# ProtecPaper®: Software for Preventing Information Leaks from Paper Media

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An increasing number of corporations handle personal information and confidential internal business information with stringent management, due to rampant occurrences in recent years involving information leaks as well as an increased awareness for the privacy of customers and the enforcement of the Personal Information Protection Law. As for paper media, which is the route for approximately half of all information leaks, however, not many corporations have actually implemented effective precautions. This paper will describe on features of "ProtecPaper®*1)", a software that implements protective measures against information leaks from paper media as well as introduce examples of its application.

## Current Status of Information Leaks

Personal information in the possession of corporations contains various types of private information that requires appropriate handling. It is for this reason that the Act on the Protection of Personal Information (commonly referred to as the "Personal Information Protection Law") was promulgated in 2003. The law prohibits the use of personal data for purposes other than those intended, as well as obligates corporations possessing personal information to implement provisions for security management. The aforementioned law also incorporates recommendations for corrective action, as well as orders and penal regulations whenever violations are committed. A decision was made to apply these items from April 2005, after observing the status on the implementation of preventative measures for compliance by corporations.

However, even after the promulgation of the law personal information has been constantly leaked from corporations, so the law makes it necessary for all corporations to implement some drastic measures. For this reason steps have been taken, such as the implementation of anti-virus software, the installation of internet gateways and the realization of features to prevent USB device connections. As shown in **Figure 1**, however, the only measures implemented to prevent information leaks from paper media, which make up approximately 46% of all information leaks, were the prohibition of printing and the taking of printing logs. In reality there are numerous occasions when the contents of information are verified or amended using printed materials, therefore, the prohibition of printing could end up promoting inefficiency in business operations across the board. Furthermore, although it is possible to have a good overview of the printing activities through the taking of logs, such efforts have no effect with regard to preventing information leaks from occurring. Additionally, once an information leak takes place, extensive log analysis is required and an enormous amount of time is needed to identify the route of a leak in order to comprehend the scale of such a leak. We developed ProtecPaper in order to resolve the issue of prevention for such information leaks of paper media.

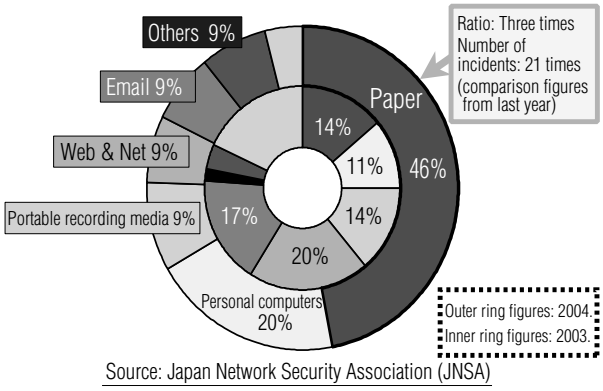


**Fig. 1 Proportions of personal information leakage routes**

## ProtecPaper Principle

ProtecPaper prints finely detailed dot patterns expressing information (Val-Code®*2)) as a background pattern over a document[1].

A sample printing using ProtecPaper is shown in **Figure 2**.

The information contained in such background patterns is restored through the extraction of the Val-Code, which is read through the scanning of the printed material. Features of Val-Code include its characteristic, which makes it possible to retrieve information even if the printed material has been copied a number of times, it becomes soiled or if the printed material has folds or creases. Furthermore, the information can be extracted even from a portion of the printed material.

ProtecPaper embeds information (referred to as "source information") that can be used to identify the source of printing, including such details as the date of printing, name of person printing, name of printed file as well as the name

*1) ProtecPaper is a registered trademark of Oki Electric Industry Co., Ltd.
*2) Val-Code is a registered trademark of Oki Electric Industry Co., Ltd.

**Fig. 2 Sample of printing with ProtecPaper**

of the computer used for printing. It is, therefore, possible to quickly identify the source of the information, such as which computer was used to print the particular file by whom and when, even with just a fraction of the printed material in the unlikely event that such printed material is leaked.

