

# Write-On™: A New Tool for Handwriting Comparison

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**Write-On™ is an innovative software program that was developed to aid Forensic Document Examiners (FDEs) in cases that include extended handwriting. Searches for comparable words, letter combinations, and characters can be done. The results of these searches are documented and they can be used to develop statistical data to support the analysis and opinion. The program's chart-making facilities are a sophisticated alternative to traditional cut-and-paste techniques. Write-On™ is quite versatile and can be used in cases consisting of two documents or hundreds of documents.**

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## Introduction

Cases involving the examination of extended writings are common to many document examiners. One of the main problems in this type of case is its management. Keeping track of the various significant features and characters requires careful note taking and making a detailed record of the documents or pages on which these features occurred. These notes and records will be an important aid during testimony. The examiner can demonstrate the findings in a clear and concise manner, and visually support the opinions.

Write-On™ is a software program developed and designed specifically to aid in the examination and presentation of cases that include extended writings. The software was developed by Pikaso Software (Ottawa, Canada), together with the financial investment and technical support of ten document examiners from Australia, Canada and the United States. *[Disclosure: The author is one of the document examiners].*

The program aids in the assessment of natural variation by finding comparable letterform combinations and ensures that all possible comparisons are made. It can just as easily be used in the comparison of two sets of writings or in hundreds. Write-on™ also provides statistical support to the analysis, which gives a more objective framework on which to form and support an opinion. The program's chart-making facilities are a sophisticated alternative to traditional cut-and-paste techniques.

## How Write-On™ works

Write-On™ does not include scanning capabilities nor does it attempt to recognize handwriting. Before using the software, the handwritten documents are scanned and saved individually as bitmap files using any capable graphics software. Scanning to 100 dpi works well. Whilst higher resolutions can be used, this will lead to higher memory consumption and slower operation of the program.

The user produces a transcript of the handwritten documents. This transcript can be created using the Text Editor function in Write-On™. Alternatively, it can be prepared on Notepad, MSWord, WordPerfect or any other word-processing programs provided it is imported into Write-On™ in ASCII format. The transcript should resemble the layout of the handwritten document as much as possible. To minimize demands on computer memory, each transcript is limited to 300 lines, 300 characters per line and an overall total of 30000 characters. Documents exceeding these limits should be split into smaller sections.

The scanned handwriting is then associated to the transcript using the Associate function. This is perhaps the most labor-intensive part of the process. Using the Automatic Association button, rectangles are drawn around each word in the handwritten document and automatically associated with the transcript. An assistant can do this work with minimal training. The software's association tool is very efficient and a page can be associated in a few minutes.

