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

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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

FOREWORD

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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;
- withdrawn;
- replaced by a revised edition, or
- amended.

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

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.

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 roperty;

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.

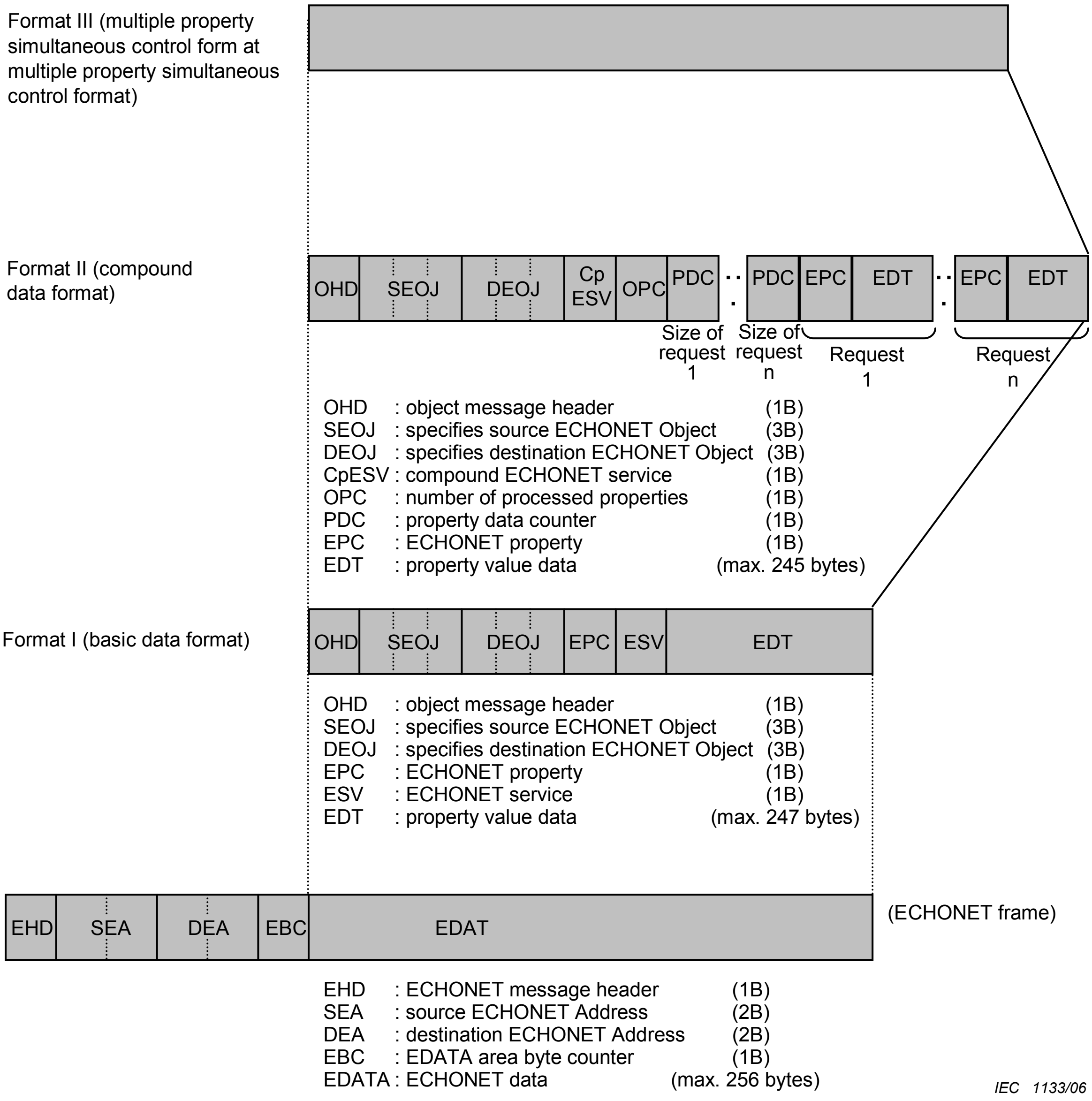
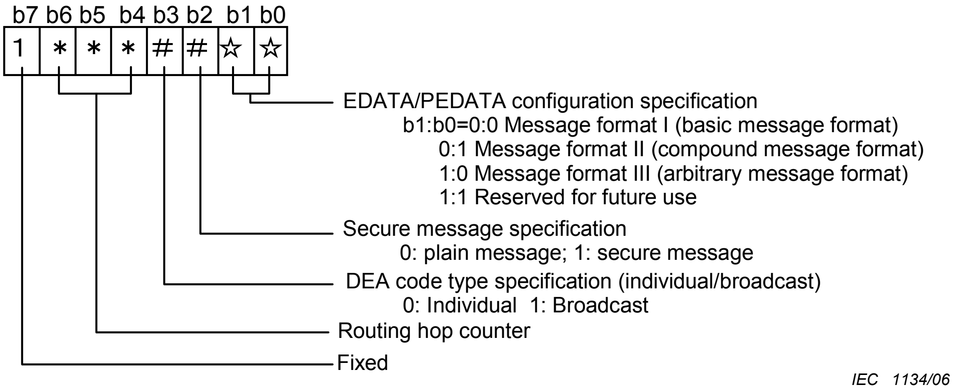

Format III (multiple property simultaneous control form at multiple property simultaneous control format)
Format II (compound data format)
OHD
SEOJ
DEOJ
Cp ESV
OPC
PDC
PDC
EPC
EDT
EPC
EDT
Size of request 1
Size of request n
Request 1
Request n
OHD : object message header (1B)
SEOJ : specifies source ECHONET Object (3B)
DEOJ : specifies destination ECHONET Object (3B)
CpESV : compound ECHONET service (1B)
OPC : number of processed properties (1B)
PDC : property data counter (1B)
EPC : ECHONET property (1B)
EDT : property value data (max. 245 bytes)
Format I (basic data format)
OHD
SEOJ
DEOJ
EPC
ESV
EDT
OHD : object message header (1B)
SEOJ : specifies source ECHONET Object (3B)
DEOJ : specifies destination ECHONET Object (3B)
EPC : ECHONET property (1B)
ESV : ECHONET service (1B)
EDT : property value data (max. 247 bytes)
EHD
SEA
DEA
EBC
EDAT
(ECHONET frame)
EHD : ECHONET message header (1B)
SEA : source ECHONET Address (2B)
DEA : destination ECHONET Address (2B)
EBC : EDATA area byte counter (1B)
EDATA : ECHONET data (max. 256 bytes)
IEC 1133/06

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.



EDATA/PEDATA configuration specification
b1:b0=0:0 Message format I (basic message format)
0:1 Message format II (compound message format)
1:0 Message format III (arbitrary message format)
1:1 Reserved for future use

Secure message specification
0: plain message; 1: secure message

DEA code type specification (individual/broadcast)
0: Individual 1: Broadcast

Routing hop counter

Fixed

IEC 1134/06

NOTE When b7=0, b0 to b6 will be specified separately (reserved for future use).

Figure 2 – EHD detailed specifications

The combination of b1 and b0 specifies the message format for EDATA/PEDATA. When b1:b0 = 0:0, it indicates Message Format I (basic message format), which allows one message to operate on one property of one object. When b1:b0 = 0:1, it indicates Message Format II (compound message format), which allows one message to operate on two or more properties of one object. When b1:b0 = 1:0, it indicates Message Format III (arbitrary message format), of which EDATA/PEDATA section is in an arbitrary format.

Bit b2 indicates whether the EDATA section is enciphered or not. When b2 = 1, it means that the EDATA section is enciphered. When b2 = 0, it means that the EDATA section is not enciphered. Detailed information about enciphered and other secure messages is set forth in Clause 10.

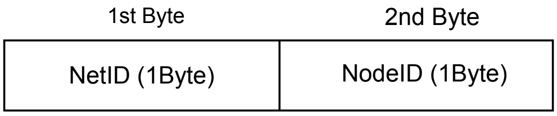
Bit b3 specifies whether the DEA (destination ECHONET address) shown in Figures 3 and 4 is a broadcast address or an individual address. When b3 = 1, it indicates that a broadcast address is stipulated by the DEA code. When b3 = 0, it indicates that an individual address is stipulated by the DEA code. Broadcast address codes are discussed in 7.1.3.

Bits b4, b5, and b6 constitute a routing hop counter, which can be manipulated only by ECHONET routers. When a message received at one subnet of an ECHONET router is forwarded to another subnet, the counter is incremented. For every transmission from an ordinary node, a hop count of 0 is used. The relationship between b4, b5, and b6 and the hop count is shown in the table below. The number of hops can be set to a value between 0 and 7.

b6	b5	b4	Hop count (router passes)
0	0	0	0
0	0	1	1
0	1	0	2
0	1	1	3
1	0	0	4
1	0	1	5
1	1	0	6
1	1	1	7

7.1.3 Source/Destination ECHONET address (SEA/DEA)

This subclause provides detailed specifications for the source ECHONET address (SEA) and destination ECHONET address (DEA) shown in Figure 3. Figure 4 shows the configuration of the source ECHONET address (SEA) and the destination ECHONET address (DEA) prevailing when an individual address is stipulated by setting b3 of EHD to 0.

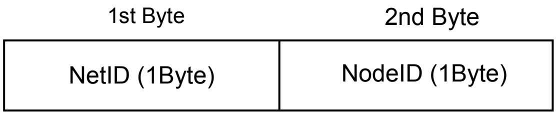


1st Byte	2nd Byte
NetID (1Byte)	NodeID (1Byte)

IEC 1135/06

Figure 3 – Configuration of SEA and DEA when an individual address is specified

When b3 of EHD is set to 1 to specify a broadcast, the destination ECHONET address (DEA) becomes a code indicating a broadcast message for a specific ECHONET address group (including a general broadcast). The DEA configuration in this case is shown in Figure 4. The broadcast target stipulation code is shown in Figures 5 and 6.



1st Byte	2nd Byte
NetID (1Byte)	NodeID (1Byte)

Broadcast type stipulation code	Broadcast target stipulation code	Remarks
0x00	Specifies the node groups to be targeted for a broadcast within all subnets. For node group selection, see Figure 5	An intra-domain broadcast. In all subnets within a domain, a broadcast is sent to the nodes stipulated by the broadcast target stipulation code
0x01	Specifies the node groups to be targeted for a broadcast within its own subnet. For node group selection, see Figure 5	An intra-own-subnet broadcast. In the own subnet, a broadcast is sent to the nodes stipulated by the broadcast target stipulation code
0x02	All nodes within the subnet having the Net ID code stipulated by the "broadcast target stipulation code" are targeted	A general broadcast within a specified subnet. A broadcast is sent to all nodes within the subnet stipulated by the broadcast target stipulation code
0x03～0x7F	Reserved for future use	
0x80～0xFF	Open to user	Used when a system manager will manage the system in a collective housing unit or small office building

IEC 1136/06

Figure 4 – DEA (broadcast-stipulated) address configuration

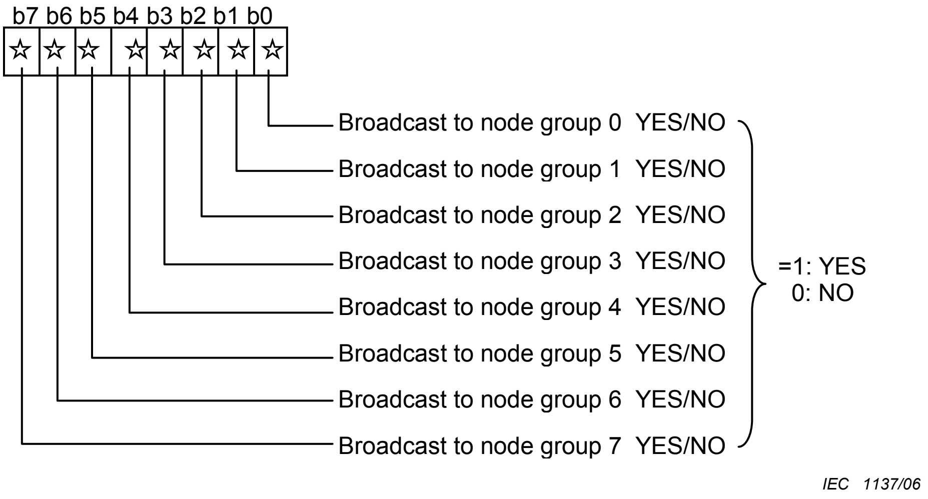

b7 b6 b5 b4 b3 b2 b1 b0
☆ ☆ ☆ ☆ ☆ ☆ ☆ ☆
Broadcast to node group 0 YES/NO
Broadcast to node group 1 YES/NO
Broadcast to node group 2 YES/NO
Broadcast to node group 3 YES/NO
Broadcast to node group 4 YES/NO
Broadcast to node group 5 YES/NO
Broadcast to node group 6 YES/NO
Broadcast to node group 7 YES/NO
=1: YES
0: NO
IEC 1137/06

Figure 5 – Broadcast target stipulation code

	0	8	4	C	2	A	6	E	1	9	5	D	3	B	7	F	
0																	Group 0
8																	
4																	Group 1
C																	
2																	Group 2
A																	
6																	Group 3
E																	
1																	Group 4
9																	
5																	Group 5
D																	
3																	Group 6
B																	
7																	Group 7
F																	

IEC 1138/06

Figure 6 – Node group stipulation bit specifications

7.1.4 ECHONET byte counter (EBC)

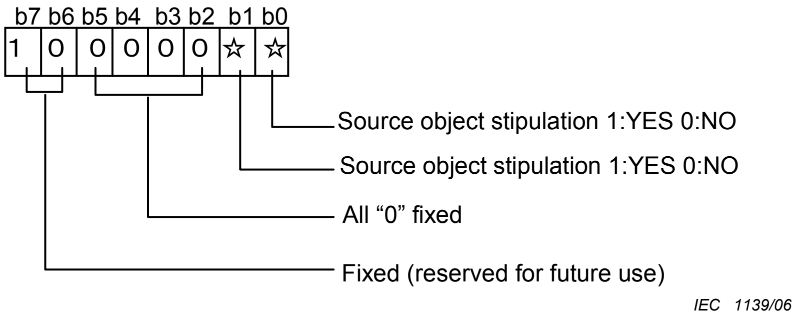
EBC Indicates the size of the ECHONET data region (EDATA region) shown in Figure 1. The size is variable in 1-byte increments. The acceptable EDATA region size ranges from 6 to 256 bytes (0x06 to 0xFF; 0x00 = 256). The lower limit is 6 bytes, which indicates that a message consists of at least 6 bytes. The reason is that either the SEOJ or the DEOJ needs to be specified with the EPC to ESV options specified for a plain message. A 6-byte message can be a message requesting an ESV with the DEOJ specified or a message carrying a "response of processing impossible" for ESV with the SEOJ specified.

