

INTERNATIONAL STANDARD

IEC 62394

First edition
2006-06

**Service diagnostic interface for consumer
electronics products and networks –
Implementation for ECHONET**

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IEC 62394:2006

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Reference number
IEC 62394:2006(E)

Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

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International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch



Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE

XA

For price, see current catalogue

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SERVICE DIAGNOSTIC INTERFACE FOR CONSUMER ELECTRONICS PRODUCTS AND NETWORKS – IMPLEMENTATION FOR ECHONET

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International Standard IEC 62394 has been prepared by IEC technical committee 100: Audio, video and multimedia systems and equipment.

The text of this standard is based on the following documents:

FDIS	Report on voting
100/1077/FDIS	100/1102/RVD

Full information on the voting for the approval of this standard 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 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

- reconfirmed;
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- replaced by a revised edition, or
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A bilingual version of this publication may be issued at a later date.

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INTRODUCTION

Consumer products are often repaired by service workshops, which service a wide range of products developed by different manufacturers.

For highly complex products, fault diagnosis becomes increasingly difficult and time-consuming. To make diagnosis possible, manufacturers often develop built-in diagnostic software, which can be used for fault-finding together with an external diagnostic unit through a service diagnostic interface (SDI).

To avoid the need for a service workshop to purchase several different diagnostic units from different manufacturers for different products, a standardized SDI is proposed for use by all manufacturers and in all products in which such diagnostic interfaces are required. The result will be that only one SDI is needed in the service workshops.

The SDI should also be suitable for diagnosis in a network (facilities or household appliances network) in which different products from different manufacturers are connected together. The interface should also allow for future development.

The standard SDI which has to be specified, should

- be usable in future products;
- be easily connectable to a product or a network;
- be cheap;
- not limit product design.

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SERVICE DIAGNOSTIC INTERFACE FOR CONSUMER ELECTRONICS PRODUCTS AND NETWORKS – IMPLEMENTATION FOR ECHONET

1 Scope

This International Standard specifies requirements for service diagnostic software to be implemented in products that incorporate a digital interface. It does not specify requirements for carrying out remote diagnosis or for manufacturer-dependent software.

The SDI requires the use of a controller (exclusive controller or general-purpose controller/PC) into which service diagnostic software can be loaded. Part of this controller software should be standardized while another part of this controller software is manufacturer-/product-related.

To reach a common approach in servicing all products from all manufacturers it is necessary to standardize specific items in the products (device under test (DUT)) as well as in the diagnostic software on the controller.

The SDI is based upon the ECHONET specification because this interface will be used in most future products. The use of this connection and existing communication protocols enable implementation in products at low cost and gives maximum flexibility and efficiency.

The SDI consists of

- the specific hardware and software requirements of the DUT;
- the specific requirements of the controller:
 - the service software;
 - an ECHONET interface (to be built in if not already present);
- the connection between the controller and the DUT.

This specification is the minimal specification necessary to be able to carry out computerized diagnosis and covers the standardized software of the controller as well as the standardized software and provisions in the DUT.

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.

ECHONET Specification:2002, Version 2.11

3 Terms, definitions and abbreviations

3.1 Terms and definitions

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

3.1.1

ECHONET specifications

ECHONET specifications were designed to enable the use of various kinds of transmission media (for example, power line, low-power radiofrequency, ETHERNET, Bluetooth®)

NOTE Ethernet is a registered trademark of the Xerox Corporation. Bluetooth® is a trademark owned by Bluetooth SIG, Inc.

3.1.12

remote diagnosis

diagnosis of a product via telephone, Internet, etc.

3.2 Abbreviations

EHD	ECHONET headers
SEA	Source ECHONET address
DEA	Destination ECHONET address
EBC	ECHONET byte counter
EDATA	ECHONET data
OHD	Object message header
EOJ	ECHONET objects
EPC	ECHONET property
ESV	ECHONET service
EDT	ECHONET property value data
CpESV	Compound ECHONET service
DUT	Device under test
OEM	Original equipment manufacturer
PC	Personal computer
ROM	Read-only memory
SDI	Service diagnostic interface

4 Different types of service diagnostics

4.1 Stand-alone products

For stand-alone products, a connection is made between the diagnostic controller and the DUT, where the DUT is from any manufacturer and of any type.

4.2 Facilities or household appliances network

In a facilities or household appliances network, a connection is made between the diagnostic controller and a network of facilities or household appliances. Several different facilities or household appliances are interconnected and not all of them are necessarily from the same manufacturer.

In this case, the SDI shall list the products on the network, detect which facilities or appliance is causing problem, and diagnose the product concerned.

