

ENERGY STAR[®] Qualified Imaging Equipment
Revised Draft Test Procedure Rationale
Typical Electricity Consumption (TEC)
February 16, 2005

This document provides details and rationale regarding the contents of the revised TEC test procedure, and provides a summary of what has changed in this version from the clarified procedure that was distributed on September 23, 2004.

Introduction

The attached TEC test procedure and corresponding materials present a method to measure and compare the relative energy consumption of imaging equipment products in a precise and repeatable manner.

The revisions in this test procedure are the culmination of careful consideration of all stakeholder feedback received to date. This document is intended to respond to feedback and explain why each revision was made. It is EPA's intention that stakeholders will use the attached test procedure to perform testing over the next few months to help EPA determine the feasibility of using the TEC method to compare the energy efficiency of like products. Once EPA confirms that the TEC method is feasible, it is expected that this data will be used eventually to determine the specification limits.

It should be emphasized again that **the TEC method is not meant to precisely replicate real-life operating patterns**. EPA has structured the method to resemble a typical working week. However, due to the wide variation of imaging equipment, both in usage and functionality, it is impossible to mimic real usage in all cases. Rather, the TEC test procedure, which results in a TEC value, is a consistent method of measuring imaging equipment and comparing like products' energy performance. The TEC procedure does not replace the usefulness or need for more sophisticated measurements such as the ASTM test procedures.

Product Categorization

The revised 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 ^t	Direct Thermal
Stand-alone copiers [^]	Dye Sublimation
Stand-alone printers	Electrophotographic (laser, LED, LCD) ^{**}
Stand-alone fax machines	Solid Ink
Multifunction devices (MFDs) [*]	Thermal Transfer

Based on careful consideration of stakeholder feedback, EPA determined that the above products and marking technologies are the most viable candidates for the TEC approach for product comparison. These marking technologies use heat-intensive processes in transferring images to the media, which causes Active and Ready modes to dominate energy consumption and potential savings. Additionally, there is evidence to show that products using these technologies are more subject to power-management disabling due to longer recovery times. EPA considers user-disabling a primary reason to consider the TEC of a product.

The product areas listed in Table 1 are products that commonly utilize the listed marking technologies, with the exception of digital duplicators. Digital duplicators have been selected for consideration under the TEC approach based on high productivity and functional similarities to traditional copiers and printers.

Treating Non-Ink Jet Printers Under TEC

EPA has decided to explore testing non-Ink Jet types of printers under the TEC approach based on several factors. As stakeholders will note, printers were not included in the original February 2004 Directional Draft where EPA initially proposed the TEC concept. As today's imaging-equipment market moves increasingly towards multifunctionality, EPA feels it makes sense to address related imaging equipment together, based on both functionality and marking technology. Several stakeholders have commented that since non-Ink Jet printers are often the basis for non-Ink Jet MFDs, it does not make sense at this time to treat printers differently from their MFD counterparts; EPA agrees with this assessment. Stakeholder feedback also supports this conclusion.

MFDs Without Print Capability

MFDs without print capability are treated as copiers in all aspects of this procedure. To avoid excess verbiage, this distinction is not made in every reference to MFDs or copiers. This is because these

^t Digital duplicators use a marking technology not reflected in the list of technologies covered by TEC; however, these products are still treated by TEC

[^]Includes standard and upgradeable

^{*} Includes printer/fax combination units

^{**} Includes both serial and parallel color

products cannot be tested with print jobs and so must be tested while copying, and because the lack of a network connection makes the use of an Auto-off mode more practical. EPA has not yet determined how these products will be categorized in the future specification.

Operational Mode Categorization

The majority of comments received support considering the products and marking technologies listed in Table 1 under the TEC approach. Similarly, most stakeholders also agreed that Ink Jet and Impact continue to be treated under the Operational Mode (OM) approach. Based on this feedback, for the time-being, EPA plans to address remaining imaging equipment not covered by this Draft TEC Test Procedure under the traditional OM approach, including Ink Jet and Impact printers, faxes, and MFDs, as well as scanners and mailing machines. Additionally, based on operating patterns and duty cycle considerations, EPA plans to address all large/wide-format imaging equipment using the OM approach. EPA may decide at a later time to treat these products under TEC, but for the time-being, stakeholder feedback and other considerations such as energy-savings potential support the OM path. **A revised OM procedure will be released to stakeholders in the coming weeks for review and consideration.** This procedure will be better harmonized with the revised Draft TEC test procedure for greater consistency and ease of testing.

