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Multimedia security –
Guideline for privacy protection of
equipment and systems in and out of use –

Part 1:
General

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INTERNATIONAL ELECTROTECHNICAL COMMISSION
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MULTIMEDIA SECURITY –
GUIDELINE FOR PRIVACY PROTECTION OF EQUIPMENT
AND SYSTEMS IN AND OUT OF USE –

Part 1: General

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Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC 62045-1, which is a technical specification, has been prepared by IEC technical committee 100: Audio, video and multimedia systems and equipment.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
100/1103/DTS	100/1162/RVC

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The list of all the parts of IEC 62045, under the general title *Multimedia security – Guideline for privacy protection of equipment and systems in and out of use*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

• transformed into an International standard,
• reconfirmed,
• withdrawn,
• replaced by a revised edition, or
• amended.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

There has been an increase in consumer products of multimedia that store the user's private data and privacy information. For instance, a digital TV tuner has a kind of IC card which stores the user's information and sometimes includes credit information. Also, from a wider viewpoint, digital cameras or digital video recorders store the private data of users, and digital audio players, cellular phones and PCs are banks of private data.

This private information should be protected from unauthorized or illegal access and use.

When the user discards such products, private data remains stored and this should be protected or deleted. In addition, when a user lends his product to others, private information should be protected. For instance, even if all the contents in the memory of digital video recorders or digital cameras are deleted, these data can be recovered easily with some software technology.

As consumer products of multimedia include storage and computer architecture, this problem will be raised in many aspects of usage. All products should have privacy protection methods.

This technical specification describes the system model and general methods for the user's privacy protection of data storage, equipment and systems, both in and out of use. Equipment and systems have their own structure in each application, therefore, the other part of this technical specification defines a dedicated method for privacy protection for the specific application. Also, the implementation of the privacy protection method depends on each design.

**MULTIMEDIA SECURITY –
GUIDELINE FOR PRIVACY PROTECTION OF EQUIPMENT
AND SYSTEMS IN AND OUT OF USE –**

Part 1: General

1 Scope

This part of IEC 62045 gives the guideline for methods for the protection of the user's privacy in consumer equipment and systems, both when the equipment or systems are in use and out of use.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60958-3, *Digital audio interface – Part 3: Consumer applications*

IEC 61880-2, *Video systems (525/60) – Video and accompanied data using the vertical blanking interval – Analogue interface – Part 2: 525 progressive scan system*

IEC 61883-6, *Consumer audio/video equipment – Digital interface – Part 6: Audio and music data transmission protocol*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

**3.1
data storage**
all kinds of data-storing functions, which are devices or systems including hard disk drive, optical disc and memory devices and others

**3.2
data encryption**
conversion of data into code or cipher

**3.3
data access**
reading, writing or use of data stored in data storage

**3.4
access control**
control for condition of use or entry to system or data

**3.5
private data**
data that is property of the user

3.6
social engineering
cracking techniques that rely on human rather than hardware and software weaknesses

4 Privacy of user

4.1 Privacy protection

The reason for protecting the user's privacy is that the privacy of the user is the property of the user. The manufacture of equipment and systems, and the service providers have the responsibility of safeguarding the user's privacy.

4.2 Definition of privacy

Privacy, as defined in this specification, is the private information of the user or private information created by the user that is produced or accompanied with user's usage, operation and behaviour with multimedia equipments or systems. Using the equipment, system and service, these activities produce private information that is stored or transferred. This privacy has attribution and origination.

Attribution is specified depending on its nature as shown in Table 1.

Table 1 – Privacy attribution

Privacy attribution	Description	Example
Identification of user	User can be identified with this information	Name, address, telephone number, e-mail address Social information, credit card information, social number Biometrics data of user
Creation by user	Information that is the property of user	Document, photograph, video, music
Provided by user	Information provided by user operation	Broadcasting programme, downloaded contents, cookie, usage record

The identification of the user is fundamental information of the user. The user can be identified by this information, and others can access to the user or the property of user with this information.

Creation by the user is a property of the user. This information should be protected from others.

Provided by the user is also a property of user. This is provided by user operation or behaviour.

The origin of that information is specified as shown in Table 2.