4.3 Remote diagnosis

In addition to the configurations described in 4.1 and 4.2, a link can be made (for example, via telephone, the Internet, etc.) between the diagnostic controller in the workshop and a DUT/network at the customer's home. Therefore, if a product has both an ECHONET interface and a remote connection capability, this product should be able to transfer the diagnostic data, as described in this standard, through the remote connection.

5 SDI requirements

The SDI consists of

- hardware and software, both in the DUT and in the test equipment ("tester");
- the connection between the tester and the DUT.

The total SDI can be divided into the parts described in 5.1 and 5.2.

5.1 Hardware

5.1.1 Tester hardware

The hardware used for testing shall be a controller exclusive computer or general-purpose controller (for example, desktop or laptop PC) provided with at least one suitable network interface which enables the transfer of the ECHONET frame, as specified in 7.1, and running the necessary diagnostic software.

NOTE The minimum specification for the tester hardware depends on the respective tester platform.

5.1.2 Facilities or household appliances network

For the connection between the tester and the DUT, the "facilities or household appliances network" shall be used. For the diagnosis of the DUT using the network, the tester shall be connected to the facilities or household appliances network that conforms to the requirements of 7.1.

5.1.3 DUT hardware

5.1.3.1 General

The DUT shall be provided with at least one network interface which enables the transfer of the ECHONET frame as specified in 7.1.

5.1.3.2 Facilities or household appliances network

For diagnosis on a network, the tester shall, where possible, be connected to a "facilities or household appliances network" that conforms to the requirements of 7.1.

5.2 Software

NOTE The software for the SDI can be divided into two parts (tester and DUT) of which each part again can be divided into mandatory (SDI common) software and non-mandatory (manufacturer-dependent) software.

5.2.1 Tester software

The software platform of the tester shall be able to handle the ECHONET frame as specified in 7.1.

The SDI common software on the tester shall have the following functionalities:

- a) to initiate a service of “property value read request”, as specified in 7.1.9;
- b) to read out the service of “property value read response” and “property value notification” of all products, as specified in 7.1.9;
- c) to display a list of all products connected to the facilities or household appliances network to which the tester is connected. On the display shall be listed the
 - manufacturer code property;
 - place-of-business code property;
 - product code property;
 - serial number property;
 - date-of-manufacture property;
- d) to display an indication of the fault status property which describes the occurrence of an error in an actual device. The property code used as a property value is 0 × 41 when an error exists or 0 × 42 when no error exists and is found to be “OK” or “Not OK” as specified in 8.3.5;
- e) to display an indication of the fault content property which describes the content of an error in an actual device as specified in 8.3.6.

5.2.2 DUT software requirements for the SDI

The DUT shall be able to handle the ECHONET frame as specified in 7.1.

In addition, the SDI common software in the DUT shall be able to

- a) run a self-test routine;
- b) receive a service of “property value read request” as specified in 7.1.9 which is initiated by the tester and response a service of “property value read response” as specified in 7.1.9;
- c) initiate a service of “property value notification” as specified in 7.1.9.

6 Tester software requirements

6.1 Reading the property diagnostic unit

6.1.1 General

The common application shall be able to retrieve from the SDI-compliant devices and display the information specified in 6.1.1 to 6.1.3.

6.1.2 General information (product identification)

The manufacturer code property, the place-of-business code property, the product code property and the serial number property shall be read from the DUT and displayed. These property data shall always be available as specified in 8.3. The tester shall display this information for all devices in the system.

NOTE The manufacturer code displayed might not be the same as the name on the physical device.

6.1.3 Diagnosis information

After start-up of the general information software, the diagnosis information shall be displayed.

7 Control protocol

7.1 Message structure (frame format)

The ECHONET specifications were designed to enable the use of various kinds of transmission media (for example, power line, low-power radiofrequency, ETHERNET, Bluetooth®). Slow transmission speeds discourage large data transfers, and it is desirable to reduce the mounting load on simple devices. In the light of this situation, ECHONET specifies the frame format for the ECHONET communication middleware block to minimize the message size while fulfilling the requirements of the communications layer structure.

7.1.1 Frame format

Figure 1 shows the content of the ECHONET communication middleware frame format. Detailed specifications for each message component will be provided in the following subclauses.

7.1.1.1 Message configuration for exchange between ECHONET communications processing blocks

In the ECHONET communication middleware specifications, messages exchanged between ECHONET communications processing blocks are called ECHONET frames. ECHONET frames are roughly divided into two types depending on the specified EHD: the secure message format, of which the EDATA section is enciphered, and the plain message format, of which the EDATA section is not enciphered. The secure message format and the plain message format are subdivided into three formats depending on the specified EHD (see Table 2). Therefore, the following six different message formats are available for ECHONET frames.

a) Plain basic message format

Insecure communication is performed so that one message is used to view or change the contents of one property.

b) Plain compound message format

Insecure communication is performed so that one message is used to view or change the contents of two or more properties.

c) Plain arbitrary message format

Insecure communication is performed so as to exchange information that complies with vendor-unique specifications.

d) Secure basic message format

Secure communication is performed so that one message is used to view or change the contents of one property.

e) Secure compound message format

Secure communication is performed so that one message is used to view or change the contents of two or more properties.

f) Secure arbitrary message format

Secure communication is performed so as to exchange information that complies with vendor-unique specifications.