Test Conditions

The Test Conditions section of the revised Draft TEC Test Procedure includes several changes from the original clarified version distributed on September 23, 2004. These changes, as well as items that have remained the same despite stakeholder suggestions otherwise, are detailed and further explained below per the corresponding topic category:

Color vs. Monochrome

Color-capable products shall be tested in monochrome.

Though some stakeholders suggested that testing of color machines should incorporate both monochrome and color images, EPA has determined that testing should remain in only monochrome. This decision will allow for greater consistency across products, which may or may not be color-capable. In addition, EPA has not seen evidence that altering the test procedure to incorporate color testing will greatly change the relative comparison of these color-capable machines to one another. EPA would certainly consider any TEC or other results that show otherwise, if manufacturers provide these results.

Environmental Conditions

The environmental conditions and equipment specifications for testing imaging equipment can be found in the document, **Test Conditions for Determining the ENERGY STAR Qualification Status of Imaging Equipment Products**. This document also includes the rationale behind the creation of this document and response to stakeholder comments on environmental conditions.

Media Input and Output Configurations

Paper source and finishing hardware shall be present and configured as-shipped.

As several stakeholders have commented, a single imaging equipment product is often sold in a variety of configurations. Throughout the specification, where “as-shipped” is specified, EPA assumes partners will test the product in the base configuration available to consumers. For example, if a copier is offered with or without an automatic stapler, this copier may be tested in its base state, e.g., without the automatic stapler installed. Partners who are concerned that they might be penalized for offering more complex base machines should provide TEC test data to EPA supporting this concern.

Some stakeholders have commented that color products, as-shipped, are configured to print only in color so that testing in monochrome, as the procedure calls for, is not testing the product “as shipped.” Since this discrepancy should only exist for certain Ink Jet products, such as photo-printers, EPA assumes that the products covered by the TEC test procedure (see section on **Product Categorization**) are capable of processing jobs in monochrome “out of the box.”

Anti-humidity features may be turned off if user controllable.

Since these devices are used only in limited geographic locations, EPA does not want to penalize partners who offer these devices on certain units for certain customers.

Digital duplicators are eligible for testing under this version of the TEC test procedure, and shall be set up and used in accordance with their use and capabilities.

Since these products are designed for large print/copy jobs of a single pattern, which is dissimilar from standard printers or copiers, EPA advises stakeholders to modify testing as appropriate to these machines, e.g., a single image/job. Further direction is provided in the test procedure text.

Media

The test image is not specified.

Stakeholders commented that speed for Ink Jet products varies dramatically according to the image produced, but that for EP products there is essentially no such dependency. Because the TEC test procedure is applicable to technologies such as EP, the size and type of test image is not necessary to specify. It is left to the manufacturer to choose an appropriate test image while using the TEC test procedure.

Testing may be performed on 8.5" by 11" or A4 paper.

Due to variation in standard paper among international markets, EPA has clarified in this version of the test procedure that testing may be performed on A4 paper if the product is sold in a market where A4 paper is more prevalent.

Paper shall be of basis weight not less than 75 g/m² and not greater than 80 g/m².

This is the range of standard paper weight, as used in an office setting, which EPA has determined is reasonable for testing like products. This specification of paper weight comes in response to some stakeholders who suggested that basis weight can significantly change energy consumption.

Networking

Images shall be sent to the product in a page description language (e.g., PCL or Postscript) if the product is capable.

Despite a stakeholder recommendation that testing be performed in straight text, EPA has decided not to remove this direction for testing. Using a page description language, if it is available on a product, reflects typical usage patterns and should not be overly burdensome.

Printers and MFDs shall be connected to a network if capable of being network-connected as-shipped.

Despite a stakeholder suggestion to remove this language from the test procedure, EPA has decided it is important to keep this direction since it is plausible that the presence of the network connection may change a product's power levels or behavior. For consistency, EPA requests that all products that are network-capable be connected, even products that are not tested via the network (e.g., fax machines). This does not mean that network-capable products must have the job sent via the network (e.g., jobs may be sent via a USB connection from a personal computer).

The type of network connection used shall be reported.

EPA does not feel it is necessary to specify the type of network connection used during testing since a variety are sold on the market for different purposes and customers. One stakeholder recommended that EPA specify that the most common type of network connection for a particular product be used during testing. The revised TEC test procedure calls for the manufacturer to test using any available network connection for which the product may be configured; however, it also asks that the person performing the test procedure note which connection this is.

Simplex vs. Duplex

Originals for copying may be simplex or duplex.

