

Graphic Arts, Photocopier, and Printer Examinations

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Graphic Arts, Photocopier, and Printer Examinations

1 INTRODUCTION

This procedure is intended to be utilized by trained personnel to ensure consistency and transparency of methods employed during the examination of graphic arts, photocopier, and printer evidence received in the Questioned Documents Unit (QDU).

2 SCOPE

These procedures will be used by a forensic document examiner when conducting graphic arts examinations. These procedures include the examination and comparison of various office printing technologies (e.g., ink jet and toner processes) and commercial technologies (e.g., lithography and relief processes). Further, these procedures apply to the examination of photocopies, facsimiles, and/or computer printed documents for determining generational order and/or origin.

3 EQUIPMENT

- 150-watt tungsten halogen light, or comparable equipment
- 30-watt transmitted light box, or comparable equipment
- Hand magnifier (minimum magnification, 4X)
- Stereomicroscope (minimum magnification, 6.3X), or comparable equipment
- Keyence VHX-2000E Digital Microscope, or comparable equipment
- Foster and Freeman Video Spectral Comparator (VSC), or comparable equipment
- ChemImage Hyperspectral Imager (HSI) Examiner 200 QD, or comparable equipment
- Measuring devices (e.g., Half-Tone Screen Determiner, Linen Tester, ruler, grids)
- Clear acetate sheets
- Magnetic detector
- Reference materials
 - FBI reference materials include, but are not limited to the following:
 - Standards- known samples from photocopiers and laser printers
 - Subfile- Administrative and miscellaneous related information from manufacturers and product comparison guides
 - Samples from machines using the dot matrix processes
 - Samples from facsimile machines

4 PROCEDURE

- All the following steps will be performed using lighting and magnification sufficient to allow fine detail to be distinguished, as needed.

4.1 Determining Printing Technology

- A. Visually examine the text and/or graphics to determine the printing technology(s) used in the preparation and printing of the submitted item(s).
 - Determine the technology(s) by evaluating the printing medium, its adherence to the printing surface, and any specific technology class

characteristics that may be observed such as hickeys, squeegee edges, overspray, pinholes, serrated edges, or embossing (see Table 1 below).

- To assist in technology determination, obtain authentic documents or utilize standards and/or information from QDU reference materials.
 - To locate information concerning a particular type of machine, the examiner or analyst will search the brand name of the machine in the appropriate section of the reference materials.
 - To locate machine samples, the examiner or analyst will visually search for the sample. Samples are arranged by manufacturer in model number order.

Table 1: Print Process Characteristics

Print Process	Characteristics of the Print Process
Impact Dot Matrix	<ul style="list-style-type: none"> ● Ribbon-inked/carbon ● Embossing ● Series of dots ● Stepped edges ● Paper fiber disturbance
Ink Jet	<ul style="list-style-type: none"> ● No ribbon ● Liquid medium ● No embossing ● Absorbs into paper ● Overspray around printed characters ● May have stepped edges
Laser	<ul style="list-style-type: none"> ● No ribbon (toner) ● No embossing ● Overspray over surface of paper ● Adheres to surface of paper ● Melted plastic ● Mounded toner beads ● May have stepped edges
Photocopy	<ul style="list-style-type: none"> ● No ribbon (toner) ● No embossing ● Overspray over the surface of the paper ● Adheres to surface of paper ● Edges may be smooth or serrated ● Toner may be magnetic ● Mounded toner beads ● Liquid (toner) ● Toner material suspended in a liquid carrier
Thermal	<ul style="list-style-type: none"> ● Heated wax carbon ribbon ● No embossing

	<ul style="list-style-type: none"> • Adheres to surface of paper (can be peeled off) • Serrated edges • Coated paper, heat removes coating, dots
Letterpress	<ul style="list-style-type: none"> • Embossing • Ring of ink (squeeze out effect)
Flexography	<ul style="list-style-type: none"> • Little if any embossing • Ring of ink (squeeze out effect)
Lithography	<ul style="list-style-type: none"> • No embossing • Even inking • Smooth edges • There may be hickeys
Gravure/Intaglio/Die Stamp	<ul style="list-style-type: none"> • Serrated edges • Cell pattern • Raised ink surface effect
Screen	<ul style="list-style-type: none"> • Serrated edges (sometimes) • Raised effect
Thermography	<ul style="list-style-type: none"> • Smooth edges • Air bubbles/crystallization • Raised (melted plastic)
Typewriting (Typebar/Single-Element)	<ul style="list-style-type: none"> • Ribbon - carbon/fabric • Embossing • Smooth/round edges
Thermal Dye Diffusion	<ul style="list-style-type: none"> • Fuzzy appearance • Grid pattern may be visible • Normally coated paper substrate
Thermal Wax Transfer	<ul style="list-style-type: none"> • Thick waxy ink creates raised texture • Stepped appearance • Peel-off appearance
Direct Thermal	<ul style="list-style-type: none"> • Flat appearance • Characters/images have stepped edges • Substrate is thin • Shiny paper • Blank spots/lines possible if print head fails • Discoloration • Fading of substrate possible if exposed to heat, light, or scratched