7.1.5 ECHONET data (EDATA)

The DATA region for messages exchanged by the ECHONET communication middleware. Maximum size: 256 bytes.

7.1.6 Object message header (OHD)

This subclause provides detailed specifications for the object message header (OHD) shown in Figure 1. The state in which b1 and b0 are both 0 will never occur.


b7 b6 b5 b4 b3 b2 b1 b0
1 0 0 0 0 0 ☆ ☆
Source object stipulation 1:YES 0:NO
Source object stipulation 1:YES 0:NO
All "0" fixed
Fixed (reserved for future use)
IEC 1139/06

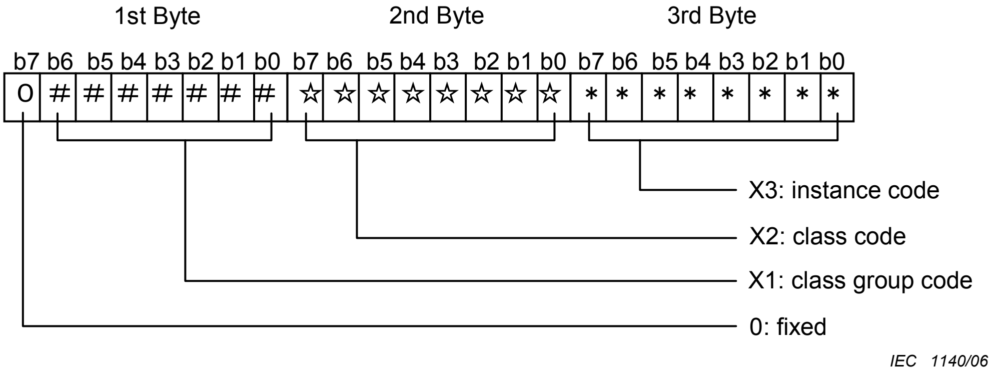
NOTE When b6 and b7 have values other than b6 = 0 and b7 = 1, b0 to b5 will have different meanings.

The meanings of bits b0 to b5 when b6 and b7 have values other than b6 = 0 and b7 =1 will be stipulated in the future (reserved for future use).

Figure 7 – OHD detailed specifications

7.1.7 ECHONET objects (EOJ)

This subclause provides detailed specifications for the source ECHONET object (SEOJ) code and destination ECHONET object (DEOJ) code shown in Figure 1.



NOTE The meanings of the bits when b7 of the 1st byte is 1 will be stipulated in the future (reserved for future use).

Figure 8 – EOJ detailed specifications

ECHONET objects are described using the format [X1.X2] and [X3], with these formats to be specified as shown below. (However, "." is used only for descriptive purposes and does not mean a specific code.) The object class is designated by the combination of X1 and X2, while X3 shows the class instance. A single ECHONET node may contain more than one instance of the same class, in which case X3 is used to identify each one.

The specific items in Table 1 were specified on the basis of JEM 1439 (see Clause 9). Detailed specifications for the objects shown here will be developed over time and, during this phase, specifications for the objects themselves (i.e., present/not present) will be further reviewed.

The instance code 0x00 is regarded as a special code (code for specifying all instances). When a DEOJ for which this code is specified is received, it is handled as a code specifying a broadcast to all instances of a specified class.

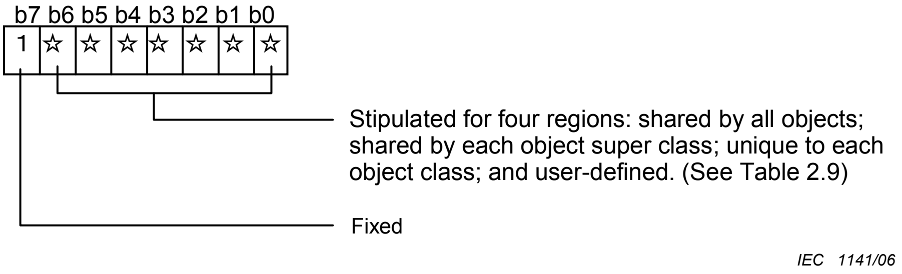
- X1 : class group code 0x00-0x7F. For details, refer to Table 1.
- X2 : class code 0x00-0xFF. For detailed examples, refer to Tables 2 to 8.
- X3 : instance code 0x00-0xFF.
  The identifier code is used when more than one of the same class specified by [X1.X2] exists within the same node. However, 0x00 is used as a general broadcast to all instances of class specified with [X1.X2].

Table 1 – List of class group codes

Class group code	Group name	Remarks
0x00	Sensor-related device class group	
0x01	Air conditioner-related device class group	
0x02	Housing/facility-related device class group	Includes lighting
0x03	Cooking/housework-related device class group	
0x04	Health-related device class group	
0x05	Management/control-related device class group	
0x06	AV-related device class group	
0x07～0x0C	Reserved for future use	
0x0D	Service class group	
0x0E	Profile class group	
0x0F	User definition class group	
0x10～0x1F	Communications definition class group for stipulation of status notification method	
0x20～0x2F	Communications definition class group for stipulation of setting control reception method	
0x30～0x3F	Communications definition class group for linked settings (action settings)	
0x40～0x4F	Communications definition class group for linked settings (trigger settings)	
0x50～0x5F	Secure communication access property set-up class	
0x60～0x7F	Reserved for future use	

7.1.8 ECHONET property (EPC)

This subclause provides detailed specifications for the ECHONET property (EPC) code shown in Figure 1. The EPC specifies a service target function. Each object stipulated by X1 (class group code) and X2 (class code), described in 7.1.7, is specified here. (When a specified object changes, the target function also changes even when the code remains unchanged. However, the detailed specifications are designed to ensure that, whenever possible, the same functions will have the same code.) Specific code values for each object are stipulated in 8.3. These codes correspond to the object property identifiers in the object definitions.

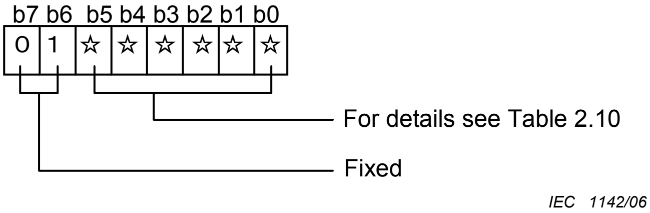

b7 b6 b5 b4 b3 b2 b1 b0
1 ☆ ☆ ☆ ☆ ☆ ☆ ☆
Stipulated for four regions: shared by all objects; shared by each object super class; unique to each object class; and user-defined. (See Table 2.9)
Fixed
IEC 1141/06

NOTE When b7 = 0, the other bits will be defined differently.

Figure 9 – EPC detailed specifications

7.1.9 ECHONET service (ESV)

This subclause provides detailed specifications for the ECHONET service (ESV) code shown in Figure 1.



NOTE In cases other than when b7:b6 = 0:1, the meaning of values b0 – b5 will be specified separately.

Figure 10 – ESV detailed specifications

This code stipulates manipulation of the properties stipulated by EPC. The three main kinds of operations are shown below. There are also two kinds of responses: the “response,” which is given when the stipulated properties exist; and the “response not possible,” which is given when the requested properties (including array elements) do not exist or when the stipulated service cannot be processed.

“Request”/“Response” (response/response not possible)/“Notification”

A “response” is considered to be a reply to a “request” that requires a response; when the object stipulated in the DEOJ exists, as a rule it is either “response” or “response not possible” (stipulated processing cannot be accepted, or the stipulated object exists but the property does not). When the request requires no response and the stipulated object does not exist, no response is made.

There are two types of "notification": one for transmitting the own-property information autonomously and the other for sending a response to a notification request. However, these two types have the same code.

Three specific operations are provided: write (response required/no response required), read, and notification (notification/notification with response required). The 12 operations shown below are set in consideration of whether or not the content of the given property is an array.

a) Property value write (response required/no response required)

b) Property value read

c) Property value notification

d) Property value array-element-stipulated write (response required/no response required)

e) Property value array-element-stipulated read

f) Property value array-element-stipulated notification

g) Property value array-element-stipulated addition (response required/no response required)

h) Property value array-element-stipulated deletion (response required/no response required)

i) Property value array-element-stipulated existence confirmation

j) Property value array element addition (response required/no response required)

k) Property value notification (response required)

l) Property value array-element-stipulated notification (response required)

The relationship between the message configuration (presence or absence of SEOJ and DEOJ) and EPC and ESV is described below.

- The EPC in an ECHONET message stipulating only SEOJ indicates the properties of the sender object specified in SEOJ. Here, ESV contains an autonomous “notification” or “notification” or “response” in response to a request for properties specified in SEOJ and EPC. If ESV is a “request” in such a case, the received message is treated as an illegal message.
- The EPC in an ECHONET message stipulating only DEOJ indicates the properties of the destination object specified in DEOJ. Here, ESV contains a “request” regarding the properties specified in DEOJ and EPC. If ESV is a “response” or a “notification” in such a case, the received message is treated as an illegal message.
- For ECHONET messages stipulating both SEOJ and DEOJ, the ESV value is used to determine whether the EPC is stipulated by the SEOJ or the DEOJ. When the ESV is a “response” or a “notification”, the EPC is considered to be a component of the object specified by SEOJ and is viewed as a “response” or “notification” directed towards the object stipulated in the DEOJ. When the ESV is a “request,” the EPC is considered to be a component of the DEOJ and is viewed as a “request” from the object stipulated in the SEOJ.

Tables 1 through 3 show specific ESV code assignments based on the content described above. Specific descriptions of a) through l) above are provided in (1) through (12) of the remarks column in the relevant table. In the figures given in (1) through (12), the DEOJ for "requests" is shown as an individually stipulated code. However, when the DEOJ indicates a broadcast to all instances of a specified class (when the DEOJ's X3 = 0x00), a response is transmitted with both "process-not-possible" response and "response" configured for each target instance. Note that in the table, the “array elements” described above are presented as “elements.”

Table 2 – List of ESV codes for requests

Service code (ESV)	ECHONET service content	Symbol	Remarks
0x60	Property value write request (no response required)	SetI	(1)
0x61	Property value write request (response required)	SetC	
0x62	Property value read request	Get	(2)
0x63	Property value notify request	INF_REQ	(3)
0x64	Property value element-stipulated write request (no response required)	SetMI	(4)
0x65	Property value element-stipulated write request (response required)	SetMC	
0x66	Property value element-stipulated read request	GetM	(5)
0x67	Property value element-stipulated notify request	INFM_REQ	(6)
0x68	Property value element-stipulated add request (no response required)	AddMI	(7)
0x69	Property value element-stipulated add request (response required)	AddMC	
0x6A	Property value element-stipulated delete request (no response required)	DelMI	(8)
0x6B	Property value element-stipulated delete request (response required)	DelMC	
0x6C	Property value element existence confirm request	CheckM	(9)
0x6D	Property value element add request (no response required)	AddMSI	(10)
0x6E	Property value element add request (response required)	AddMSC	
0x6F	Reserved for future use		

Table 3 – List of ESV codes for response/notification

Service code (ESV)	ECHONET service content	Symbol	Remarks
0x71	Property value write response	Set_Res	ESV=0x61 response (1)
0x72	Property value read response	Get_Res	ESV=0x62 response (2)
0x73	Property value notification	INF	*1 (3)
0x74	Property value notification (response required)	INFC	(11)
0x75	Property value element-stipulated write response	SetM_Res	ESV=0x65 response (4)
0x76	Property value element-stipulated read response	GetM_Res	ESV=0x66 response (5)
0x77	Property value element-stipulated notify	INFM	*2 (6)
0x78	Property value element-stipulated notify (response required)	INFMC	(12)
0x79	Property value element-stipulated add response	AddM_Res	ESV=0x69 response (7)
0x7A	Property value notify response	INFC_Res	ESV=0x74 response (11)
0x7B	Property value element-stipulated delete response	DelM_Res	ESV=0x6B response (8)
0x7C	Property value element-stipulated existence confirm response	CheckM_Res	ESV=0x6C response (9)
0x7D	Property value element-stipulated notify response	INFMC_Res	ESV=0x78 response (12)
0x7E	Property value element add response	AddMS_Res	ESV=0x6E response (10)
0x70, 0x7F	Reserved for future use		

NOTE 1 Used for autonomous property value notification and for 0x63 response.