In the original version, EPA did not specify whether originals were meant to be simplex or duplex; this has been clarified.

Testing shall be performed in duplex mode when product is duplex-capable.

Several stakeholders suggested that testing should be performed in simplex output mode across-the-board for consistency to allow for products which may not possess a duplex mode. EPA continues to ask users to test products in duplex mode in this revised test procedure for several reasons, which are listed below. EPA also has included testing within the revised TEC procedure that is intended to demonstrate how product behavior differs between simplex and duplex imaging.

- Stakeholders have suggested that products on the market today are able to duplex at speeds which are comparable to simplex speeds; and
- Stakeholders have suggested that imaging in duplex mode should theoretically use less power than in simplex mode for fuser-based devices, e.g., EP, due to the fact that a significant portion of the energy used in these devices is used to heat the paper and remove water from it. Duplexing allows machines to produce two images while only removing the moisture once, thereby saving energy; and
- If products are slower while duplexing, they may be in a higher power state for longer than while simplexing and thus use more energy. In any case, as duplexing saves the energy and carbon emissions embodied in the paper (as well as saving customer paper purchase and use costs), it is valuable to promote duplexing within the ENERGY STAR program.

Voltage

Testing voltage shall be appropriate for the market the product is intended for.

One stakeholder suggested that EPA choose a single voltage at which manufacturers may test, rather than specify that the voltage be “appropriate for the market the product is intended for,” since many products today are shipped to multiple international markets. EPA continues to call for testing to be performed at all voltages since it is possible for energy consumption values to vary according to input voltage. This is also the general procedure for ENERGY STAR testing across product categories.

Job Structure

The Job Structure section of the Revised Draft TEC Test Procedure is a new section that presents the revised Job Table. The following items have changed regarding the Job calculation since the last version was distributed in late September 2004:

Jobs/Day Calculation

The number of images per job is now determined by two calculations.

A new calculation method has been developed for obtaining the number of images per job. This method relies on two separate calculations of jobs per day and images per day, and the result better reflects the assumption that products with greater imaging speeds typically produce greater numbers of jobs per day. The new calculation of jobs per day was developed in response to stakeholder comments, which called for the calculated number of jobs per day to increase according to product speed, consistent with the proposed new ASTM test for copiers and MFDs.

Job Table (Images per Day)

A single images-per-day formula is used for all imaging equipment covered by the TEC method, except for stand-alone fax machines.

This single formula is more consistent to reflect the limited and similar marking technologies covered by TEC (see **Test Conditions** section), and responds to stakeholders who suggested that there is no need to differentiate between copier- and printer-based MFDs.

The formula for images per day was approximated from the proposed new ASTM test procedures developed by JBMIA for copiers and MFDs.

These ASTM procedures use monthly volumes of 10 * cpm^2 for copiers and 15 * cpm^2 for MFDs with copying capability, which results in daily volumes (at 22 days per month) of 0.455 * cpm^2 for copiers and 0.682 * cpm^2 for MFDs with copying capability. One stakeholder proposed 0.32 * ipm^2 . EPA does not believe that the exact formula will change the comparison of products significantly.

Measurement Procedure

The Measurement Procedure section of the Revised Draft TEC Test Procedure contains two versions of the test procedure—one for Printers, Digital Duplicators and MFDs with Print Capability, and Fax Machines, which are assumed not to utilize an Auto-off, and one for Copiers, Digital Duplicators, and MFDs without Print Capability, which are assumed to have an Auto-off mode. The assumptions upon which these categorizations are based were derived from stakeholder feedback. Changes to each version of the test procedure are detailed further below.

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 have no Sleep mode in the Final period. Step 1 applies to printers, digital duplicators and MFDs with print-capability, and fax machines; Step 10 only applies to copiers, digital duplicators, and MFDs without print-capability. This figure does not show any of the jobs for interim additional testing.

General

Test procedure measurements record energy values not power values.

Several stakeholders have commented that measuring the accumulated energy used in various power modes and converting this value into power may lead to significant error, particularly with short measurement periods and low power levels in Sleep and Off. It should be noted that for Sleep, there is now a full hour in that mode in the procedure, which was added for the purposes of allowing the fuser partially to cool down; this period may be used to obtain a more accurate measurement. For Off,

manufacturers are allowed to extend the measurement period past the minimum of five minutes to obtain a more accurate reading if desired. Some stakeholders have suggested that power be measured directly. EPA continues to ask for energy measurements for Off to maintain consistency across the procedure.

The test procedure remains brief but thorough.