Figure 1 shows the ECHONET frame structure for the plain message format.

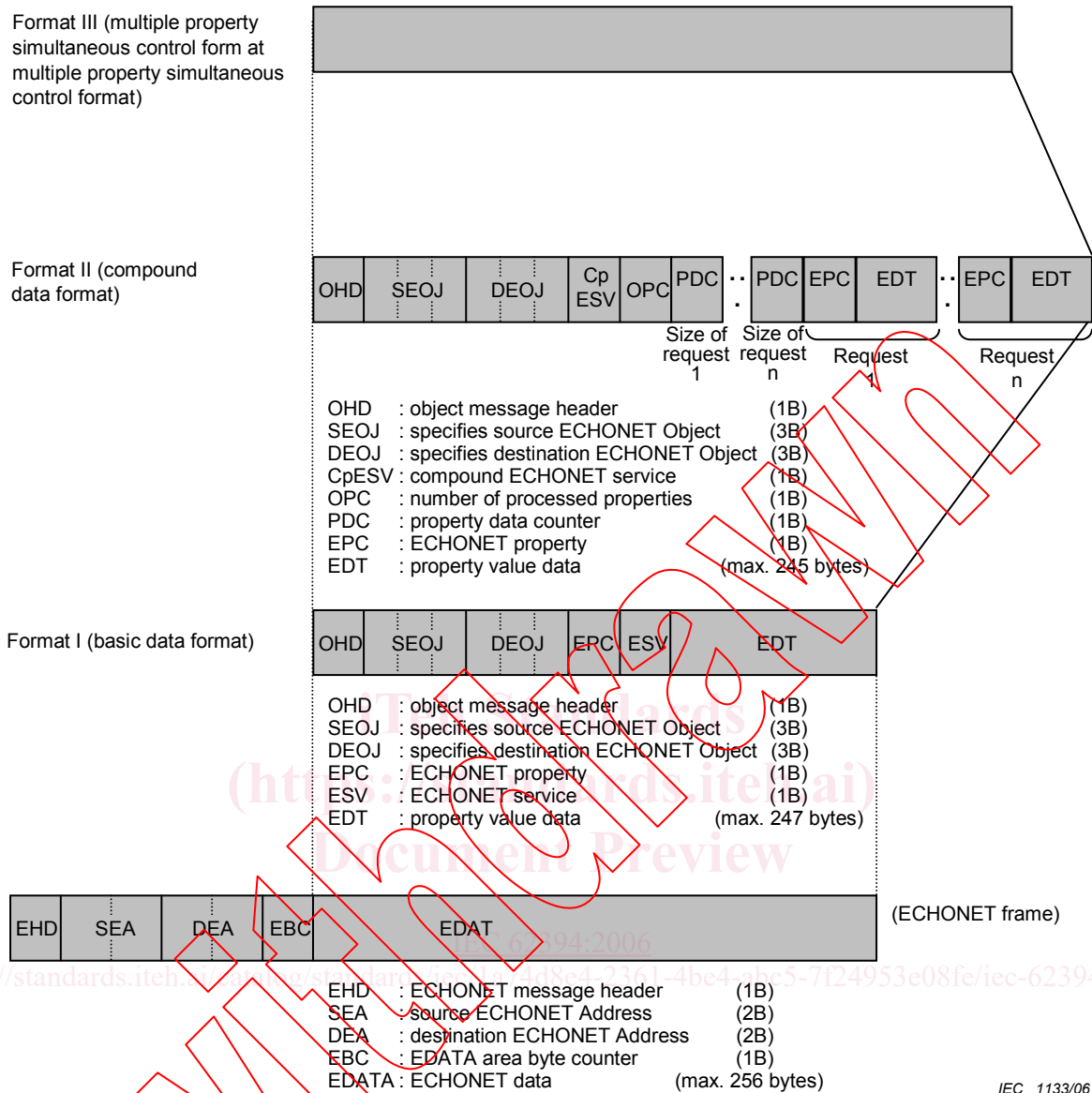


Figure 1 – ECHONET frame for plain data format

7.1.2 ECHONET headers (EHD)

This subclause provides detailed specifications for the ECHONET header (EHD) shown in Figures 1 and 2.