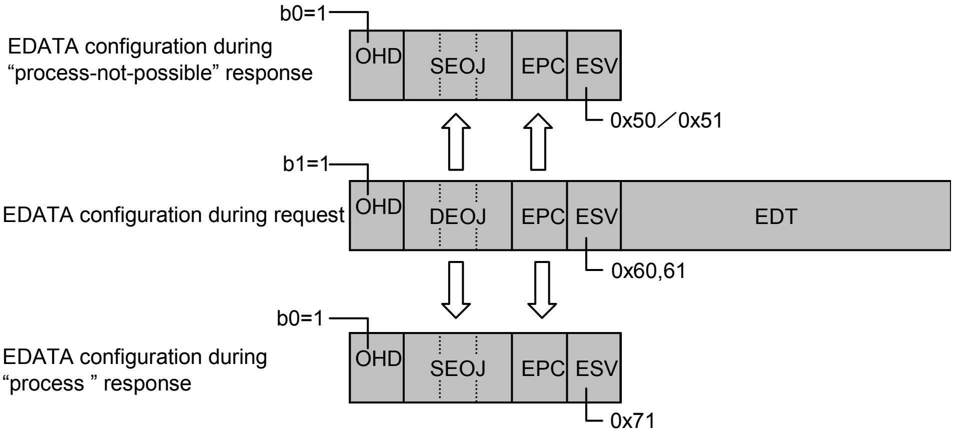
NOTE 2 Used for autonomous property value notification and for 0x67 response.

Table 4 – List of ESV codes for “response-not-possible” responses

Service code (ESV)	ECHONET service content	Symbol	Remarks
0x50	Property value write “process-not-possible” response	SetI_SNA	ESV=0x60 response not possible (1)
0x51	Property value write “process-not-possible” response	SetC_SNA	ESV=0x61 response not possible (1)
0x52	Property value read “process-not-possible” response	Get_SNA	ESV=0x62 response not possible (2)
0x53	Property value notify “process-not-possible” response	INF_SNA	ESV=0x63 response not possible (3)
0x54	Property value element-stipulated write request “process-not-possible” response	SetMI_SNA	ESV=0x64 response not possible (4)
0x55	Property value element-stipulated write request “process-not-possible” response	SetMC_SNA	ESV=0x65 response not possible (4)
0x56	Property value element-stipulated read request “process-not-possible” response	GetM_SNA	ESV=0x66 response not possible (5)
0x57	Property value element-stipulated notify request “process-not-possible” response	INFM_SNA	ESV=0x67 response not possible (6)
0x58	Property value element-stipulated add request “process-not-possible” response	AddMI_SNA	ESV=0x68 response not possible (7)
0x59	Property value element-stipulated add request “process-not-possible” response	AddMC_SNA	ESV=0x69 response not possible (7)
0x5A	Property value element-stipulated delete request “process-not-possible” response	DelMI_SNA	ESV=0x6A response not possible (8)
0x5B	Property value element-stipulated delete request “process-not-possible” response	DelMC_SNA	ESV=0x6A response not possible (8)
0x5C	Property value element-stipulated existence confirm request “process-not-possible” response	CheckM_SNA	ESV=0x6C response not possible (9)
0x5D	Property value element add request “process- not-possible” response	AddMSI_SNA	ESV=0x6D response not possible (10)
0x5E	Property value element add request “process- not-possible” response	AddMSC_SNA	ESV=0x6E response not possible (10)
0x5F	Reserved for future use		

a) Property value write service [0x60,0x61,0x71,0x50,0x51]

In the case of a “request” (0x60,0x61), this indicates a request to write the content shown in EDT to the property stipulated in the EPC of the object stipulated in DEOJ. In response to this “request,” when a value indicating a response is stipulated (0x61) and the request is to be (or has already been) received, “response” (0x71) is returned. This “response” is not a processing implementation response. When the request is not to be received, or when the stipulated DEOJ exists but the stipulated EPC does not exist, “response not possible” (0x50,0x51) is returned. In the response frame format, SEOJ represents the value of the object stipulated by the request, and the relevant property is set in EPC. When the relevant object itself does not exist, neither “response” nor “response not possible” is returned. Also, the “response” message DEA is defined as the requesting entity (i.e., the request message SEA).

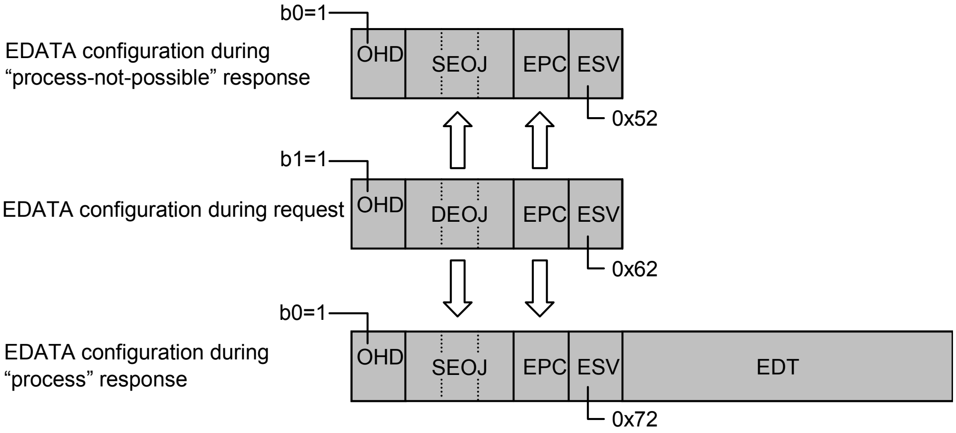

b0=1
EDATA configuration during "process-not-possible" response
OHD
SEOJ
EPC
ESV
0x50／0x51
b1=1
EDATA configuration during request
OHD
DEOJ
EPC
ESV
EDT
0x60,61
b0=1
EDATA configuration during "process " response
OHD
SEOJ
EPC
ESV
0x71

IEC 1143/06

When EDATA stipulates SEOJ during a "request," the EOJ stipulated by SEOJ in EDATA during the "request" is allocated as a DEOJ (b1 of OHD is also set to 1), in the case of both "response not possible" and "response."

b) Property value read service [0x62,0x72,0x52]

In the case of a "read" (0x62), this indicates a request to read the content of the property stipulated in the EPC of the object stipulated in the DEOJ. In response to this "read," when the request is to be (or has already been) accepted, "response" (0x72) is returned. When the request is not to be accepted, or when the stipulated DEOJ exists but the stipulated EPC does not exist, "response not possible" (0x52) is returned. In the response frame format, the value of the object stipulated by the request is set in SEOJ, the requested property is set in EPC, and the value of the requested property (i.e., the read content) is set in EDT. When "response not possible" is returned, nothing is written to the EDT. When the relevant object itself does not exist, neither "response" nor "response not possible" is returned. Also, the "response" message DEA is defined as the requesting entity (i.e., the request message SEA).


b0=1
EDATA configuration during "process-not-possible" response
OHD
SEOJ
EPC
ESV
0x52
b1=1
EDATA configuration during request
OHD
DEOJ
EPC
ESV
0x62
b0=1
EDATA configuration during "process" response
OHD
SEOJ
EPC
ESV
EDT
0x72

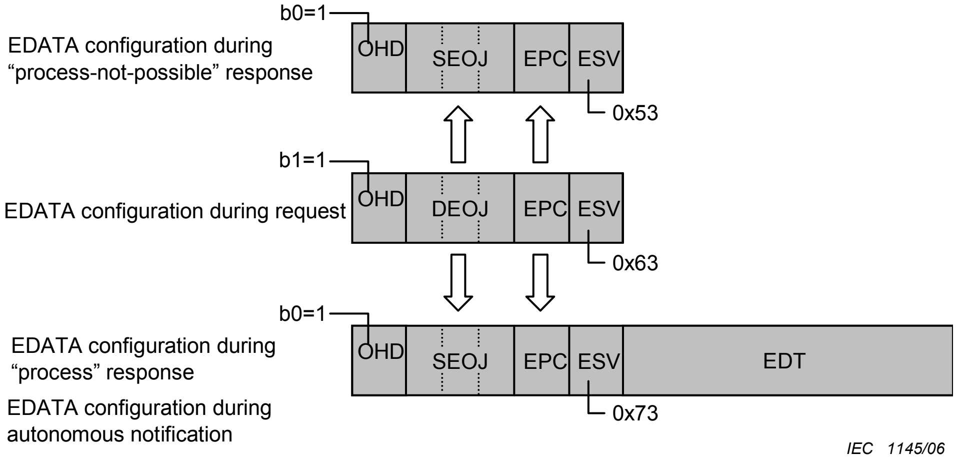
IEC 1144/06

When EDATA stipulates SEOJ during a "request," the EOJ stipulated by SEOJ in EDATA during the "request" is allocated as a DEOJ (b1 of OHD is also set to 1), in the case of both "response not possible" and "response."

c) Property value notification service [0x63,0x73,0x53]

There are two types of "notification": the notification sent as a response to a "notify request" (0x63) and the autonomous notification which is unrelated to notify requests. The codes for the two types are identical. (Here, notification in response to a "notify request" signifies an announcement that does not specify the property value [content], while an autonomous notification is a voluntary announcement that was not made in response to a request.) In the case of a "notify request" (0x63), this indicates a request to notify (by general broadcast;

hereafter “announce” will signify a general broadcast to the entire domain) the content of the property stipulated in the EPC of the object stipulated in the DEOJ. In response to this “notify request,” when the request was accepted, a “response” (0x73) value is notified; when the request is not to be accepted, a “response not possible” response (0x53) value is returned. In the response frame format, the value of the object stipulated by the request is set in SEOJ, the requested property is set in EPC, and the value of the requested property (i.e., the notification content) is set in EDT. Here, DEA is set to general broadcast, but when “response not possible” is returned, nothing is written to the EDT, and the DEA sets the EA value of the requester. When the relevant object itself does not exist, neither “response” nor “response not possible” is returned. In the case of an autonomous "notification", the DEA is set to a general broadcast for a required status change notification. In the other cases, however, the DEA can be set as desired regardless of whether "broadcast" or "individual" is selected.


b0=1
EDATA configuration during
“process-not-possible” response
OHD
SEOJ
EPC
ESV
0x53
b1=1
EDATA configuration during request
OHD
DEOJ
EPC
ESV
0x63
b0=1
EDATA configuration during
“process” response
EDATA configuration during
autonomous notification
OHD
SEOJ
EPC
ESV
EDT
0x73

IEC 1145/06

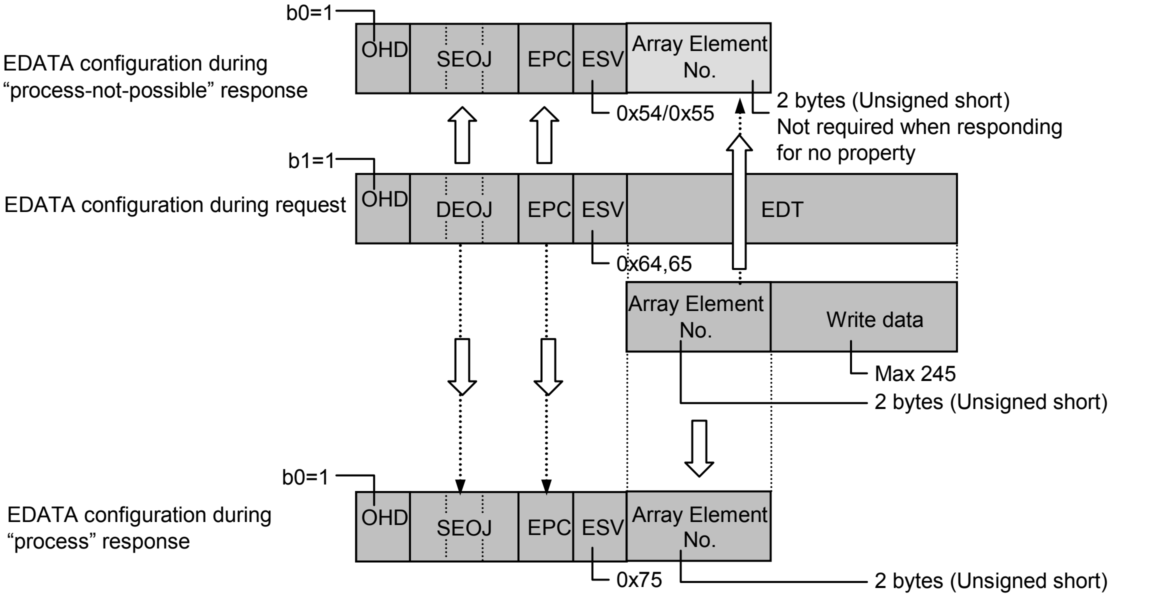
When EDATA stipulates SEOJ during a request, the EOJ stipulated by SEOJ in EDATA during the “request” is allocated as a DEOJ. In the case of both “response not possible” and “process,” the EOJ stipulated in the SEOJ in the EDATA during “request” is allocated as a DEOJ within the EDATA (b1 of OHD is also set to 1). In the case of autonomous notification, the required notification of status change does not add a DEOJ; in all other cases, the addition of a DEOJ is optional.

d) Property value element-stipulated write service [0x64,0x65,0x75,0x54,0x55]

In the case of a “request” (0x64, 0x65), this indicates a request to write the value stipulated in the EDT (includes array element number and write request value data) of the property stipulated in the EPC of the object stipulated in the DEOJ. In response to this “request,” when a value to process the response is stipulated, and when the request is to be (or has already been) accepted, a “response” (0x75) is returned. However, this “response” is not a processing implementation response. When the request is not to be accepted, or when the stipulated DEOJ exists but the stipulated EPC does not exist, and when the stipulated DEOJ and EPC exist but the array element does not, “response not possible” (0x54, 0x55) is returned.