Some stakeholders have cautioned EPA to avoid making the TEC test procedure too short. They note that though shortening the procedure makes it simpler to test products, it also introduces possible error and inaccuracies. EPA notes that the revised TEC test procedure is now longer in duration, incorporating additional Job measurements and a longer Sleep measurement, hopefully allaying these stakeholders' concerns.

Active

The Job measurement is now repeated four times.

This change was implemented in response to stakeholders who found that some units consume a notably different amount of energy in the first job than in successive ones. If sufficient data is gathered that shows fewer than four jobs are needed, EPA will consider abbreviating this portion of the procedure.

The test procedure continues to ask that jobs be printed on MFDs rather than copied.

EPA believes that more images are produced on MFDs by printing than by copying. If the page rendering process increases consumption, then the procedure should take that into account. EPA has not seen evidence showing that measuring both printing and copying would change the results enough to merit the added complexity of the procedure and calculations. The majority of stakeholders support printing the job on MFDs instead of copying them due to simplicity, and also because some argue that MFDs with print capability are more often used for printing than for copying. However, they also note that measuring the Job energy this way neglects the energy consumption of the automatic document feeder (ADF) and scanner, if present. EPA will certainly consider any data manufacturers wish to share that show a TEC value is significantly affected by these components.

Jobs performed on an MFD may be sent via network or via direct connection.

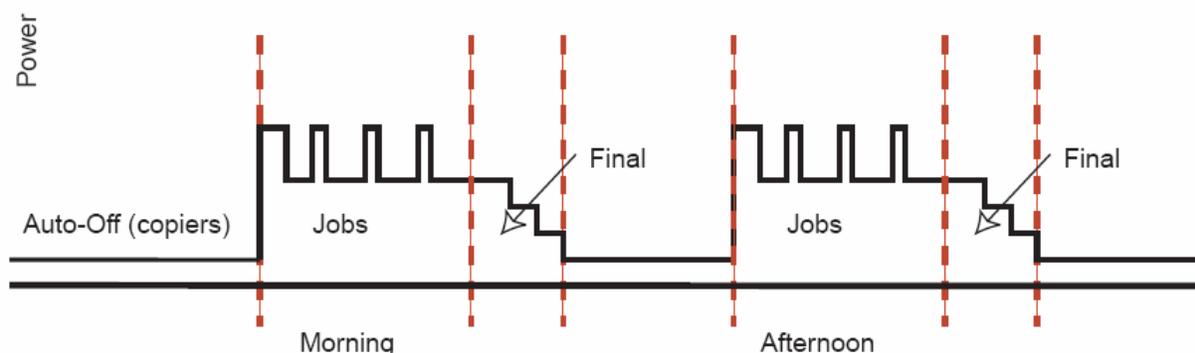
For MFDs, in response to stakeholder input, EPA has clarified that the job may be sent to the product either via a network connection or via a direct connection to a computer, e.g., USB.

The Job interval remains at 15 minutes for all products tested under TEC.

Some stakeholders have suggested to EPA that the standard 15-minute Job interval should be expanded to a greater duration of time, e.g., 30 minutes, depending on the type of product. Some have commented that some manufacturers' products will enter Sleep during the measurement of Job energy, whereas others will not. In an office environment, these latter models would certainly enter Sleep during a typical work day, not just at night. By not entering Sleep during the measurement of Job energy, the TEC test makes it appear as if these products are in Active and Ready for eight hours each day. Other stakeholders support the static 15-minute Job interval, claiming it benefits EP products by allowing residual heat from one job to be incorporated into successive jobs. EPA continues to use the 15-minute Job interval in this revised TEC procedure because it seems to be the best single interval to use across the full range of imaging products. However, the number of jobs per day has been reduced and an effective lunch period has been incorporated into the calculations to increase the amount of time during the day that products spend in Sleep or in Off.

Figure 2 shows a schematic example of an eight-ipm copier that performs four jobs in morning, four jobs in afternoon, two "final" periods, and experiences a period of Auto-off between the morning and afternoon and then overnight. Lunchtime is implied but not explicit. Drawing 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 their length. Printers, digital duplicators, and MFDs with print capability use Sleep rather than Auto-off as the base mode but are otherwise treated the same as copiers.

Figure 2. A Typical Day



Off and Auto-off

The measurement of Off for copiers is now performed at the end of the procedure rather than at the beginning.

This change is in response to several stakeholders who commented that on some models the Manual Off and Auto-off power levels are different.