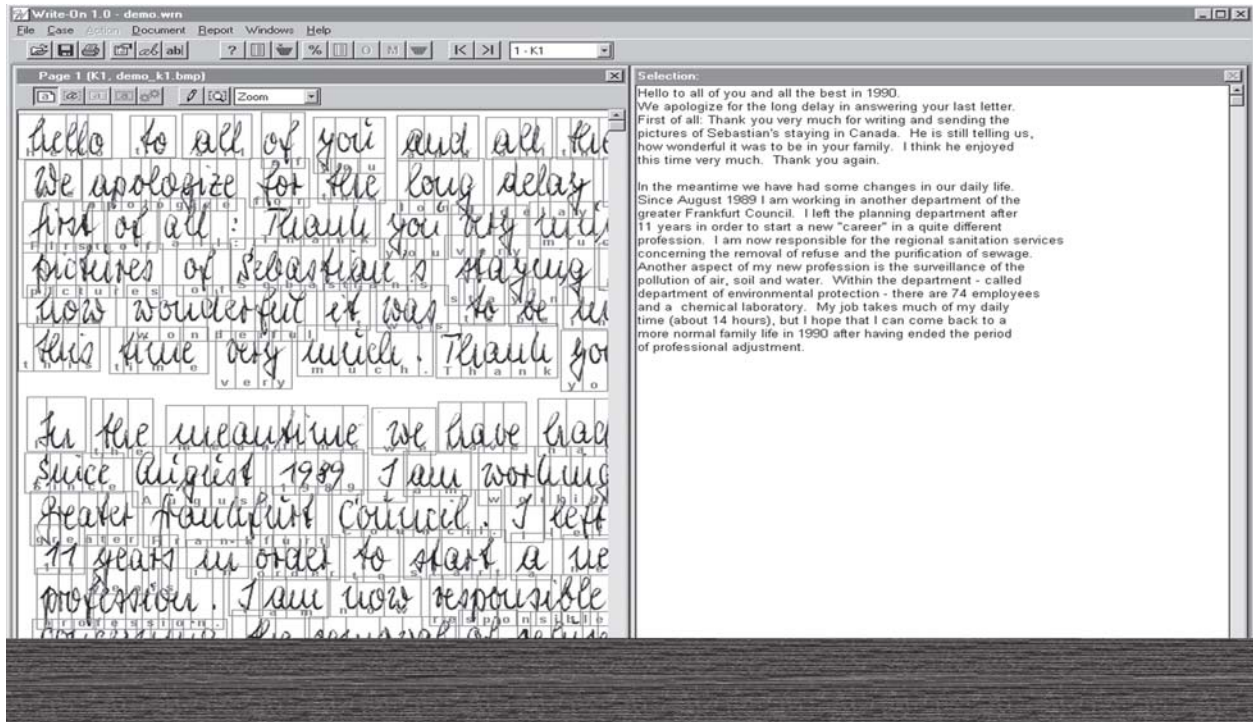


Figure 1. Scanned document and transcript after association.

After the association has been made, the Reporting functions of the program can be used.

### Word Index

The Word Index function gives the total number of words in both the questioned and known documents. Each word (or numeral) is designated as Q

or K, followed by the page on which it appeared, the line number on that page and the word number in that specific line. At a glance, the examiner can immediately tell how many times a word occurred in the questioned and known documents. This index is very helpful in selecting word and letter combinations to search for.

| Words Index          |                                                               |
|----------------------|---------------------------------------------------------------|
| Word found (#)       | Index (type, page, line, word)                                |
| No. of words found : | 210 (total: 422)                                              |
| a(6)                 | K1,1,11,8 K1,1,11,14 K1,1,17,2 K1,1,18,18 Q1,2,9,11 Q1,2,10,4 |
| about(2)             | K1,1,18,3 Q1,2,11,5                                           |
| adjustment(1)        | K1,1,20,3                                                     |
| after(2)             | K1,1,10,10 K1,1,19,10                                         |
| After(1)             | Q1,2,15,9                                                     |
| Afterwards(1)        | Q1,2,5,4                                                      |
| again(2)             | K1,1,6,8 Q1,2,14,1                                            |
| air(1)               | K1,1,15,3                                                     |
| all(5)               | K1,1,1,3 K1,1,1,7 K1,1,3,3 Q1,2,15,10 Q1,2,16,5               |
| am(2)                | K1,1,9,8 K1,1,12,4                                            |
| an(1)                | Q1,2,17,2                                                     |
| and(6)               | K1,1,1,6 K1,1,3,11 K1,1,13,6 K1,1,15,6 K1,1,17,1 Q1,2,14,5    |
| another(1)           | K1,1,9,11                                                     |
| Another(1)           | K1,1,14,1                                                     |
| answering(1)         | K1,1,2,8                                                      |

Figure 2. Word Index taken from documents in Demo.wrn.

Occurrence Charts

The Occurrence Chart function enables the examiner to search for a particular word, letter or letter combination. The examiner can scroll through the questioned and known windows looking for matching features. This function is particularly useful in determining the range of variation in both the questioned and known writings.