In the frame format for response, the value of the object stipulated by the request is SEOJ, and the relevant property is set in EPC. When the relevant object itself does not exist, neither “response” nor “response not possible” is returned.. Also, the “response” message DEA is defined as the requesting entity (i.e., the request message SEA).

When the request is not to be accepted, or when the stipulated DEOJ exists but the stipulated EPC does not exist, the EDT of “response not possible” is the array element number of a “request” and when the stipulated DEOJ exists but the stipulated EPC does not exist, the EDT of “response not possible” does not exit.

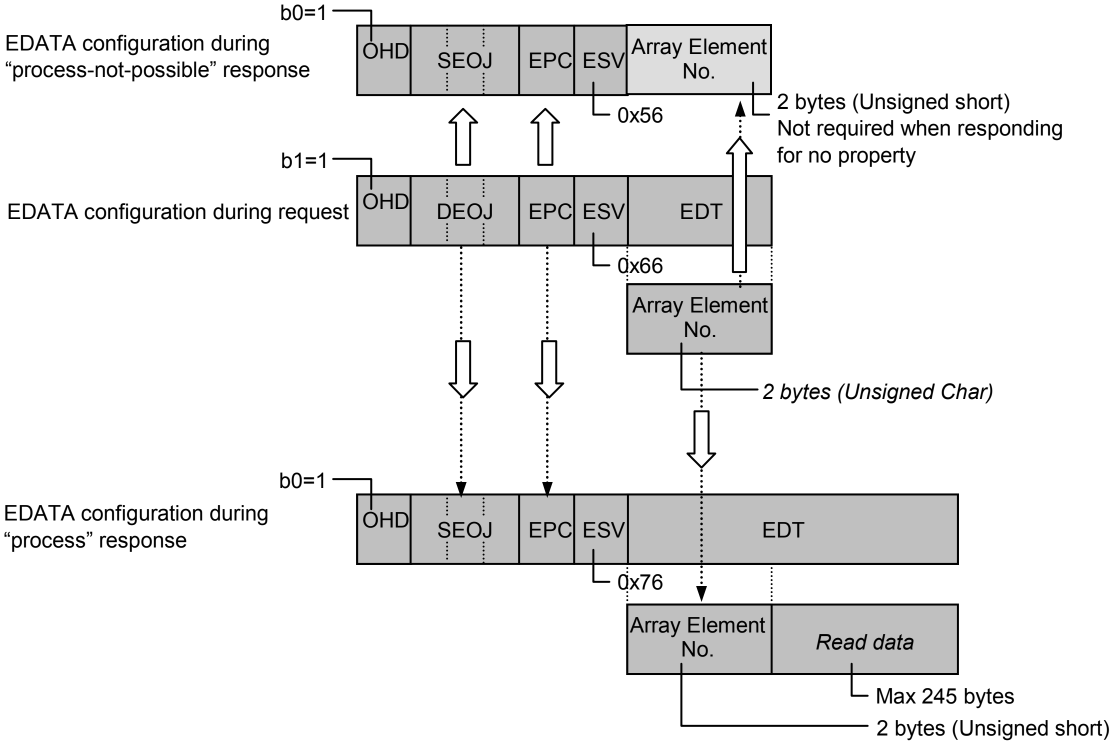

b0=1
EDATA configuration during "process-not-possible" response
OHD
SEOJ
EPC
ESV
Array Element No.
0x54/0x55
2 bytes (Unsigned short) Not required when responding for no property
b1=1
EDATA configuration during request
OHD
DEOJ
EPC
ESV
EDT
0x64,65
Array Element No.
Write data
Max 245
2 bytes (Unsigned short)
b0=1
EDATA configuration during "process" response
OHD
SEOJ
EPC
ESV
Array Element No.
0x75
2 bytes (Unsigned short)

IEC 1146/06

The content of each array element number in an array format property is defined separately for each property. When the stipulated (array) element does not exist, "response not possible" is returned. Also, when the EDATA stipulates SEOJ during a "request," the EOJ stipulated in SEOJ by EDATA during the "request" is allocated as a DEOJ within EDATA (b1 of OHD is also set to 1) in the case of both "response not possible" and "response."

e) Property value element-stipulated read service [0x66,0x76,0x56]

In the case of a "read" (0x66), this indicates a request to read the content stipulated in the array element indicated in the EDT (includes array element number data to be read) of the property stipulated in the EPC of the object stipulated in the DEOJ. In response to this "read," when the request is to be (or has already been) accepted, "response" (0x76) is returned. When the request is not to be accepted, or when the stipulated DEOJ exists but the stipulated EPC does not, and when the stipulated DEOJ and EPC exist but the array element does not, "response not possible" (0x56) is returned. In the frame format for response, the value of the object stipulated by the request is set in SEOJ, and the relevant property is set in EPC and the value of the relevant property (data to be read) is set in EDT. In the case of "response not possible", when the request is not to be accepted, or when the stipulated DEOJ exists but the stipulated EPC does not exist, EDT of "response not possible" is the array element number of a "request" and when the stipulated DEOJ exists but the stipulated EPC does not exist, "response not possible" EDT of "response not possible" does not exit. When the relevant object itself does not exist, neither "response" nor "response not possible" is returned. Also, the "response" message DEA is defined as the requesting entity (i.e., the request message SEA).



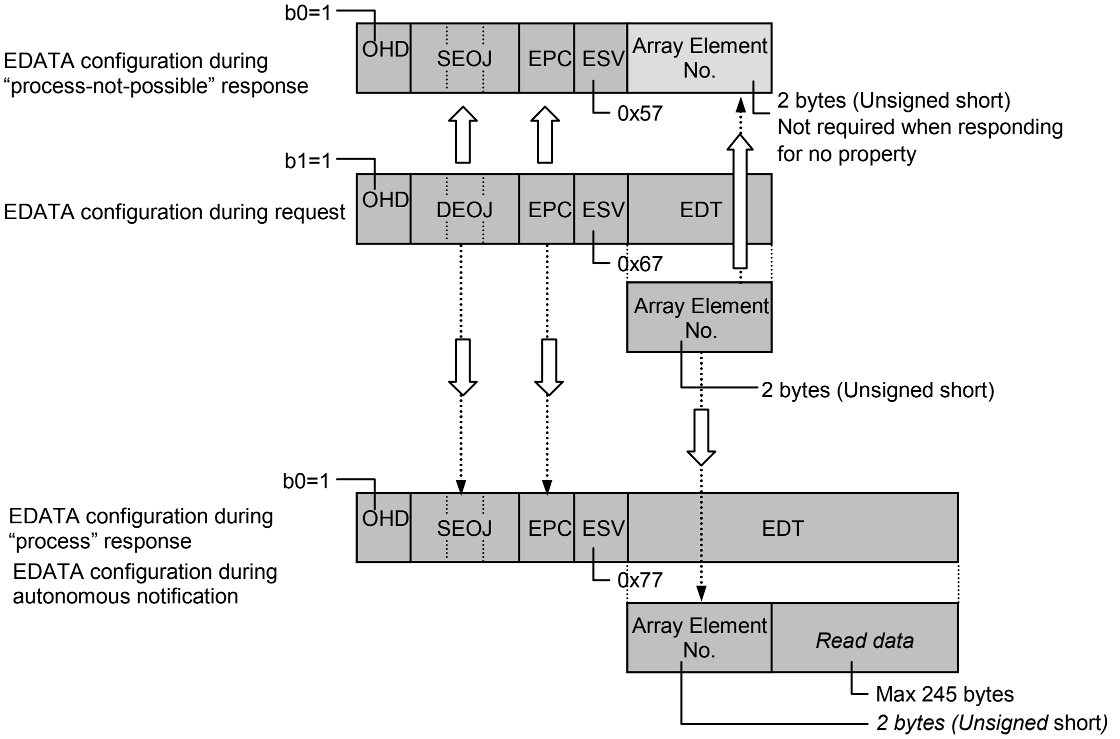
IEC 1147/06

The content of each array element number in an array format property is defined separately for each property. When the stipulated array element (element) does not exist, “response not possible” is returned. Also, when EDATA stipulates SEOJ during a “request,” the EOJ stipulated in the SEOJ by EDATA during the “request” is allocated as a DEOJ within the EDATA (b1 of OHD is also set to 1) in the case of both “response not possible” and “response.”

f) Property value element-stipulated notification service [0x67,0x77,0x57]

There are two types of “notification”: notification sent in response to a “notify request” (0x67); and autonomous notification, which is unrelated to notify requests. The two types are not distinguished from each other in the codes. (Here, notification in response to a “notify request” signifies an announcement that dos not specify the property value [content], while an autonomous notification is a voluntary announcement that was not made in response to a request from someone.) In the case of a “notify request” (0x67), this indicates a request to notify (announce) the content of the array element number stipulated in the EDT of the property stipulated in the EPC of the object stipulated in the DEOJ. In response to this “notify request,” when the request was accepted, an array element value (content) is announced as a “response” (0x77). When the request is not to be accepted, or when the stipulated DEOJ exists but the stipulated EPC does not, and when the stipulated DEOJ and EPC exist but the array element does not, “response not possible” (0x57) is returned. In the frame format for response, the value of the object stipulated by the request is set in SEOJ, the requested property is set in EPC, and the value of the requested array element number and its array element value (i.e., the notification content) is set in EDT. Here, DEA is set to general broadcast, but when “response not possible” is returned, and the DEA sets the EA value of the requester. When the relevant object itself does not exist, neither “response” nor “response not possible” is returned.

When the request is not to be accepted, or when the stipulated DEOJ exists but the stipulated EPC does not exist, EDT of “response not possible” is the array element number of a “request” and when the stipulated DEOJ exists but the stipulated EPC does not exist, the EDT of “response not possible” does not exit.


b0=1
EDATA configuration during "process-not-possible" response
OHD
SEOJ
EPC
ESV
Array Element No.
0x57
2 bytes (Unsigned short)
Not required when responding for no property
b1=1
EDATA configuration during request
OHD
DEOJ
EPC
ESV
EDT
0x67
Array Element No.
2 bytes (Unsigned short)
b0=1
EDATA configuration during "process" response
EDATA configuration during autonomous notification
OHD
SEOJ
EPC
ESV
EDT
0x77
Array Element No.
Read data
Max 245 bytes
2 bytes (Unsigned short)

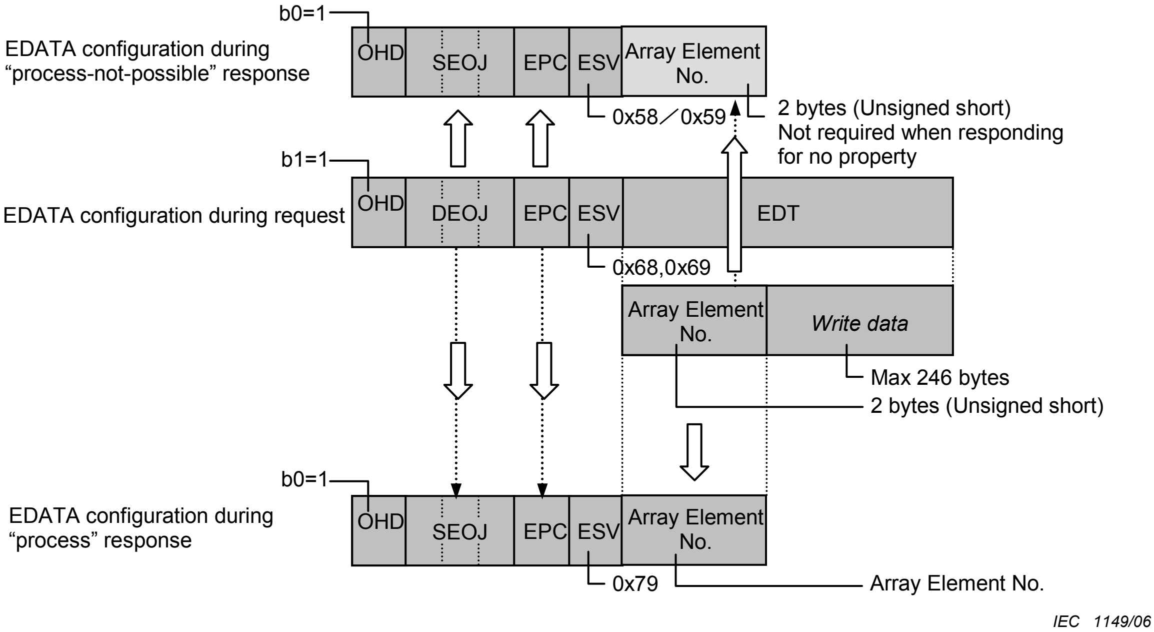
IEC 1148/06

The content of each array element number is defined separately for each property. When the stipulated (array) element does not exist, "response not possible" is returned. Also, when EDATA stipulates SEOJ during a "request," the EOJ stipulated in the SEOJ by EDATA during the "request" is allocated as a DEOJ within the EDATA (b1 of OHD is also set to 1) in the case of both "response not possible" and "response." In the case of autonomous notification, the required notification of status change does not add a DEOJ; in all other cases, the addition of a DEOJ is optional.

g) Property value element-stipulated addition [0x68,0x69,0x58,0x59,0x79]

In the case of a "request" (0x68, 0x69), this indicates a request to add the array element indicated in the EDT (includes array element number and write request value) of the property stipulated in the EPC of the object stipulated in the DEOJ, and to write the value stipulated therein. In response to this "request," when a value indicating implementation of the response (0x68) is stipulated, and when the request is to be (or has already been) accepted, a "response" (0x78) is returned. However, this "response" is not a processing implementation response. When the request is not to be accepted, or when the stipulated DEOJ exists but the stipulated EPC does not, and when the stipulated DEOJ and EPC exist but the array element does not, "response not possible" (0x58, 0x59) is returned. In the frame format for response, the value of the object stipulated by the request is set in SEOJ, and the requested property is set in EPC. When the relevant object itself does not exist, neither "response" nor "response not possible" is returned. Also, the "response" message DEA is defined as the requesting entity (i.e., the request message SEA).