This makes it possible to easily identify the information of customers included in a list even if a list file that has undergone repeated revision is leaked, since the file name and printed time can be identified immediately. Furthermore, because the name of the person who printed the file and the name of the computer used can be identified, it is possible to investigate the status of the pertinent corporate organizations, implement penalties and rapidly formulate remedies to prevent the loss of social credibility due to delays in implementing information leak preventative measures.

Furthermore, since the Val-Code is printed to appear as a background pattern, which covers the entire surface of the printed material, people printing such materials are made aware of the embedded source information each time such materials are printed. In the unlikely event the printed materials are leaked, the person printing such materials will be held responsible, which will naturally make them more cautious about handling printed materials, thereby enhancing the inhibiting effects for information leaks.

There are two types of ProtecPaper software, the ProtecPaper SDK (software development kit) for software developers and the ProtecPaper System 1.1 Standard Edition intended for final end users. Furthermore, imaging software for SDK users, an Oki Image Rasterizer, is available as an optional product.

## ProtecPaper SDK

ProtecPaper SDK is used by developers for incorporating the ProtecPaper function into the application software of customers. ProtecPaper SDK is comprised of I-SDK, which embeds information into graphical images and the V-SDK, which extracts information from such images. I-SDK can be used to embed arbitrary information of up to a maximum of 75 bytes as Val-Code in a graphical A4 size image. V-SDK can be used to detect Val-Code and extract the embedded information from images read by scanners.

Since the input of I-SDK is performed in a graphical image format, it is not possible to directly use the data with applications, such as spreadsheet software. The software for generating the files of graphical image formats, Oki Image Rasterizer, is available as an optional product for this reason. This is a set of software with a printer driver format and a control module for such software. When an application uses the Oki Image Rasterizer to perform printing, an image file with a bmp format is generated. Information can be embedded through processing the generated image file with I-SDK.

An example of the software operation using the ProtecPaper SDK is shown in **Figure 3**. It is possible to raise the level of security for printed materials by incorporating software modules developed by using ProtecPaper SDK into spreadsheet software, multi-function products and printers to prevent information leaks. The software configuration of the ProtecPaper SDK is shown in **Table 1**.

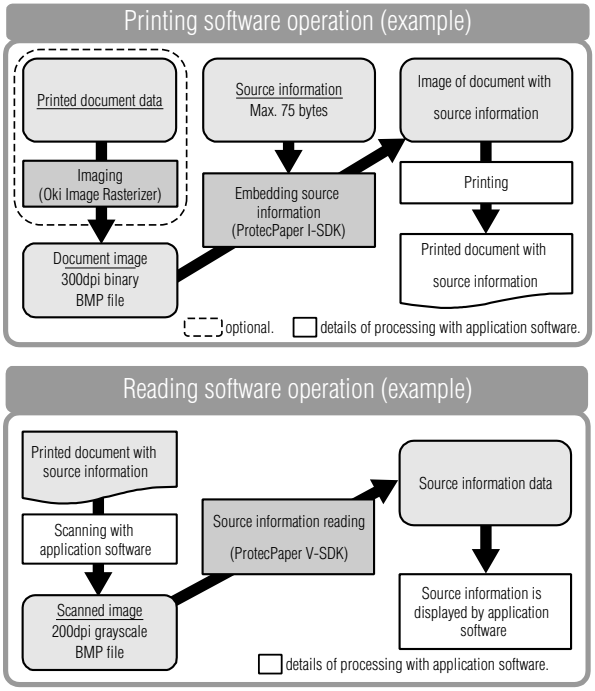


**Fig. 3 Example of software operation using ProtecPaper SDK**

**Table 1 Configuration of ProtecPaper SDK**

| Classification | Item | Function |
|---|---|---|
| I-SDK | Source information embedding function | Function for embedding information in document images (max. 75 bytes). |
| V-SDK | Source information reading function | Function for reading source information from scanned image and output as source information data. |
| Oki Image Rasterizer | Imaging function | Function for converting printed document data into document image. |

## ProtecPaper System 1.1 Standard Edition

ProtecPaper Standard Edition is software that can be utilized by end users once it is simply installed in their computers. It is comprised of ProtecPrint, which adds source information to the file intended for printing before the printing of the processed file begins and ProtecCheck, which is used for scanning the printed material to extract source information.