B. If the printing medium is determined to be typewriting, refer to [DOC-223 Typewriting Examinations](#).

4.2 Computer-Generated Text

- A. Examine the computer-generated text. Note the general class characteristics, including:
- Width of font (thinness/thickness of characters)
 - Serif, sans serif, ornamental, or script style
 - Weight of characters (darkness/lightness)
 - Stylistic variants (regular/italic)
 - Size is not considered a characteristic of value when examining computer-generated texts, since digital fonts can be scaled to any size.
- B. Classify the style(s) of computer-generated text, if necessary, by following these procedures:

Redacted

4. Note any unusual characters in the font.
 5. Conduct a font search using published resources, and/or the internet.
 6. Determine the font based on correspondence of all observed features.
 - Many fonts are similar and appear indistinguishable. Therefore, it may not be possible to narrow a search to a particular font.
- C. Conduct a side-by-side comparison of the text on the item(s).
- D. Evaluate the similarities, differences, and limitations of the features of the text being compared. Determine their significance individually and in combination.

4.3 Readable Machine Ribbons

- A. If a ribbon or cartridge is submitted for transcription Redacted
transfer the
item(s) to the Operational Projects Unit for imaging/transcription.
- B. If the ribbon contains limited text, the examiner may use backlighting and manually transcribe the text by recording what is visible on the ribbon.
- C. If a request is made to determine if a particular text is contained on a submitted ribbon, the examiner has the option of transcribing the entire ribbon or searching the ribbon for the desired text.
- If the requested text is searched for and located on the submitted ribbon, a copy of that portion of the transcription or a description of its location will be noted in the case records.

4.4 Determining Common Origin

- A. Visually examine the item(s) for class characteristics, as well as the presence or absence of identifying characteristics.

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- o Record any such characteristics by photographing and/or scanning.
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entation/arrangement of these codes may be compared in the QDU.

- o Documents requiring Redacted comparisons may be referred to the United States Secret Service (USSS) to facilitate additional specialized examinations.

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If the item(s) is to be sent to the USSS for examination, the examiner will follow the procedures outlined in section 2.10 of the QDU [Quality Assurance Manual – Part II](#).

- D. Documents requiring chemical Redacted examinations maybe referred to the USSS to facilitate additional specialized examinations.
 - o Prior to these examinations, contact the latent print examiner to determine if preliminary latent fingerprint examinations should be conducted.
 - o If the item(s) is to be sent to the USSS for examination, the examiner will follow the procedures outlined in section 2.10 of the QDU [Quality Assurance Manual – Part II](#).
- E. If a known machine is located, collect known exemplars, if applicable, by following these instructions:
 1. Consult with the Computer Analysis Response Team (CART), where applicable.

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4. If the machine is a photocopier:

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5. If the machine is a printer:

i. Print a test page.

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6. If the machine is a multi-function machine,

Redacted

7. Record the following on the back of each exemplar (to minimize obstructing potential characteristics):

- The date the exemplars were obtained
- The name of the person who directed the exemplars
- The laboratory number (if known)
- The location where the exemplars were made

F. Record the following information in the case notes:

- Make of the machine
- Model of the machine
- Serial number of the machine
- Information about the supplies and components
- Whether the paper supply is sheet or roll fed
- Options available such as:
 - Color
 - Reduction
 - Enlargement
 - Zoom
 - Mask
 - Trim
 - Editor board

G. Visually compare the items to evaluate

Redacted

and

identifying characteristics for consistencies and inconsistencies.

- An overlay plotting the trash marks and/or other print characteristics and their orientation on a clear acetate sheet is often helpful when conducting comparisons.

4.5 Determining Generational Order

- Successive copying on the same machine may make marks slightly out of register. Doubling or tripling of a pattern of dots or marks indicates at least, respectively, two or three generations of copies on the same machine. Copying on more than one device may bear the distinctive marks of all machines.
- Visually examine the item(s) **Redacted** to determine, if possible, the generational order of the submitted document(s).

4.6 Conclusions

- Once examinations have been completed, reports may include one or more of the following types of conclusion(s), opinion(s), and other findings, if applicable:

4.6.1 Printing Technology

- Information about the machine used to prepare the document, including printing technology.
- Manufacturer, make, and/or model information for the photocopier, printer, or facsimile machine used to prepare the document, as applicable.
- No Conclusion/No Determination
 - No determination could be reached as to the manufacturer, make, or model of the office machine used, usually due to limiting factors **Redacted**.
 - This conclusion requires an explanation of the limiting factor(s).