Table 2 – Origin of information

Origin	Description
Direct information	Provided direct by user
Indirect information	Provided indirectly by user's use of equipment or systems
Accompanied information	Data accompanied by the user's use of equipment or systems

Direct information is provided by the user intentionally and consciously, or unintentionally and unconsciously. When the user inputs his private information or recalls his information, that information is provided direct by the user's operation or behaviour.

Indirect information is provided by the user's use of equipment or systems intentionally and consciously, or unintentionally and unconsciously. When the user uses equipment or systems, this behaviour causes communication of information including the user's private information.

Accompanied information is information other than that made by the user, which is created by equipment or systems having a relation with the user's use or behaviour. For instance, when the user uses equipment, the equipment may record a log. This log will include private information regarding the user.

4.3   Characteristics of privacy

4.3.1   Characteristics of privacy general

Privacy defined as private information has the characteristic of protection.

4.3.2   Information attribution

The information to be protected is specified by a judgment of what is important information for the user who has the right to that information. Information itself is the object to be protected and also indirect information is the object. Three kinds of information are specified as shown in Table 3.

Table 3 – Information attribution

Information attribution	Case
Original information	All the original information
	Part of the original information
Derivative information	Secondary information from original information
	Proxy information of original information
Access information	Access information to original or derivative information

Original information is principal information primarily provided by the user. All of this information is private and, in some cases, part of the original information is the subject of protection.

Derivative information is produced from original information by the user or other persons, there are two cases of this information. Secondary information is produced from the original information and it includes private information of original information. Proxy information is a proxy of the original information, it includes information of the relation with the original information.

Access information is a key or authentication information used to access to the original information or derivative information. This is not private information in itself but the subject of protection.

4.3.3   Rights holder

The rights holder who has the rights of private information is defined by a judgment of what authorized person or organization control or has the rights of that information to protect their rights or property. Basically the rights belong to the user, but there will be other cases where part or all of the rights belong(s) to others or other organizations. Rights holders are shown in Table 4.

Table 4 – Rights holder

Rights holder	Condition
User	User rights
Manufacture	Manufacture rights
Contents provider	Contents provider rights

The manufacturer provides consumer products including the property of manufacture.

The user can take advantage of that property but the rights belong to the manufacturer.

The contents provider has the rights of the contents.

4.3.4 Protection execution

Protection should be executed depends on each condition as shown in Table 5.

Table 5 – Protection execution

Protection execution	Description
Always	To be protected whether user desires or not, and is aware or not
Automatically	To be protected automatically depending on operation
On request of the user	To be protected when user desires
Never	Not to be protected because of other conditions (see note)
On request of other than user	To be protected because of other conditions (see note)
NOTE Legal or security reason will affect conditions irrespective of user preference.	

Always is applied for principal information of properties of user, that information should be protected always.

Automatically is provided by equipment or systems in appropriate timing of operation by use.

On request of the user is controlled by the user, information should be protected by the request of the user.

Never may apply because of legal or security reason regardless of user preferences.

On request of other than user is controlled by legal or security reason.

4.3.5 Access rights holder

In some cases, persons other than the user can access the user's information. When the user accepts access from others, others can use them. An authorized supervisor can access user's information.

NOTE For security reasons, for instance, the police may access user's information in the framework of investigation.

Table 6 – Access rights holder

Access rights holder	Description
User	User
Others	Persons other than user
Authorized supervisor	Person authorized other than user (see note)
NOTE Legal or security reasons will affect conditions irrespective of the user's preference.	

5   Methods for privacy protection

5.1   System model

5.1.1   Definition of system model

The system model consists of body of equipment or systems and communication paths as shown in Figure 1.

Privacy information is data that is stored in storages. These are:

- data storage;
- equipment with data storage device;
- systems involving these data storage and equipment.

Storage device, equipment or systems have plural paths of data access that is categorized by attribution. These are:

- data interface;
- user interface;
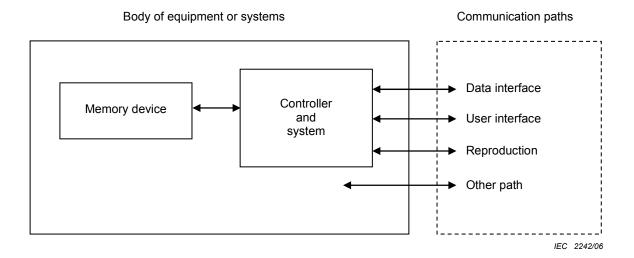- reproduction;
- other paths.