When the request is not to be accepted, or when the stipulated DEOJ exists but the stipulated EPC does not exist, EDT of "response not possible" is the array element number of a "request" and when the stipulated DEOJ exists but the stipulated EPC does not exist, the EDT of "response not possible" does not exit.

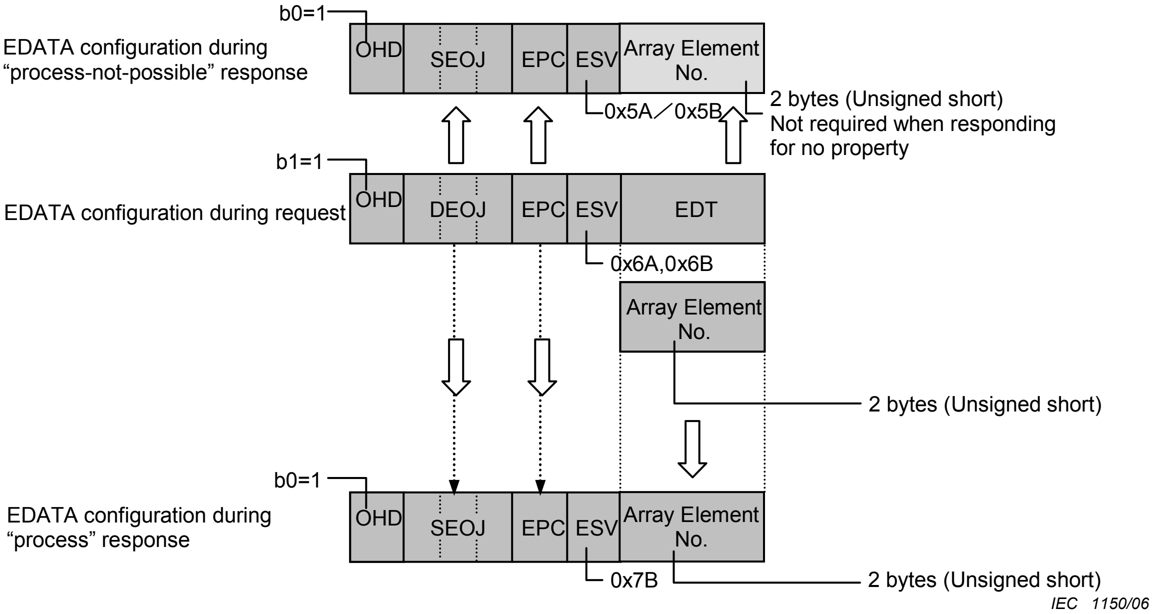


The content of each array element number in an array format property is defined separately for each property. When the stipulated array element (element) does not exist, "response not possible" is returned. Also, when EDATA stipulates SEOJ during a "request," the EOJ stipulated in the SEOJ by EDATA during the "request" is allocated as a DEOJ within the EDATA (b1 of OHD is also set to 1) in the case of both "response not possible" and "response."

h) Property value element-stipulated deletion [0x6A, 0x6B, 0x5A, 0x5B, 0x7B]

In the case of a "request" (0x6A, 0x6B), this indicates a request to delete the array element indicated in the EDT (array element number) from the property stipulated in the EPC of the object stipulated in the DEOJ. In response to this "request," when a value indicating implementation of the response (0x6B) is stipulated, and when the request is to be (or has already been) accepted, a "response" (0x7B) is returned. However, this "response" is not a processing implementation response. When the request is not to be accepted (including cases in which the deletion is not to be implemented), or when the stipulated DEOJ exists but the stipulated EPC does not, "response not possible" (0x5A, 0x5B) is returned. In the frame format for response, the value of the object stipulated by the request is set in SEOJ, and the relevant property is set in EPC. When the relevant object itself does not exist, neither "response" nor "response not possible" is returned. Also, the "response" message DEA is defined as the requesting entity (i.e., the request message SEA).

When the request is not to be accepted, or when the stipulated DEOJ exists but the stipulated EPC does not exist, EDT of "response not possible" is the array element number of a "request" and when the stipulated DEOJ exists but the stipulated EPC does not exist, the EDT of "response not possible" does not exit.

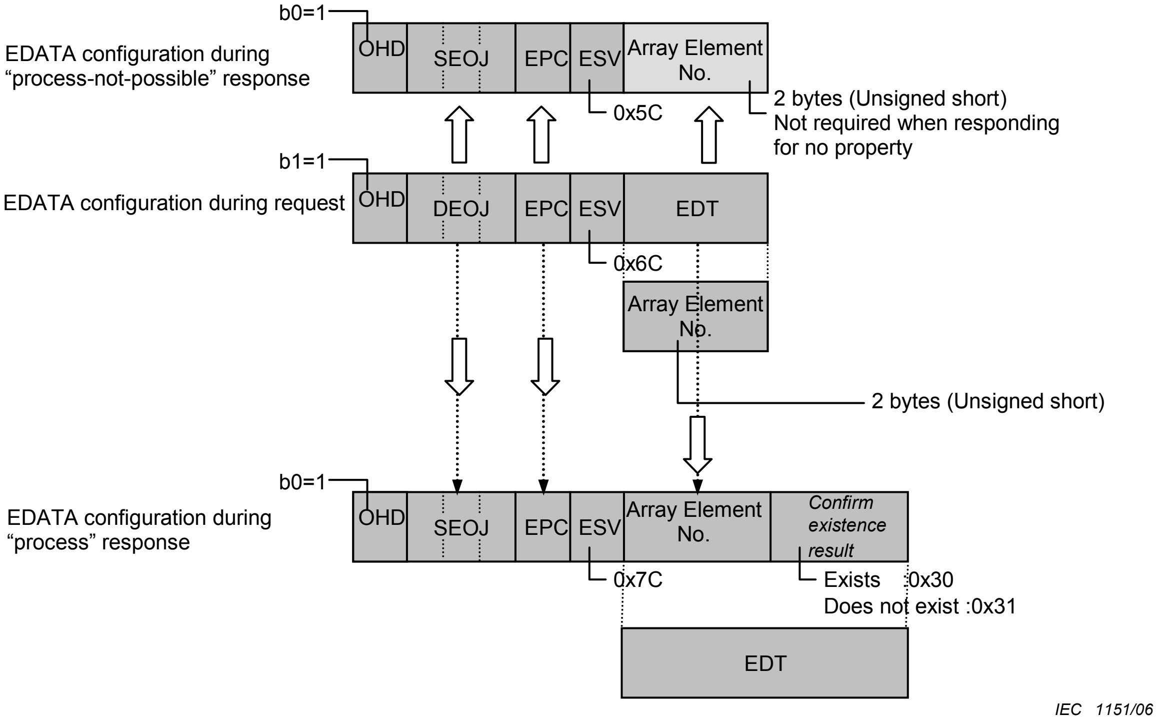


The content of each array element number in an array format property is defined separately for each property. When the stipulated array element (element) does not exist, "response not possible" is returned. Also, when EDATA stipulates SEOJ during a "request," the EOJ stipulated in the SEOJ by EDATA during the "request" is allocated as a DEOJ within the EDATA (b1 of OHD is also set to 1) in the case of both "response not possible" and "response."

i) Property value element-stipulated existence confirmation [0x6C, 0x5C, 0x7C]

In the case of a "request" (0x6C), this indicates a request to confirm the existence of the array element indicated in the EDT (includes array element number value information) in the property stipulated in the EPC of the object stipulated in the DEOJ. When the request is to be (or has already been) accepted, a "response" (0x7C) is returned. When the request is to be rejected (cannot be processed by the ESV) or when the specified DEOJ exists but the specified EPC does not exist, a "process not possible" (0x5C) is returned. In the frame format for response, the value of the object stipulated by the request is set in SEOJ, and the relevant property is set in EPC. When the relevant object itself does not exist, neither "response" nor "response not possible" is returned. Also, the "response" message DEA is defined as the requesting entity (i.e., the request message SEA).

When the request is not to be accepted, or when the stipulated DEOJ exists but the stipulated EPC does not exist, EDT of "response not possible" is the array element number of a "request" and when the stipulated DEOJ exists but the stipulated EPC does not exist, the EDT of "response not possible" does not exit.

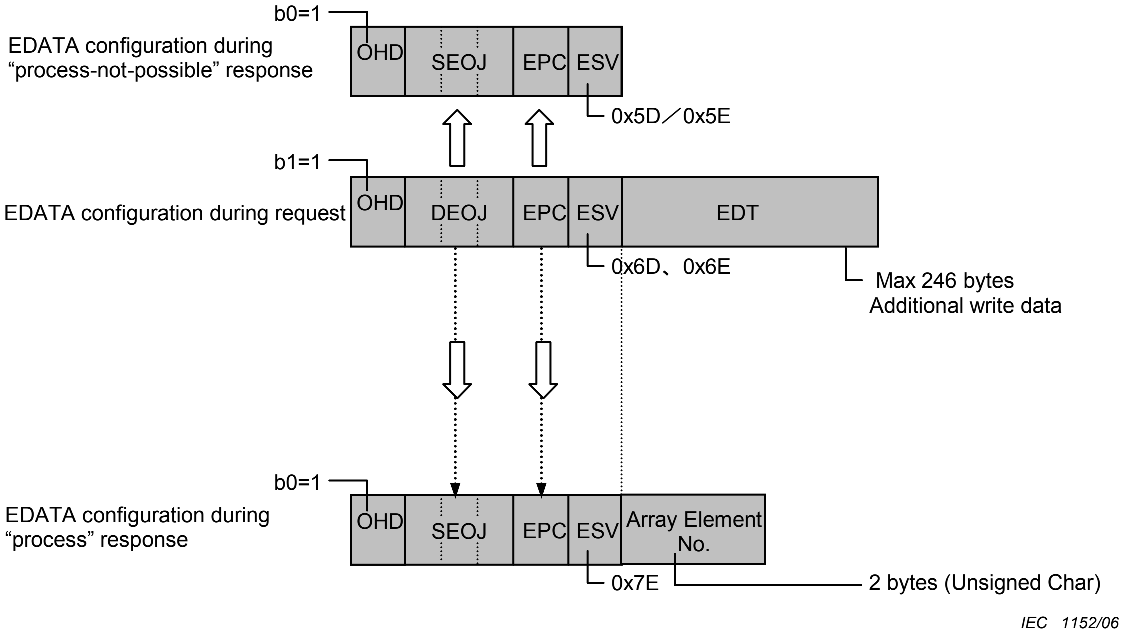


The content of each array element number in an array format property is defined separately for each property. Also, when EDATA stipulates SEOJ during a "request," the EOJ stipulated in the SEOJ by EDATA during the "request" is allocated as a DEOJ within the EDATA (b1 of OHD is also set to 1) in the case of both "response not possible" and "response."

j) Property value element addition [0x6D, 0x6E, 0x5D, 0x5E, 0x7E]

In the case of a "request" (0x6D, 0x6E), this indicates a request to newly add an array element to the property stipulated in the EPC of the object stipulated in the DEOJ, and to write to the newly added array element the value data stipulated in the EDT. In response to this "request," when a value indicating implementation of the response (0x6E) is stipulated, and when the request is to be (or has already been) accepted, a "response" (0x7F) is returned. However, this "response" is a processing implementation response, and the added array element number is returned as an EDT. When the request is not to be accepted, or when the stipulated DEOJ exists but the stipulated EPC does not, "response not possible" (0x5D, 0x5E) is returned. In the frame format for response, the value of the object stipulated by the request is set in SEOJ, and the relevant property is set in EPC. When the relevant object itself does not exist, neither "response" nor "response not possible" is returned. Also, the "response" message DEA is defined as the requesting entity (i.e., the request message SEA).

For "response not possible", EDT does not exit.



The content of each array element number in an array format property is defined separately for each property. Also, when EDATA stipulates SEOJ during a "request," the EOJ stipulated in the SEOJ by EDATA during the "request" is allocated as a DEOJ within the EDATA (b1 of OHD is also set to 1) in the case of both "response not possible" and "response."

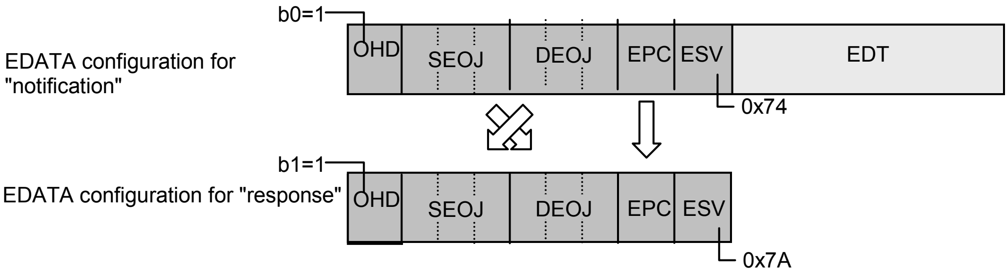
k) Property value notification (response required) [0x74, 0x7A]

The "notification (response required)" (0x74) autonomously notifies a specific node of the property value stipulated by the EPC of the SEOJ-stipulated object and requests a response. The response process for this "notification (response required)" varies depending on whether the DEOJ is specified.