Outlines of ProtecPrint and ProtecCheck are shown in **Figure 4** and **Figure 5** respectively.

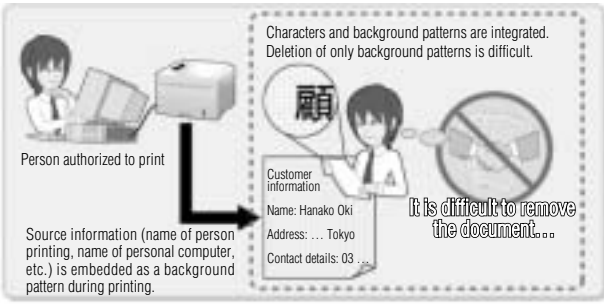


**Fig. 4 Outline of ProtecPrint**

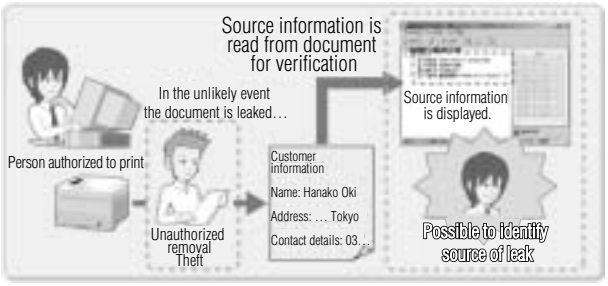


**Fig. 5 Outline of ProtecCheck**

### (1) ProtecPrint

ProtecPrint is software with a printer driver format. It actually combines with the printer driver that is used for printing.

The Val-Code embedded with information can be printed together with a printing image when ProtecPrint is specified for printing in the application of the user.

It is possible to embed source information comprised of the date and time, name of computer used for printing, the logged in user printing the document, as well as the name of the print job. Ordinary applications use the name of the printed file for the print job name. With ProtecPrint, however, it is possible to include information, such as “when”, “by whom”, “what” and “from where”, as Val-Code in the printed material.

Because ProtecPrint is registered in the system as a kind of printer, it can be utilized for printing by a wide range of applications. It is also possible to embed source information automatically for printing simply by specifying ProtecPrint as the usable printer, without changing any existing printing procedures. Furthermore, it is possible to prohibit the printing of documents without adding source information simply by combining ProtecPrint with the authorization setting function for the user administration of Windows, thereby making it possible to thoroughly assure the security of printed materials. In addition, because the impression density of Val-Code can be adjusted by the printer administrator, from the Properties window of the printer driver, a trade-off between the resistance against copying and the appearance can be managed and operations can be conducted in accordance with the security policy.

### (2) ProtecCheck

ProtecCheck is application software that displays source information by reading it from printed materials. Embedded information can be displayed and read from printed materials once it has been scanned with a connected scanner. In this way, in the unlikely event that information is leaked, the source of the leak can be determined quickly from the printed material leaked, thereby making it possible to comprehend the scale of the leak as well as speedily implement subsequent processes.

ProtecCheck also supports the automatic document feeder (ADF) function of the scanner, making it possible to perform serial scanning and display the source information for printed materials.

A screenshot of ProtecCheck is shown in **Figure 6**.