IEC   2242/06

Figure 1 – System model

The privacy information of the user is a kind of data. The data is created through a relationship with data storage, equipment or systems, and it is stored in storage device, or it is not stored. Relationship means possession, operation, usage and end of use. These

activities produce information including privacy of user. Private data will be transmitted or communicated to outside or accessible from outside through communication paths, or data can be reproduced by a function of equipment and systems.

Therefore, the method for protection of these data should be implemented in storage device, equipment or systems or in a combination of these. Also, the method should be implemented in communication paths. Storage device, equipment and systems are able to have a structure from physical layer to application layer. There are many methods for protection of data in each structure layer and the combination of each method. Also access paths have structures from physical layer to application layer.

There is another aspect of privacy protection. A system is operated by the user as a human being, and there will exist a security hole caused by this nature of human operation. This is not a technical but user assistance for this security hole is important. Without knowledge of security user cannot protect privacy if equipment and systems have complete protection methods. This is described in Clause 5.

5.1.2   Communication paths

Communication paths are specified in each case as shown in Table 7.

Table 7 – Communication paths

Communication path	Description	Examples
Data interface	Between data and outside equipment or systems	Network interface, digital interface (for example, IEC 60958-3, IEC 61883-6), video interface (IEC 61880-2), etc.
User interface	Between user and equipment or systems	Operational function, monitor display for operation
Reproduction	Data reproduction path to outside the equipment or systems	Audio and video play, data output
Other path	Other path of data to outside the equipment or systems	Power line, etc.

Data interface is a data communication path to outside such digital audio and video interface, or local area network. As primitive case, data line of memory device is this communication path.

User interface consists of control device and information device such as display device, information can be reproduced or communicated with these devices.

Reproduction may be a main function of equipment or systems, reproduction reveals information to outside.

Other path is other than these three paths, it is not intended to use data communication but it may be possible to obtain information through that path.

5.1.3   Body of equipment or systems

In the body of the equipment or systems, the data of privacy information is stored in the storage functionality. Data storage is storage equipment such as memory devices. Equipment involves data storage inside, for instance, many consumer products include data storage inside. A system consists of these equipment and data storage.

Table 8 – Storage functionality

Storage functionality	Examples
Data storage	Memory, memory card, HDD, optical disc
Equipment	Digital broadcasting tuner, optical disc player and all categories of consumer products
Systems	AV system, home network system

5.2 Case of usage

Cases of usage are specified in three cases as shown in Table 9.

Table 9 – Case of usage

Case of usage	Description
Owner use	Owner user uses own possession
Other use	Others use owner's possession
Out of use	No more use

Owner use is a case of normal usage, the privacy of the user should be protected from others than the user.

Other use is a case where persons other than the owner use the owner's equipment or systems; the owner's privacy should be protected from others, at the same time the privacy of others in use should be protected from the others, including the owner.

Out of use is a case after owner's disuse of equipment or systems, privacy information may remain in that equipment or systems. Privacy data should be deleted or protected before disuse.

5.3 Methods for data protection

5.3.1 Applicable portion and mode

Data storage, equipment and systems and communication paths make up the combination table as shown in Table 10. Each method for data protection is applied to each combination or plural combinations.

Table 10 – Combination table

	Storage device	Equipment	Systems
Interface	a	b	c
User interface	d	e	f
Reproduction	g	h	i
Other path	j	k	l

Appropriate method for data protection for each combination from a to l should be applied. This method is defined in each application. It will be specified in the other part of this specification.

Operation modes are specified as shown in Table 11.

Table 11 – Operation modes

Operation modes	Description	
Normal mode	For normal user usage	m
Maintenance or service mode	For service usage	n
Diagnostic mode	For user or service usage	o

Equipment and systems have some special mode for maintenance and service. Even in this mode, private data should be protected.

The maintenance or service mode may allow access to an internal data including private data. It is preferable to prevent access to private data with encryption or authentication and password. A better method is to design a system that permits no access to private data.

The diagnostic mode may allow access to internal data. It is preferable to apply the same methods as maintenance mode applies.

These modes of m, n and o may exist for all of combination of operation modes from a to l.

5.3.2 General method for protection

5.3.2.1 Definition of general method

Subclause 4.3.2 describes general methods for protection. The specific method and details should be specified in each application depending on each design. The other parts of this specification give a specific method for protection in each application.