The revised test procedure maintains the measurements of Off and Auto-off at the minimum of five minutes.

Many stakeholders have commented that these modes are very stable for imaging equipment, and longer measurement durations are not necessary. A few expressed concern over accuracy with these short periods so the procedure allows for longer measurement periods if desired.

Ready

Multiple Ready or Sleep modes are accounted for in the revised TEC test procedure, but are not measured separately.

Stakeholders have suggested that EPA revise the procedure to create multiple Ready or Sleep measurements to provide for products that may have multiple modes, e.g., secondary Ready modes that consume less energy, or additional Sleep modes such as the “Low Power” mode from the existing MFD specification. EPA believes that the revised procedure accurately accounts for multiple levels of energy consumption so that there is no need to create additional measurements within the TEC procedure to capture these additional levels. For products with such lower-energy-consuming mode, EPA believes this lower energy consumption will be reflected in the product’s overall TEC value.

Recovery and Default Times

Incremental Recovery Time is captured in the revised TEC Test Procedure.

EPA would like confirmation that the time required for products to recover from Sleep is not so large as to encourage consumers to disable power management. If data collected in the coming months shows that this is a potential problem, then EPA may include recovery time in the specification. Since the concern is for how products are used, the difference in the Active1 and Active0 measurements provides the incremental time to recover which could be used in lieu of the absolute amount of time it takes.

The Active0 measurement is done in Step 3 where it is known that the unit is in its highest Ready mode; units with short default-delay times might be asleep at the beginning of Jobs 2-4. The Active1 measurement is generally from Sleep, though units with short default-delay times to Auto-off may be in

that state at the beginning of Job1. A full job is used to initiate imaging in Step 3 so that the same delays in scanning or job processing are present for both measurements.

Service/Maintenance Modes

Service and/or maintenance modes are not included in the TEC test.

In response to stakeholder feedback, language has been added to the revised TEC Test Procedure to provide direction on how to treat service and/or maintenance modes during testing. In general, EPA asks that partners do not include data from these instances if they occur during testing.

Sleep

Steps 3 and 4 are included to ensure that all units have been asleep for one hour after having been previously Active.

In the September 2004 clarified TEC Test Procedure, the measurement of Sleep had been specified for the duration of the product's Sleep delay time; this extended Sleep period addresses stakeholder comments suggesting that longer periods of measurement might prevent avoidable inaccuracies, which are more common with shorter measurement periods.

The Final energy and time measurement includes any Ready time that occurs after the 15 minute Job period as well as possibly some Sleep time.

For printers, it includes higher Sleep modes if there is more than one, and for copiers it includes all Sleep modes. The revised method does not require separate measurements of each Ready and each Sleep mode within the procedure.

Multiple Mode Data

The test procedure includes additional, separate measurements of individual Ready, Sleep, and Off modes.

EPA requests data on the power levels and duration of individual Ready, Sleep, and Off modes to understand the behavior of products when they have multiple instances of one or more of these basic modes. For example, some products have multiple Ready modes, each of which provides output quickly. Some products have multiple Sleep modes; the existing MFD specification for example has distinct Low Power and Sleep modes that are best seen as different forms of Sleep. It is important to note that these values are not used in the calculation; therefore these measurements do not need to be conducted according to a specific test procedure. Spot measurements of power are suitable for gathering these data.

Calculation Method

The Calculation Method section includes several major changes which were introduced in response to stakeholder concerns that time spent in low-power modes, e.g., weekends, was not emphasized enough in the September 2004 version of the Draft TEC Test Procedure. Changes that are included in this version are explained below:

The TEC value captures a weekly rather than a daily value.

While it might not affect the relative comparison of like products, the computational burden of the additional calculation is small and this eliminates the possibility that the prior focus on weekdays only distorted the results.

The TEC calculation is different for copiers, digital duplicators, and MFDs without print-capability.

The calculation is different to reflect the Auto-off difference assumed for these products, as described in the **Measurement Procedures** section.

The calculation has been changed to reflect the additional Job measurements performed during the test procedure.

As further described in the **Measurement Procedures** section, the revised TEC Test Procedure now incorporates four Job measurements.

The revised test procedure addresses potential error.

Language has been added to provide direction on the calculation of total potential error of the TEC measurement process.

The non-adjusted TEC value is based on five individual formulas.