4.6.2 Computer-Generated Text

- The style of font(s).
- Corresponds in Class Characteristics
 - When the comparison of two or more bodies of text reveals correspondence in all observed class characteristics with no significant, inexplicable differences, it may be concluded that the styles of computer-generated text are in agreement. **Redacted**
 - Limitations may be present and should be explained.
- No Conclusion/No Determination
 - No determination can be reached whether the item(s) being compared contain the same style of computer-generated text. Although there may be correspondence in class characteristics between the styles of text, factors are present that limit the examinations.
 - This opinion requires explanation of the limiting factors.
- Elimination
 - A determination that the item(s) being compared do not contain the same styles of computer-generated text due to sufficient

disagreement in general class characteristics. Significant differences are observed.

4.6.3 Readable Machine Ribbons

- The submitted ribbon was transcribed and a copy of the text is provided for investigative assistance.
- The submitted ribbon was transcribed and the text being searched was/was not located.
- The submitted ribbon was not transcribed due to limiting factors such as damage to the ribbon or the ribbon is not a suitable type for transcription.
 - This conclusion requires an explanation of the limiting factor(s).

4.6.4 Machine(s) to Document(s) Comparisons

- Identification
 - A determination that the items were prepared by the same machine at some point in time (either directly or indirectly) due to an agreement in identifying characteristics. No differences that would preclude an identification were observed. The possibility of a duplicate machine can be eliminated.
- May Have Been Used in the Preparation and/or Printing
 - A less than definite determination that a particular machine was used at some point in time (either directly or indirectly) in the preparation and/or printing of the questioned document(s). There is a correspondence in characteristics between the machine printouts and the questioned document(s); however, limitations are present.
 - This opinion requires explanation of the limiting factors.
- No Conclusion/No Determination
 - No determination can be reached as to whether a particular machine was or was not used at some point in time in the preparation and/or printing of the questioned document(s) due to significant limitations.
 - This opinion requires explanation of the limiting factors.
- May Not Have Been Used in the Preparation and/or Printing
 - A less than definite determination that a particular machine was not used in the preparation and/or printing of the questioned document(s) at some point in time (either directly or indirectly). There is a lack of correspondence in characteristics between the machine printouts and questioned document(s) and some inconsistencies are noted; however, limitations are present.
 - This opinion requires explanation of the limiting factors.
- Elimination
 - A determination that a particular machine was not used in the preparation and/or printing of the questioned document(s) at some point in time (either directly or indirectly) due to sufficient disagreement in class and/or identifying characteristics. Significant differences are observed.

4.6.5 Comparing Two or More Documents

- Share a Common Source
 - A determination that the items share a common source due to agreement in identifying characteristics. No differences that would preclude a definite determination were observed.
- May Share a Common Source
 - A less than definite determination that the items originated from a common source at some point in time. There is a correspondence in characteristics between the items; however, limitations are present.
 - This opinion requires explanation of the limiting factors.
- No Conclusion/No Determination
 - No determination can be reached as to whether the submitted items originated from a common source, due to significant limitations.
 - This opinion requires explanation of the limiting factors.
- May Not Share a Common Source
 - A less than definite determination that the items did not originate from a common source at some point in time. There is a lack of correspondence in characteristics between the items and some inconsistencies noted; however, there are limitations.
 - This opinion requires explanation of the limiting factors.
- Do Not Share a Common Source
 - A determination that the items do not share a common source due to sufficient disagreement in class and/or identifying characteristics. Significant differences are observed.

4.6.6 Generational Order of Documents

- Information related to the generational order of an item(s) may be provided.

4.7 Records

- The case records will include any of the following items that were observed during the examination process and support the findings or conclusions rendered:
 - Reference information/copies of standards
 - Image files
 - Printouts
 - Photographs
 - Overlays
 - Drawings or notes of any identifying and/or eliminating characteristics observed
 - Manual transcriptions

5 LIMITATIONS

- The following factors could affect the examination process and/or the results rendered:

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Lack of a sufficient quantity of submitted item(s)/text

Prior destructive forensic examinations

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- Lack of sufficient clarity and detail in the submitted items
- Lack of/limited identifying characteristics
- Redacted
- Lack of sufficient comparability of the text being compared
- Search capabilities are limited to the items and/or information contained in the reference materials
- Accuracy and quantity of information provided to the Laboratory

6 SAFETY

Standard precautions should be followed for the handling of chemical and biological materials. Chemical and biological materials that are hazardous or potentially hazardous will be maintained and examined in specifically designated areas within QDU space. QDU personnel may refer to the [FBI Laboratory Safety Manual](#) for additional guidance.

7 REVISION HISTORY

Revision	Issued	Changes
08	01/14/2022	Updated the entire document for clarity and for new technical procedures template. Reorganized and combined graphic arts content from DOC-212, DOC-213, and DOC-223 into this standard. Added additional guidance for obtaining exemplars from machines with automatic feeders.

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