When the DEOJ is not specified, the "response" (0x7A) for autonomous notification reception is returned at all times.

When the DEOJ is specified, on the other hand, the subsequent process varies depending on whether the specified DEOJ exists. If the specified DEOJ exists, the "response" (0x7A) for autonomous notification reception is returned. If the specified DEOJ does not exist, the message is discarded.

If a node receives a "notification (response required)" for which a broadcast is specified, the node discards the message.


b0=1
EDATA configuration for "notification"
OHD
SEOJ
DEOJ
EPC
ESV
EDT
0x74
b1=1
EDATA configuration for "response"
OHD
SEOJ
DEOJ
EPC
ESV
0x7A

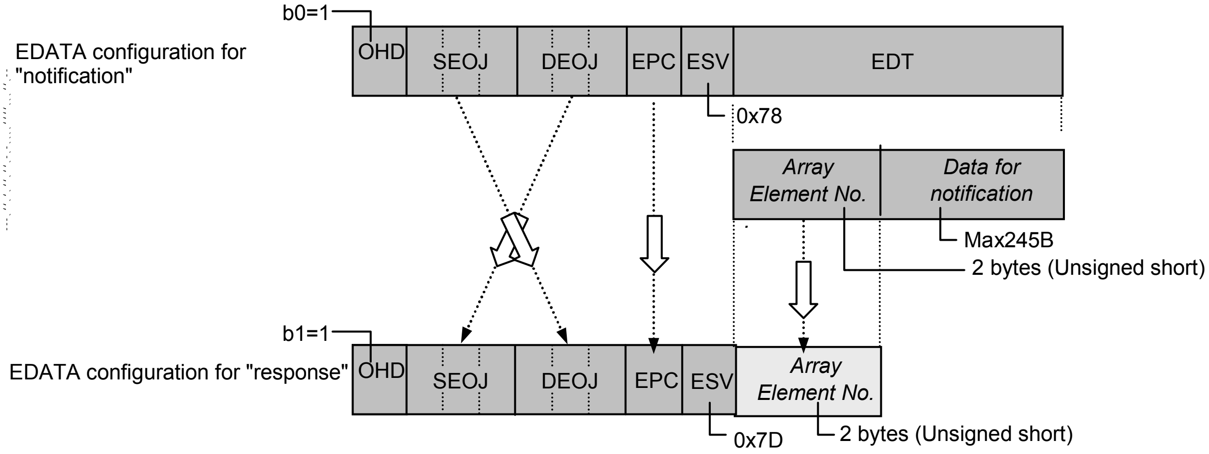
l) Property value element-stipulated notification (response required) [0x78, 0x7D]

The "notification (response required)" (0x78) autonomously notifies a specific node of the array element value stipulated by the EDT (array element number) of the property stipulated by the EPC of the SEOJ-stipulated object, and requests an acknowledgment. The response message format and response process for this "notification (response required)" varies depending on whether the DEOJ is specified.

When the DEOJ is not specified, the "response" (0x7D) for notification reception is returned at all times.

When the DEOJ is specified, on the other hand, the subsequent process varies depending on whether the specified DEOJ exists. If the specified DEOJ exists, the "response" (0x7D) for notification reception is returned. If the specified DEOJ does not exist, the message is discarded.

If a node receives a "notification (response required)" for which a broadcast is specified, the node discards the message.



IEC 1153/06

The services shown in Tables 2 through 4 are specified for each property. Regarding those stipulated as services that must be incorporated in each property, if they have the functions of that property and disclose via communications (read/write notification, etc.), this indicates that they must be processed. Processing of services for each property is specified in 8.3 and in the access rules column of the object class detailed specification tables. Access rules indicate all services that can be implemented. In this specification, the following nine access rules are specified.

Set Processes services related to write requests for non-array property values
(Performs processing indicated in (1))

Get Processes services related to read requests for non-array property values
(Performs processing indicated in (2) (3) and (11))

SetM Processes services related to write requests for array property values
(Performs processing indicated in (4))

GetM Processes services related to read requests for array property values
(Performs processing indicated in (5) (6) and (12))

AddM Processes services related to element-stipulated add requests for array property values
((Performs processing indicated in (7))

DelIM Processes services related to delete requests for array property values
(Performs processing indicated in (8))

CheckM Processes services related to existence confirm requests for array property value elements
(Performs processing indicated in (9))

AddMS Processes services related to non-array-element-stipulated add requests for array property values
(Performs processing indicated in (10))

Anno Processes non-array property value notification services
(Performs processing indicated in (3) and (11))

AnnoM Processes array property value notification services
(Performs processing indicated in (6) and (12))

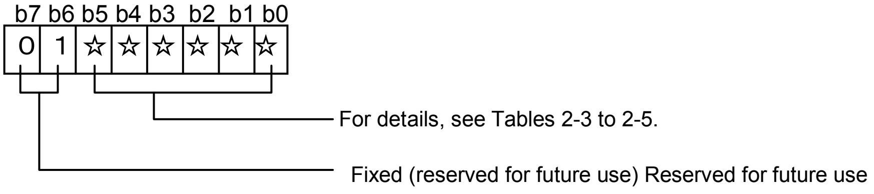
The above processing is specified for each property; there is no mixed stipulation of Set and SetM or of Get and GetM.

7.1.10 ECHONET property value data (EDT)

This subclause presents detailed specifications for the code for the ECHONET property value data (EDT) range shown in Figure 1. EDT consists of data for the relevant ECHONET property (EPC), such as status notification or specific setting and control by an ECHONET service (ESV). Detailed specifications are provided for the size, code value, etc., of EDT for each EPC (see Clause 8).

7.1.11 Compound ECHONET Service (CpESV)

This subclause provides detailed specifications for the compound ECHONET service (CpESV) code shown in Figure 1.


b7 b6 b5 b4 b3 b2 b1 b0
0 1 ☆ ☆ ☆ ☆ ☆ ☆
For details, see Tables 2-3 to 2-5.
Fixed (reserved for future use) Reserved for future use

IEC 1154/06

Figure 10 – EpESV configuration

NOTE When bits b7 and b6 are 0 and 1, respectively, the meanings of bits b0 to b5 are stipulated separately.

The service provided by this code is used when the compound message format is used. It specifies a simultaneous action for two or more properties stipulated by the EPC. However, it does not stipulate the order of operations. The order of property operations is an implementation issue.

Three types of operations are provided: request, response, and notification. The response is subdivided into two types: "accepted" response and "process-not-possible" request. The "accepted" response is used when the service request in relation to all the EPC-stipulated properties is accepted. The "process not possible" request is used when one or more specified properties do not exist or when the specified service cannot be processed for one or more properties.

- Request
- Response ("accepted" response/"process not possible" response)
- Notification

The "response" is a response to a "request" that requires a response. It shall be returned when a DEOJ-stipulated object exists. When the service processing request related to all the EPC-stipulated properties is accepted, the "accepted" response shall be returned. If the processing request related to one or more specified properties cannot be accepted or if the object exists but one or more properties do not exist, "process not possible" shall be returned. When the "request" does not require any response or when the specified object does not exist, no "response" will be returned.

Further, "write" (response-required write/no-response-required write), "read", and "notification" (autonomous notification/response-required notification) are regarded as specific operations. Therefore, the following five types are set. Regarding the OpESV for compound messages, array element properties are not targeted.

a) Property value write request (no response required)

b) Property value write request (response required)

c) Property value read request

d) Property value notification

e) Property value notification (response required)

The CpESV and message configurations (presence of SEOJ and DEOJ) and their relationship to EPC and ESV are described below.

(a) The EPC of an ECHONET message in which only the SEOJ is specified indicates the property of the SEOJ-stipulated source object. In this case, the "response", "notification", or autonomous "notification" concerning the "request" related to two or more SEOJ-/EPC-stipulated properties is positioned in the CpESV. When the CpESV is a "request" while this configuration is employed, the associated message shall be handled as an erroneous message.

(b) The EPC of an ECHONET message in which only the DEOJ is specified indicates the property of the DEOJ-stipulated destination object. In this case, the "request" related to two or more DEOJ-/EPC-stipulated properties is positioned in the CpESV. When the CpESV is a "response" or "notification" while this configuration is employed, the associated message shall be handled as an erroneous message.

(c) The EPC of an ECHONET message in which the SEOJ and DEOJ are both specified is such that the CpESV value determines whether the target object is stipulated by the SEOJ or DEOJ. When the CpESV is a "response" or "notification", it is concluded that the EPC forms a SEOJ-stipulated object and that the "response" or "notification" is addressed to a DEOJ-stipulated object. When the CpESV is a "request", on the other hand, it is concluded that the EPC forms a DEOJ and that the "request" is issued from a SEOJ-stipulated object.

Tables 5 to 7 show specific CpESV code assignments. The details of items a) through e) above are given in (1) through (5) of the remarks column of the tables). The figures in (1) through (5) presume that the DEOJ for a "request" is an individually specified code. However, when the DEOJ indicates an instance general broadcast, a response is transmitted with both "process not possible" response and "response" configured for each target instance. Figure 3 shows a sequence diagram, which indicates the relationships between individual CpESVs. The codes marked "reserved for future use" in the tables are to be stipulated in the future and shall not be used.

Table 5 – List of CpESV codes for request/notification

Service code (CpESV)	ECHONET service content	Symbol	Remarks
0x60	Property value write request (no response required)	CpSetI	(1)
0x61	Property value write request (response required)	CpSetC	(2)
0x62	Property value read request	CpGet	(3)
0x63～0x6F	Reserved for future use		

Table 6 – List of CpESV Codes for "accepted" response

Service code (CpESV)	ECHONET service content	Symbol	Remarks
0x71	Property value write "accepted" response	CpSet_Res	CpESV=61 response (2)
0x72	Property value read "accepted" response	CpGet_Res	CpESV=62 response (3)
0x73	Property value notification	CpINF_Res	(4)
0x74	Property value notification (response required)	CpINFC	(5)
0x7A	Property value notification response	CpINFC_Res	CpESV=74 response (5)
0x75～0x79, 0x7B～0x7F	Reserved for future use		

Table 7 – List of CpESV codes for "process-not-possible" response

Service code （CpESV）	ECHONET service content	Symbol	Remarks
0x50	Property value write "process not possible" response (1)	CpSetI_SNA	CpESV=60 "process not possible" response (1)
0x51	Property value write "process not possible" response (2)	CpSetC_SNA	CpESV=61 "process not possible" response (2)
0x52	Property value read "process not possible" response	CpGet_SNA	CpESV=62 "process not possible" response (3)
0x5F	Message length excessive	CpOverFlow	Response to be returned when the response message is too long
0x53～0x5E	Reserved for future use		

a) Property value write request (requiring no response) service [0x60, 0x50]

The write request requiring no response (CpESV = 0x60) requests that the EDT-stipulated contents be written into the EPC-stipulated properties of the DEOJ-stipulated object. The order of write operations is not stipulated. The response from a request-processing node is as indicated below.

1) When a processing request for all properties are accepted

   No response will be made.

2) When one or more properties relevant to the request do not exist, a processing request to one or more properties cannot be accepted, or an array property is targeted

   A write "process not possible" response (1) (CpESV = 0x50) will be returned.

3) When the object relevant to the request does not exist

   No response will be made.

4) When two or more identical properties exist in the request message

   Individual processes will be performed on the presumption that differing requests are issued. A response will be made in accordance with the processing results.

NOTE The order of processes depends on the implementation. Therefore, the resulting final property status and value also depend on the implementation.

The message structure of a write "process-not-possible" response to a property value write request (requiring no response) is such that the object code of the request destination becomes the SEOJ and that the object code of the request source becomes the DEOJ. The OPC takes the same value as in the request message.

For requests (request 1 to request n) that relate to non-existent properties and process requests that are rejected, both the PDC and EDT use the same values as those used in the write request. For requests related to properties for which processing requests are accepted, the PDC value is 0x01 and the EDT value is omitted. As for the EPC, the EPC in the request message is used as is. If the target object does not exist, neither the "response" nor the "process not possible" response is returned.

An appropriate value for the OHD shall be specified in accordance with the SEOJ/DEOJ configuration in the message. Figure 12 shows the relationship between a write request requiring no response and write addition response for situations where request m cannot be accepted. The EPC sequence in the request message shall be equal to the EPC sequence in the write "process-not-possible" response message.

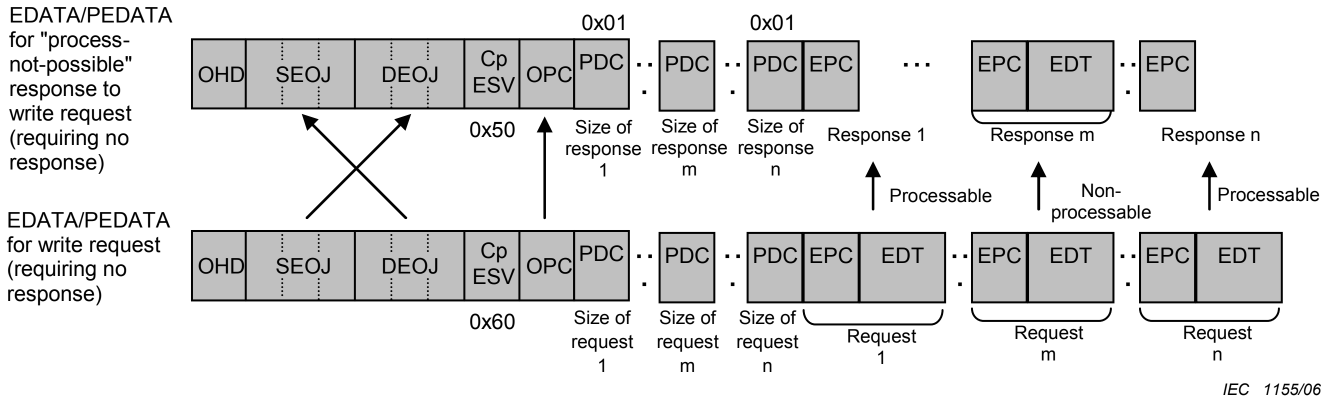


Figure 12 – Relationship between write request (requiring no response) and write "process-not-possible" response

b) Property value write request (requiring a response) service [0x61, 0x71, 0x51]

The write request requiring a response (CpESV = 0x61) requests that the EDT-stipulated contents be written into the EPC-stipulated properties of the DEOJ-stipulated object. The order of write operations is not stipulated. The response from a request-processing node is as indicated below.