For illustration purposes, the five formulas for printers, digital duplicators and MFDs with print-capability, and fax machines can be combined as follows:

$$TEC = [(Job1 \times 2) + ((Jobs Per Day - 2) \times (Job2 + Job3 + Job4) / 3)] + (2 \times Final Energy) + [24 \text{ hours} - ((Jobs per day / 4) + (Final Time \times 2)) \times Sleep Power] \times 5) + (Sleep Power \times 48)$$

And can be rearranged as shown below:

$$TEC = (Job1 \times 10) + [(Jobs Per Day - 2) \times ((Job2 + Job3 + Job4) / 3) \times 5] + (10 \times Final Energy) + [Sleep Power \times (168 \text{ hours} - (Final Time \times 10) - (Jobs per Day \times 1.25))].$$

Additional Interim Testing and Accuracy

Since the distribution of the Draft TEC Test Procedure on September 23, 2004, EPA has received stakeholder feedback raising concerns about the precision and repeatability of the TEC Test Procedure. Other stakeholders have suggested that varying the conditions in which the product is tested, e.g., color vs. monochrome, has the potential to change the TEC result appreciably. In response to these concerns, EPA suggests that stakeholders perform additional testing on a sample of products prior to the March 2005 stakeholder meeting to help resolve some of these questions. Some suggested additional testing is highlighted in this section of the test procedure, and further explained below:

Three additional Job types are included for the purpose of answering empirical questions about the effect of different factors on TEC calculations.

One possibility for color-capable products is to specify a mixture of monochrome and color output. The proposed new ASTM tests assume 20% color output for serial color units, and 50% color output for parallel color units. A revised TEC test procedure could specify that color output should be used for some specific value, which would be between those two values as it would apply to all marking technologies.

Active0 and Active1 time measurements are included to calculate incremental recovery time.

The recording of Job times is to provide some data about incremental recovery time from low-power modes should that issue arise during the specification revision process.

Meter accuracy specifications are requested for each measurement to calculate total potential error.

These accuracy specifications will be used to quantitatively assess the effect of meter accuracy on the results. Since the accuracy rating usually depends on the meter range(s) used, and on the reading itself (i.e., percent of full scale and percent of reading), this will be unique to each product.

Each of the accuracy assessments can be expressed as an absolute Watt or Watt-hour figure, or as a percentage of the reading. These are then aggregated through the same formula used to calculate the TEC to see the potential error of that value. This is then added to the TEC value to get an adjusted TEC which represents the maximum that the tested device might use considering the meter's rated accuracy.

Reporting

As noted in this document, EPA expects partners to perform testing between the release of this revised Draft TEC Test Procedure and the March stakeholder meeting in order to gather and share feedback with EPA for further refinement of this procedure. This testing will also be used to begin to gather data for

future specification levels. Therefore, it is imperative that a large dataset is collected for consideration. Manufacturers have suggested in comments submitted to EPA that a minimum of three months is needed to collect data for this purpose, so EPA recommends that manufacturers begin testing as soon as possible to allow adequate time for review and analysis.

Anticipated Questions

Below, EPA has listed potential questions stakeholders may have when reviewing and testing to the revised Draft TEC Test Procedure, along with the corresponding responses.

What are standard voltage/frequency combinations?

North America:	115 ($\pm 1\%$) Volts AC, 60 Hz ($\pm 1\%$)
	230 ($\pm 1\%$) Volts AC, 60 Hz ($\pm 1\%$)
Europe:	230 ($\pm 1\%$) Volts AC, 50 Hz ($\pm 1\%$)
Australia/New Zealand:	230 ($\pm 1\%$) Volts AC, 50 Hz ($\pm 1\%$)
Japan:	100 ($\pm 1\%$) Volts AC, 50 Hz ($\pm 1\%$)/60 Hz ($\pm 1\%$)

Do jobs need to be sent over a network connection?

No. Units with network and other data-connection types can receive the job over the other connection, but the network connection must be active, i.e., capable of being utilized.

Why does the procedure specify that paper source and finishing equipment are to be “present and configured” as shipped, but used at the discretion of the manufacturer?

The unit must be capable of printing from any source it is shipped with, but any source can be utilized for the test. The same is true in regards to finishing equipment.

Can you elaborate on the originals requirement for copiers?

The number of originals needs to be at least ten for units of 20 ipm or greater, but manufacturers may choose the number to use based on what suits their own needs. For jobs with large numbers of images, it may not be possible to match the number of required images, particularly with limits on the capacity of document feeders. In addition, duplex output may “round up” the number of images on some products when presented with an odd number of simplex originals. Because a highly specific requirement could unintentionally disadvantage some products, this requirement is kept simple to allow manufacturers to choose a good combination of originals and copies for the product being tested.