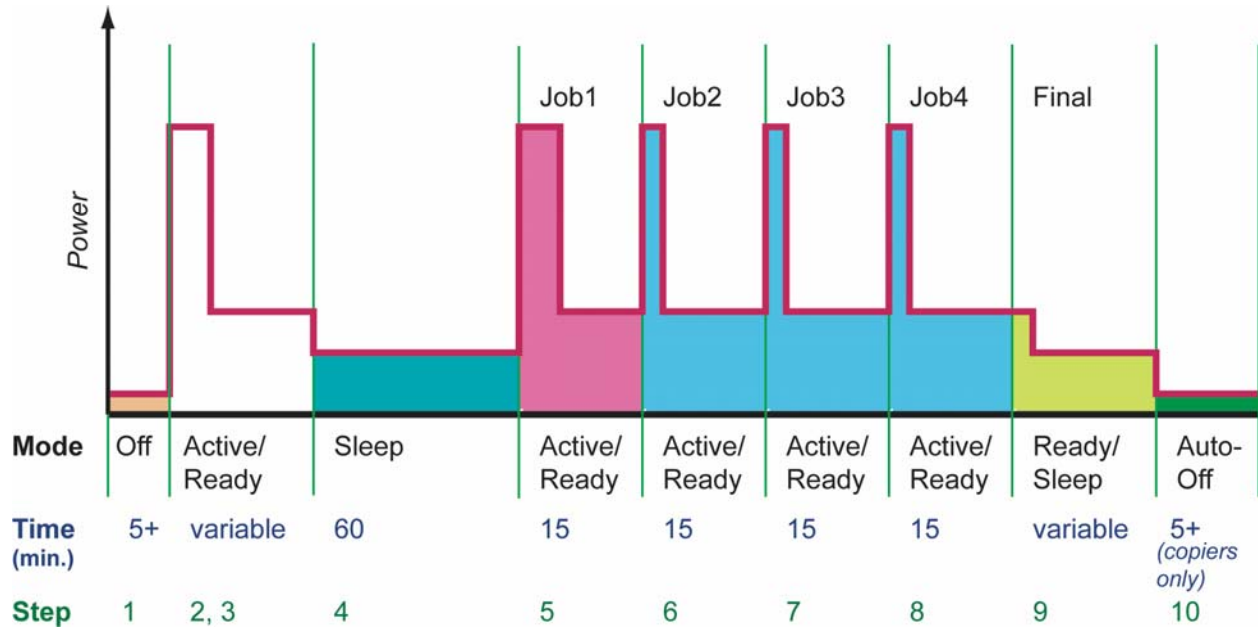


Figure 1 shows a graphic form of the measurement procedure. Note that products with short default-delay times may include periods of sleep within the four job measurements, or auto-off within the sleep measurement in Step 4. Also, non-copier products with just one sleep mode will not have a sleep mode in the final period. Step 10 only applies to copiers, digital duplicators, and MFDs without print-capability.

**Figure 2. A Typical Day**

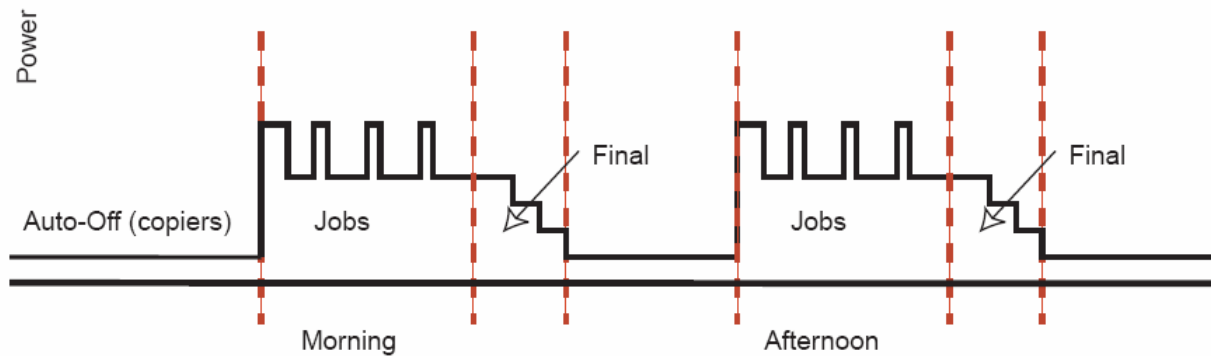


Figure 2 shows a schematic example of an eight-ipm copier that performs four jobs in morning, four jobs in afternoon, has two "final" periods and an auto-off mode for the remainder of the workday and all of the weekend. An assumed "lunchtime" period is implied but not explicit. The figure is **not** drawn to scale. As shown, jobs are always 15 minutes apart and in two clusters. There are always two full "final" periods regardless of the length of these periods. Printers, digital duplicators and MFDs with print capability, and fax machines use sleep rather than auto-off as the base mode but are otherwise treated the same as copiers.