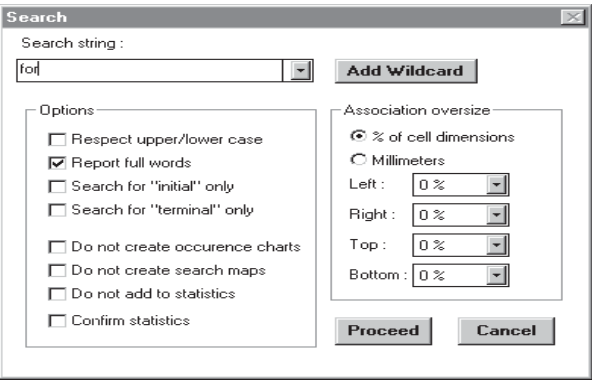


Figure 3. Search options available

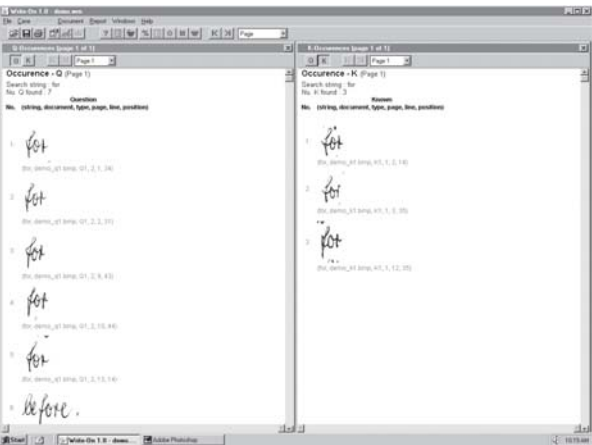


Figure 4. Occurrence Chart taken from Demo.wrn showing the word “for” (Note the Q and K windows which scroll independently to facilitate comparison)

The location of each string in the occurrence chart is also designated by document, page number, line number and word number. There are several search options available (Fig. 3) including one that allows for queries with a position designation (i.e., “ion” at terminal position or “for” at initial position).

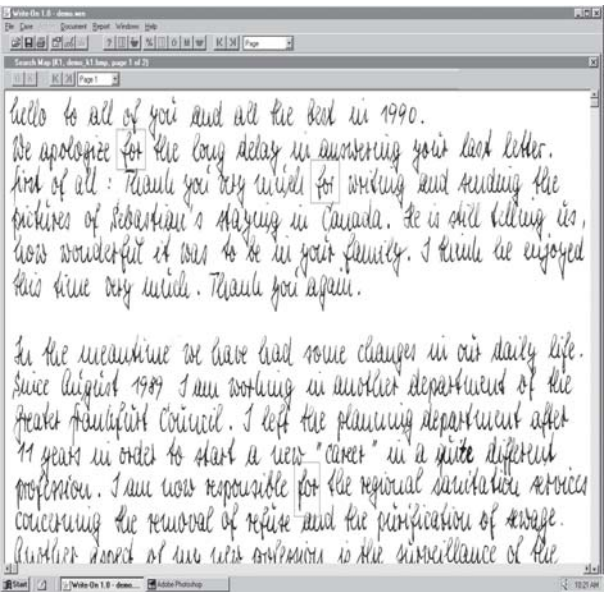


Figure 5. Search Map of the word “for” showing two of the boxed words

Search Map

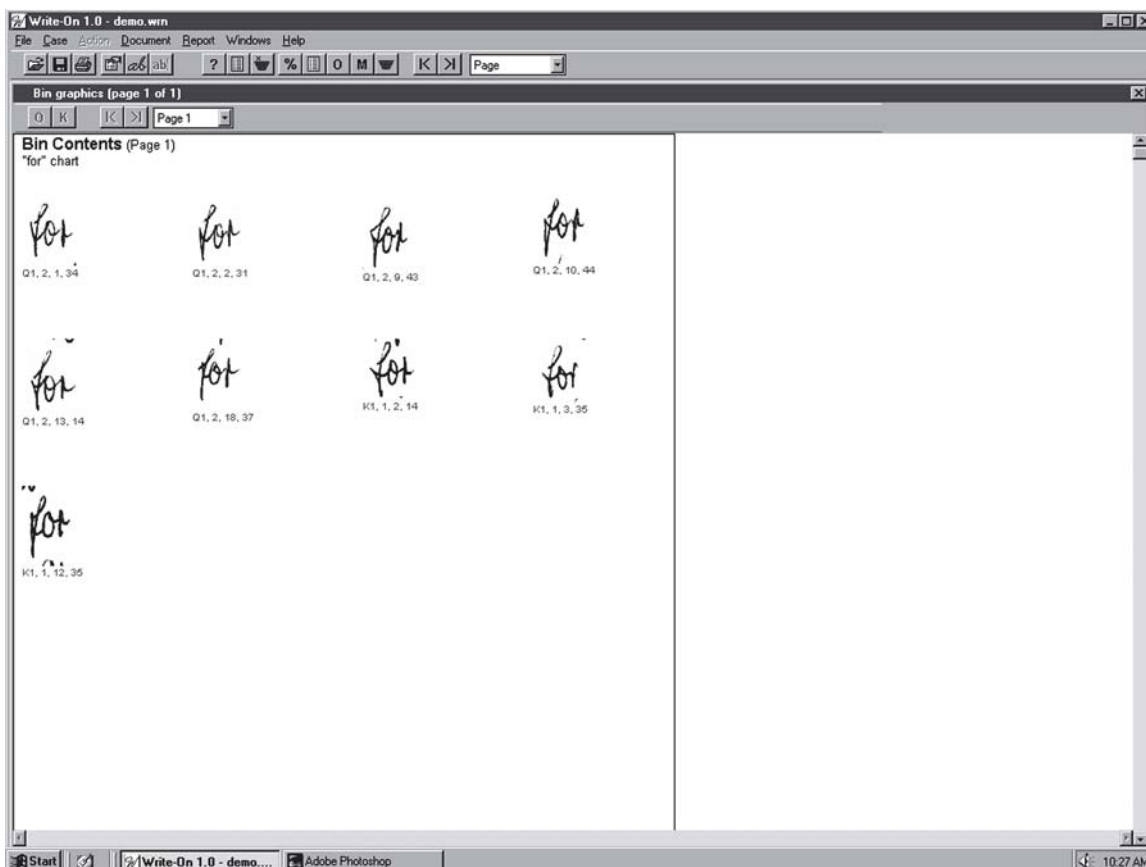
The Search Map function places a rectangle around each of the selected words. This allows the examiner to instantly view the position of these words. This provides visual support to the written designations.