The general method is protection of information. Protection means prevention or control of use of information by other person or organization. This general method is categorized in the following methods.

- Data structure
- Access control
- Data deletion
- Data identification

If user information has been accessed and used by others, identification of data can be used to trace that information. This is not a protection method but effective to find illegally used information.

5.3.2.2 Data structure

5.3.2.2.1 Data structure general

Data structure means two cases. One is that data is a plain text but protection method is implemented in data protocol, the other is that data is not a plain text but encrypted.

5.3.2.2.2 Data protocol

Generally, data protocol is based on a specific structure. For protection of data use, a unique data protocol or protected protocol should be applied. The information of the data protocol is important information that should also be protected.

This method is applicable to a, b and c.

5.3.2.2.3   Data encryption

Encryption of data limits users who have an authorized right of access to data with key and/or password. Encryption can be applied from the physical layer to the application layer, a specific method depends on each application. In general, encryption needs keys for authentication, and management of key and information of authentication system are also important information that should be protected.

This method is applicable to a, b, c, d, e, f, g, h, i, j, k and l.

5.3.2.3   Access control

Access control means control of operation or use of data, data storage, equipment and systems with communication, interface, user interface and reproduction.

For instance, access control is implemented by control flag, password or authentication.

The control flag is a basic method. It is implemented in many cases, for instance, digital interface has control flags including access control.

NOTE   In IEC standards, IEC 60958 has "generation status" flag and IEC 61880-2 has "CGMS-A" status.

Authentication and key can be applied for access control. Authentication needs key information, key information can take various kinds of form. Password, token, or any kind of identification can be a form of key. This method is applicable to a, b, c, d, e, f, g, h, i, j, k and l.

5.3.2.4   Data deletion

When data storage, equipment and systems are not used or used by others than the user, the private information of its owner should be protected or deleted.

In the case of data protection, privacy information is safe for any case of use. Otherwise, privacy information should be deleted.

When equipment or systems have an appropriate protection method for private information, that information is protected from unauthorized access, and that information may be remained inside equipment or systems after the owner discarded or no longer possessed equipment or systems. In this case, if equipment or systems are unexpectedly discarded or used by others, the private information may be safe.

However, the existence of private information inside the equipment or systems gives the possibility of illegal access or abuse of the user's private information. When the user needs to delete private data, that data in the equipment should be deleted with no possibility of data recovery.

5.3.2.5   Data identification

If privacy information has been accessed illegally and abused, traceability of the data is useful for clarification of illegal information. Data identification method such as watermark or embedded signature of data can be applied for this purpose.

6   Methods for user assistance

6.1   Importance of user assistance

Although data storage, equipment and systems have an adequate privacy protection method, the operator is a human user, and a human is not a system as complete as a machine. The whole system consists of the machine and the user, which has a weakness on the user's side

even if the machine has a complete privacy information protection method. Social engineering is a technique to take advantage of this human weakness.

A key of authentication is a principle of the privacy information protection method, and the user management of the key is important. For instance, keeping the password in a safe place is a basic procedure. However, persons other than the user can obtain that key with a special technique of communication with user as social engineering. The education of the user is a basic method, but, if the user recognizes less the importance of the key, it is preferable that the system can protect this human weakness.

Actual assistance methods depend on each specific application.

6.2   Education for user

The manufacturer or other person who provides equipment, systems and service should provide enlightenment or education for users regarding privacy protection.

Instructions written in a user's manual is a common method, and other effective methods should be provided for the user.

6.3   Instructions for user

6.3.1   Instructions for general use

Caution, notification or instructions embedded in operation of equipment or systems is an effective method for the user.

6.3.2   Passive information

When the user operates equipment or systems, there will be an opportunity to show the information of caution, notification or instruction for the user that is useful information for the user to protect user's privacy information.

6.3.3   Interactive information

The interactive operation system can provide information for the user when necessary. When the user operates equipment or a system, an interactive system can provide user step-by-step or sequential operation with caution, notification or instructions that help the user.

6.4   Failsafe and multiple protection system

The user is a human who makes mistakes. Failsafe or multiple protection can compensate for this.

Failsafe is effective to compensate this human failing. Actual implementation depends on each specific application.

Multiple protection system is one of failsafe. A single protection system may be enough but a double or triple protection system is effective. The number of protection systems to be implemented depends on the importance of private information.

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