1) When a processing request for all properties are accepted

   A write "accepted" response (CpESV = 0x71) will be returned.

2) When one or more properties relevant to the request do not exist, a processing request to one or more properties cannot be accepted, or an array property is targeted

   A write "process not possible" response (CpESV = 0x51) will be returned.

3) When the object relevant to the request does not exist

   No response will be made.

4) When two or more identical properties exist in the request message

   Individual processes will be performed on the presumption that differing requests are issued. A response will be made in accordance with the processing results.

NOTE The order of processes depends on the implementation. Therefore, the resulting final property status and value also depend on the implementation.

The message structure of a write "process-not-possible" response to a property value write request (requiring a response) is such that the object code of the request destination becomes the SEOJ and that the object code of the request source becomes the DEOJ. The OPC takes the same value as in the request message.

For requests (request 1 to request n) that relate to non-existent properties and process requests that are rejected, both the PDC and EDT use the same values as those used in the write request. For requests related to properties for which processing requests are accepted, the PDC value is 0x01 and the EDT value is omitted. As for the EPC, the EPC in the request message is used as is. If the target object does not exist, neither the "response" nor the "process not possible" response is returned.

The message structure of a write "accepted" response is such that the object code of the request destination becomes the SEOJ and the object code of the request source becomes the DEOJ. The OPC and subsequent values are omitted.

An appropriate value for the OHD shall be specified in accordance with the SEOJ/DEOJ configuration in the message. Figure 13 shows the relationships among a write request requiring a response, a write "accepted" response, and a write "process-not-possible" response for situations where request m cannot be accepted. The EPC sequence in the request message must be equal to the EPC sequence in the write "process-not-possible" response message.

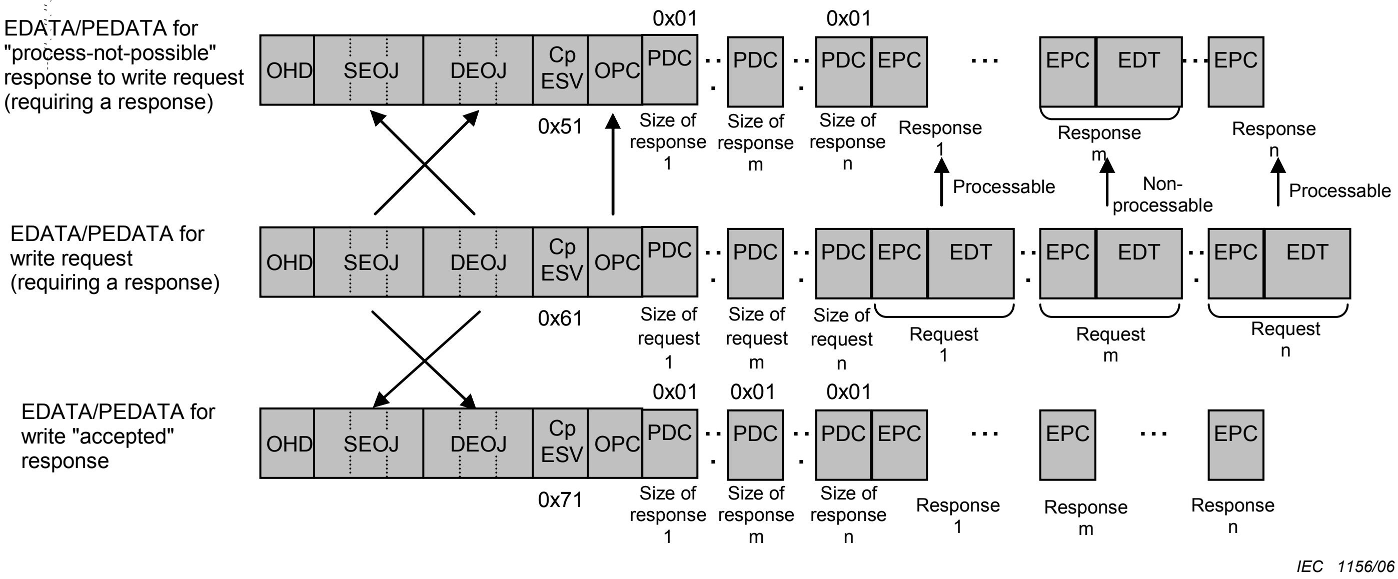


Figure 13 – Relationship among write request (requiring a response), write "accepted" response, and write "process-not-possible" response

c) Property value read request service [0x62, 0x72, 0x52, 0x5F]

The property value read request (CpESV = 0x62) requests that the contents of EPC-stipulated properties of the DEOJ-stipulated object be read. The order of read operations is not stipulated. The response from a request-processing node is as indicated below.

1) When a processing request for all properties are accepted

   A read "accepted" response (CpESV = 0x72) will be used to return all the read values.

2) When one or more properties relevant to the request do not exist, a processing request to one or more properties cannot be accepted, or an array property is targeted

   A write "process not possible" response (CpESV = 0x52) will be used to return the values of the read properties.

3) When the object relevant to the request does not exist

   No response will be made.

4) When two or more identical properties exist in the request message

   Individual processes will be performed on the presumption that differing requests are issued. A response will be made in accordance with the processing results.

NOTE The order of processes depends on the implementation. Therefore, if two or more property states are read, the resulting final status depends on the implementation.

The message structure of a read "process-not-possible" response is such that the object code of the request destination becomes the SEOJ and the object code of the request source becomes the DEOJ. The OPC takes the same value as in the request message.

For requests (request 1 to request n) that relate to non-existent properties and process requests that are rejected, the PDC value is 0x01 and the EDT value is omitted. For requests related to properties for which processing requests are accepted, the read value is placed in the EDT and the total number of EPC and EDT bytes is regarded as the PDC. If the target object does not exist, neither the "response" nor the "process-not-possible" response is returned.

The message structure of a read "accepted" response is such that the object code of the request destination becomes the SEOJ and the object code of the request source becomes the DEOJ. The read value is placed in the EDT, and the total number of EPC and EDT bytes is regarded as the PDC.

An appropriate value for the OHD must be specified in accordance with the SEOJ/DEOJ configuration in the message. Figure 14 shows the relationships among a read request, a read "accepted" response, and a read "process-not-possible" response for situations where request m cannot be accepted. The EPC sequence in the request message must be equal to the EPC sequence in the read "accepted" response and read "process-not-possible" response messages.

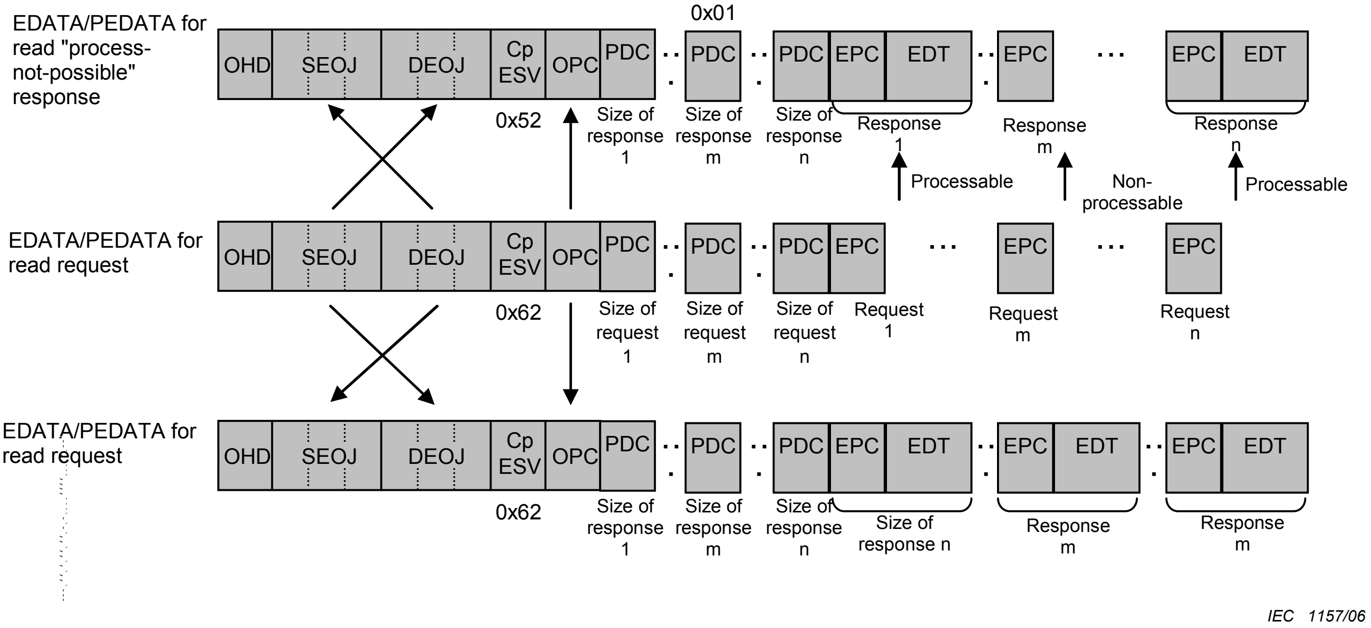


Figure 14 – Relationship among read request (requiring a response), read "accepted" response, and read "process-not-possible" response

As is obvious from Figure 14, the read "accepted" response message is longer than the read response message. Therefore, the maximum permissible message length may be exceeded when an attempt is made to return all the property values that are read in compliance with the request. In such a situation, a response will be made using the message length overflow service code (CpESV = 0x5F). In this case, the responding side can determine the number of property values to be returned; however, the sequence of such properties shall be the same as in the request message.

d) Property value notification service [0x73]

The property value notification (CpESV = 0x73) reads the contents of EPC-stipulated properties and reports them to the DEOJ-stipulated object. When the DEOJ is not contained in the message, it is a notification to nodes. Either "individual" or "broadcast" can be selected for addressing purposes. The order of property value notifications is not stipulated. Nodes receiving this message will not return a response.

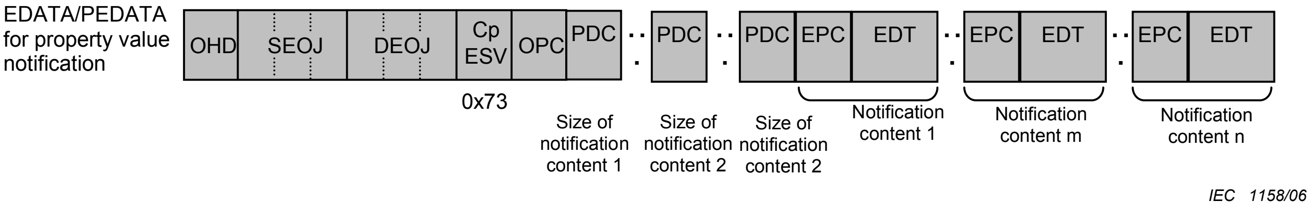

EDATA/PEDATA for property value notification
OHD
SEOJ
DEOJ
Cp ESV
OPC
PDC
EPC
EDT
0x73
Size of notification content 1
Size of notification content 2
Size of notification content 2
Notification content 1
Notification content m
Notification content n
IEC 1158/06

Figure 15 – Relationship between notification request and notification response

e) Property value notification (requiring a response) service [0x74, 0x7A]

The property value notification requiring a response (CpESV = 0x74) reads the contents of EPC-stipulated properties and reports them to the DEOJ-stipulated object. When the DEOJ is not contained in the message, it is a notification to a node. Only "individual" is available for addressing purposes. The order of property value notifications is not stipulated. The response from a node receiving this message is as indicated below.

1) When a notification is accepted

A property value notification response (CpESV = 0x7A) will be returned.

2) When the DEOJ-stipulated object does not exist

No response will be made.

The message structure of the notification response is such that the object code of the request destination becomes the SEOJ and the object code of the request source becomes the DEOJ. The OPC takes the same value as in the request message.

An appropriate value for the OHD must be specified in accordance with the SEOJ/DEOJ configuration in the message. Figure 16 shows the relationship between the property value notification (requiring a response) service and property value notification response service. The EPC sequence in the property value notification request service message shall be equal to the EPC sequence in the property value notification response service message.