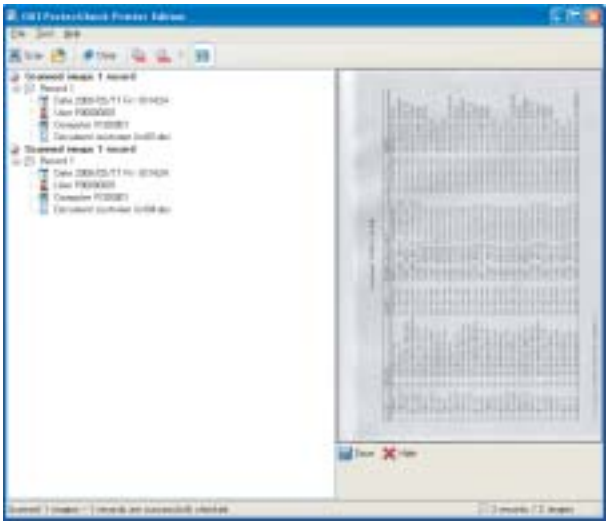

**Fig. 6 A screenshot of ProtecCheck**

Specifications of ProtecPrint and ProtecCheck are shown in **Table 2**.

## Application examples of ProtecPaper

ProtecPaper can be used to prevent information leaks for a variety of printed materials, without the implementation of any major changes to existing printing procedures. It is for this reason that ProtecPaper can be applied to a wide range of settings for documents that contain information on numerous people to be printed due to business process requirements.

Financial and education industries can be mentioned as business categories for which ProtecPaper has been adopted. In the financial industry certain institutions, such

**Table 2 Specifications of ProtecPrint and ProtecCheck**

| Specifications | |
|---|---|
| Item | Descriptions |
| Paper size | A3, A4, A5, B4 and B5 |
| Special printing | Already compliant with double-sided printing, multiple pages printing onto a single sheet and printing by individual sets. |
| Printing colors | Black and white only. |
| Source information | Names of computer, logged in user, document, as well as date and time of printing. |
| Operating environment | |
| Item | Descriptions |
| Operating systems | Microsoft® Windows® 2000 SP2 and later or Windows® XP Professional Edition; all Japanese editions. |
| CPU | Intel Pentium® III 500MHz equivalent or better. |
| Memory | 256MB or more. |
| Available hard disk space | 100MB or more. |
| Connectable printers | Printers with LED or laser printing methods incorporating a printing resolution of 300dpi or better<br>(black and white printing function with a resolution of 300dpi or 600dpi is required). |
| Connectable scanners | TWAIN compatible flatbed scanners with a scanning resolution of 200dpi or better<br>(scanning function for 256 gradation tones of black and white images at 200dpi is required). |

as banks, often need to print and have documents with them, which contain details that would cause serious implications if leaked, such as customer information and fund strategy proposals, when visiting customers or passing around internal documents for the purpose of verification and storage. Therefore, a need exists to counter leaks by using ProtecPaper when printing such documents. Furthermore, ProtecPaper is used for printing student lists, score results and pass/fail determination documents in the education industry.

In the future we intend to extend applications to communications, power and gas businesses, as well as mail ordering businesses that tend to have a lot of customer information, as well as the aforementioned business categories.

Furthermore, information that needs to be protected against leaks using ProtecPaper, includes not just personal information but other information, such as confidential corporate internal information. In particular, since the revised Unfair Competition Prevention Law was enforced in November 2005, corporate entities have been subject to the administration of penalties if an employee leaks confidential business information. For such reasons, ProtecPaper is certainly beneficial for printing sales ledgers, the minutes of executive meetings and design documents, which are required to be under even stricter confidential management. It is, therefore, also a useful product for all corporations, regardless of whether these businesses are in the possession of any personal information or not.

## Conclusion

Descriptions on features and examples of applications for ProtecPaper, which can be used to implement measures against information leaks from paper media, have been provided in this paper.

ProtecPaper is a software that enables users to implement precautionary measures to prevent leaks occurring from paper media, which make up approximately half of all information leaks, without involving changes to existing business procedures. At Oki Electric we intend to contribute to the realization of a safe and secure society through the provision of ProtecPaper.

## References

1) Hota and Hikima: “An Overview and Applications of Val-Code®: Digital Watermarking Technology for Printed Documents”, Oki Technical Review Issue 198, Vol. 71, No. 2, pp. 20 to 23, April, 2004.

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