| No. | Search | # of Q | # of K | Date    | Document range |
|-----|--------|--------|--------|---------|----------------|
| 1   | for    | 7      | 3      | 5/2/00  | K1_Q1          |
| 2   | on     | 3      | 13     | 1/16/00 | K1_Q1          |
| 3   | are    | 2      | 2      | 1/16/00 | K1_Q1          |
| 4   | day    | 3      | 0      | 1/16/00 | K1_Q1          |
| 5   | day    | 3      | 0      | 1/16/00 | K1_Q1          |
| 6   | any    | 1      | 0      | 1/16/00 | K1_Q1          |
| 7   | com    | 3      | 1      | 1/16/00 | K1_Q1          |
| 8   | day    | 3      | 0      | 1/16/00 | K1_Q1          |
| 9   | are    | 2      | 2      | 1/16/00 | K1_Q1          |
| 10  | on     | 3      | 13     | 1/16/00 | K1_Q1          |
| 11  | about  | 1      | 1      | 1/16/00 | K1_Q1          |

Figure 6. Statistics Table taken from Demo.wrn

Statistics

The Statistics function tells the examiner how many times a word appeared in the questioned and known writings. If asked for this information during testimony, the examiner will have it readily available. (Fig.6).



**Figure 7.** Bin content with selections of the word “for” (Note the designations specifying the location of each word)

## Bin

When searching through the Occurrence Chart, the examiner can make note of matching questioned and known letter formations. These can be instantly added to a Bin and can then be copied to a clipboard for preparation of a court chart. As with the Occurrence Charts the images in the bin will have a designated location. The examiner's only task will be the arrangement of the Bin contents for presentation, or as a summary chart displaying matches and differences in a concise format. (Fig. 7)

## Hardware requirements

The minimum requirements for running Write-on™ on a PC are

- 100 MHz Pentium
- 16 MB RAM
- 10MB Hard Disk space
- 0.8 MB Hard Disk space for temporary files
- 0.5 MB Hard Disk space per bitmap document

A large case with 100 documents, for example, will require approximately 150 MB of free hard disk space.

### **Potential cases for Write-on™**

Examples of cases for which Write-on™ can be used include anonymous and threatening letters, large-scale check fraud, multiple pages of extended handwritings, and tax and expense forms. The software is valuable in determining if multiple authors are involved or in the inter-comparison of one author's different writing styles.

### **Conclusion**

Write-on™ is an innovative, powerful program designed for use in the examination of extended writings. The ability to produce demonstrative answers to a variety of questions involving statistics, variation and thoroughness in examinations is another step forward in making handwriting examination more objective.

**Note:** A demonstration version of Write-on™ can be downloaded from **[www.pikaso.com/write-on](http://www.pikaso.com/write-on)**.