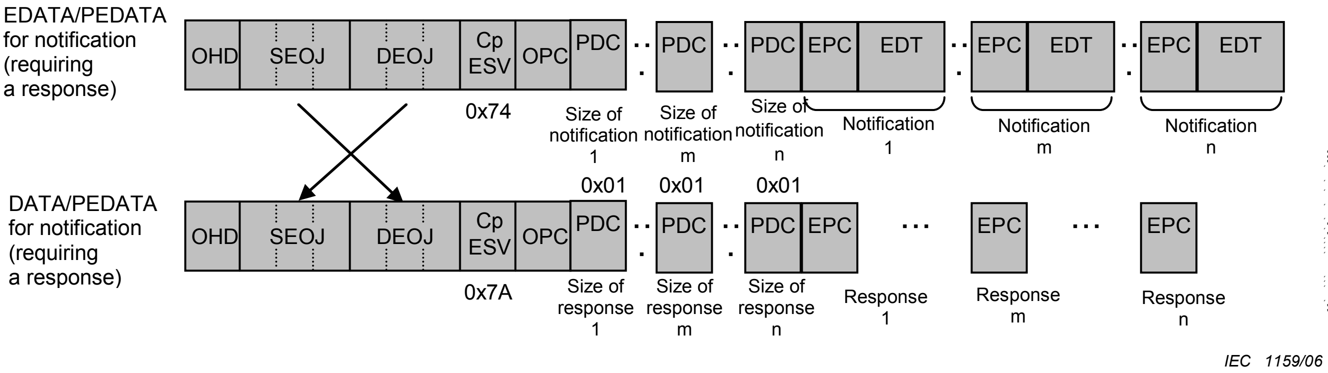


Figure 16 – Relationship between property value notification (requiring a response) and property value notification response

7.1.12 Processing target property counter (OPC)

The processing target property counter is used in the compound message format only. It consists of one byte. In a compound message, the processing target property counter retains the number of properties targeted for a write or read operation. This counter can retain the value 1 or greater. Therefore, a compound message is allowed to exist even when the number of simultaneously operable properties is only one. The maximum number of simultaneously operable properties is limited by the maximum permissible message length.

If, for instance, there are three requests as shown in Figure 17, the processing target property counter is 0x03.

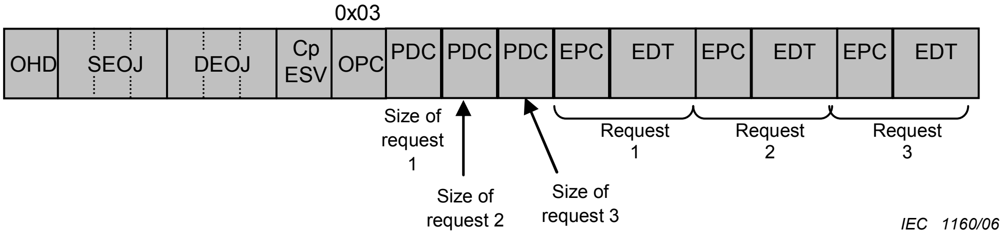


Figure 17 – Processing target property counter for three requests

7.1.13 Property data counter (PDC)

The processing data counter is used in the compound message format only. It retains the number of bytes in the ECHONET property code (EPC) and ECHONET data (EDT), which follow the proper data counter. If, for instance, the ECHONET data sizes for requests 1, 2, and 3 are 2 bytes, 1 byte, and 5 bytes, respectively, the values placed in the first, second, and third property data counters are 0x03, 0x02, and 0x06, respectively, as shown in Figure 18.

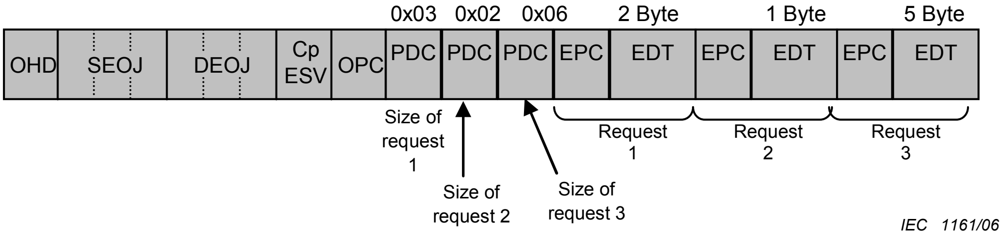


Figure 18 – Property data counter

8 ECHONET objects: detailed specifications

8.1 Basic concept

This subclause will specify specific values for the class codes of ECHONET objects processed in the ECHONET Communication Middleware, whose types and overview were given in Clause 7, along with property configurations and detailed specifications for property configurations. In the case of class codes, rather than providing entirely new specifications, standards already being studied by the industry were applied whenever possible to capitalize on past work. Regarding object properties, the operands (control content) of JEM-1439 were analysed and referred to. ECHONET objects described in this subclause and in the appendix are divided into three main classes: device objects, profile objects, and communications definition objects. In terms of the code structure, they will be divided into the class groups shown below. This subclause presents the shared ECHONET property specifications and object super classes that form ECHONET objects.

a) Device objects
   - Sensor-related device class group
   - Air-conditioning-related device class group
   - Housing-related device class group
   - Cooking/housework-related device class group
   - Health-related device class group
   - Management and control-related device class group
   - AV-related device class group

b) Profile objects
   - Profile class group

c) Communications definition objects
   - Sensor-related device communications definition class group
   - Air-conditioning-related device communications definition class group
   - Housing-related device communications definition class group
   - Cooking/housework-related device communications definition class group
   - Health-related device communications definition class group

- Management and control-related device communications definition class group
- Profile communications definition class group
- AV-related device communications definition class group

Each ECHONET node must implement a device object for at least one representative device.

8.2 ECHONET properties: basic specifications

This subclause will discuss the specifications shared by all ECHONET object classes, of which details are provided in this subclause and in 8.3.

8.2.1 ECHONET property value data types

The ECHONET property value is expressed as an unsigned integer when the value is a non-negative integer value; it is expressed as a signed integer when the value is an integer value containing negatives.

When the value is a small value, it is handled as a fixed point type; when it is a non-negative small value, it is treated as an unsigned integer; and when it is a small value containing negatives, it is treated as a signed integer. Data types and sizes are specified individually for each property.

Although the property data size is specified individually for each property, property value data of 2 bytes or larger comprises ECHONET communication middleware messages as ECHONET property value data (EDT) beginning from the significant byte.

8.2.2 Property value range

The definition range for the ECHONET properties specified in this subclause and in the appendix, and the treatment of property values when the actual device value operating range differs from them, is specified below.

a) When the actual device property value operating range is smaller than the ECHONET property definition range and the actual device property value assumes the upper and lower limit values, the upper and lower limit values of the operating range are considered to be the property values.

   Assuming that the ECHONET property definition range is 0x00-0xFD (0℃–253℃) and the corresponding actual device operating range is 0x0A–0x32 (10℃-50℃), when the actual device value is the upper limit value (50 ℃) of the operating range, the upper limit value 0x32 (50℃) of the actual device operating range is considered to be the ECHONET property value, and when the actual device property value is the lower limit value (10℃), the lower limit value 0x0A (10℃) is considered to be the ECHONET property value.

b) When the actual device property value operating range as ECHONET property is larger than the ECHONET property definition range and the actual device property value assumes a value outside the ECHONET property definition range, a code showing an underflow or overflow becomes the property value.

c) Assuming that the ECHONET property definition range is 0x00-0xFD (0℃–253℃) and the corresponding actual device operating range is -10℃–300℃, when the actual device value assumes a value below the ECHONET property definition range, the underflow code 0xFE becomes the property value; when the actual device property value assumes a value above the ECHONET property definition range, the overflow code 0xFF becomes the property value.

Table 8 shows the underflow and overflow codes for each data type.

Table 8 – Data types, data sizes, and overflow/underflow codes

Data type	Data size	Underflow	Overflow
Signed char	1 Byte	0x80	0x7F
Signed short	2 Byte	0x8000	0x7FFF
Signed long	4 Byte	0x80000000	0x7FFFFFFF
Unsigned char	1 Byte	0xFE	0xFF
Unsigned short	2 Byte	0xFFFE	0xFFFF
Unsigned long	4 Byte	0xFFFFFFFE	0xFFFFFFFF

8.2.3 Required class properties

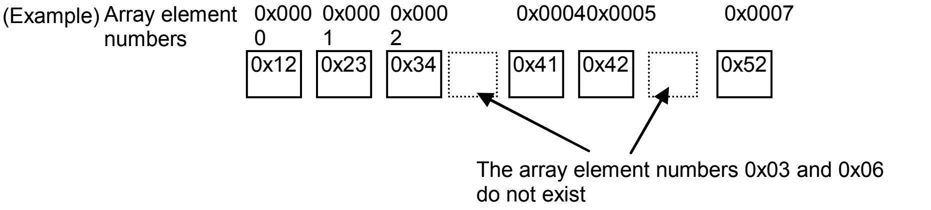
In the class property specifications described in this subclause, the properties indicated as “mandatory” shall be implemented when implementing the given class.

In addition, actual devices need not implement functions corresponding to all codes listed in the property content value range for a required property; they shall implement only those codes corresponding to the functions they possess.

In the "announcement at status change" column in the property list, the "o" mark denotes mandatory processing when the property is implemented. When a property marked in this manner is implemented and its status changes, an announcement (property value notification service data transmission with an intra-domain general broadcast specified) shall be made.

8.2.4 Array

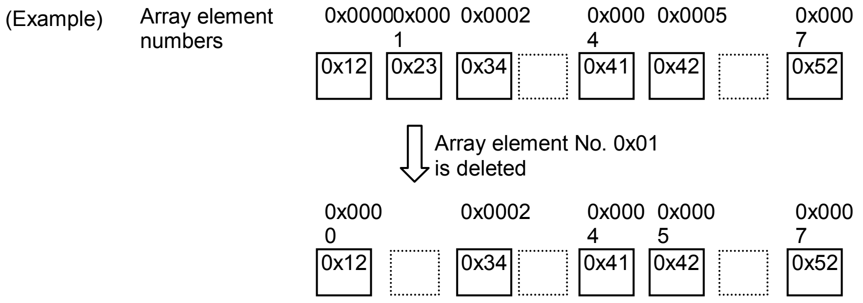
ECHONET properties can be in the form of an array. Array elements are stipulated by an array element number, which ranges from 0x0000 to 0xFFFF. Array elements may be non-contiguous. The data type of each array element must be unique within a property.


(Example) Array element numbers
0x0000
0x0001
0x0002
0x00040x0005
0x0007
0x12
0x23
0x34
0x41
0x42
0x52
The array element numbers 0x03 and 0x06 do not exist

IEC 1162/06

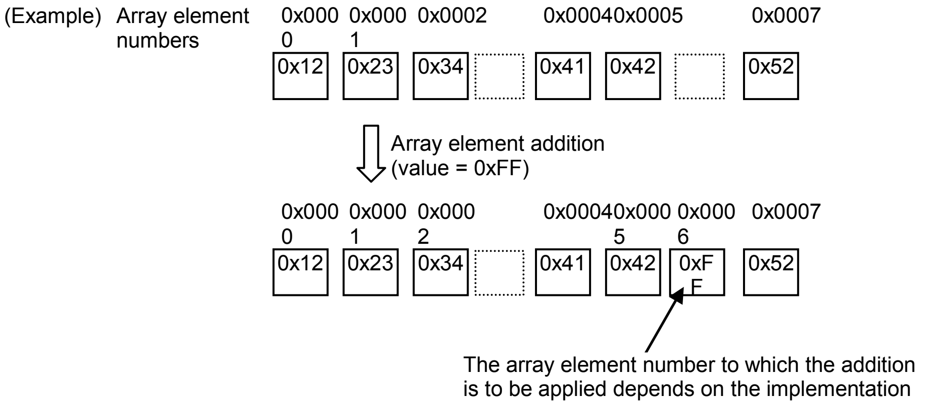
For the property value element-stipulated write service (ESV = 0x64, 0x65), property value element-stipulated read service (ESV = 0x66), property value element-stipulated notification service (ESV = 0x67), and property value element-stipulated deletion service (ESV = 0x6A, 0x6B), the "process not possible" response is returned if the associated array element does not exist. For the property value element-stipulated addition service (ESV=0x68,0x69), the "process-not-possible" response is returned if the associated array element exist.

The property value element-stipulated deletion service deletes a specified array element but does not shift the subsequent elements forward.



IEC 1163/06

The property value element addition service (ESV = 0x6D, 0x6E) does not specify the array element number to which an element addition is to be applied. Such a target array element number depends on the implementation.



IEC 1164/06

8.3 Device object super class specifications

This subclause will provide detailed specifications for the property configurations shared by all device object classes in the class groups corresponding to device objects (class group codes 0x00–0x06). These specifications will be presented as the device object super class.

8.3.1 Overview of device object super class specifications

The device object super class property is implemented by each device object class. Specifications for the device object super class are shown below.

The "operating status" (EPC=0x80) property implements the "get" access rule for all device object classes, signifying that it can be referenced from other nodes. Similarly, the "status change announcement property map" (EPC=0x9D), "fault status" (EPC=0x88), "set properties map" (EPC=0x9E), and "get properties map" (EPC=0x9F) properties also implement the "get" access rule, signifying that they can be referenced.

Table 9 shows the list of device object super class configuration properties.

Table 9 – List of device object super class configuration properties

Property name	EPC	Property content	Data type	Data size (byte)	Access rule	Mandatory	Announcement Status change	Remarks
		Value range (decimal notation)						
Operating status	0x80	Indicates ON/OFF status	Unsigned char	1	Set		○	
		ON=0x30, OFF=0x31			Get	○		
Installation location	0x81	Indicates the ECHONET instance installation location	Unsigned char	1	Set/ Get	○	○	
		See 8.3.3						
Specification version information	0x82	Indicates applicable specification version.	Unsigned char	4	Get	○		
		1st byte: Indicates major version number (digits to the left of the decimal point) in binary notation 2nd byte: Indicates minor version number (digits to the right of the decimal point) in binary notation 3rd byte: Indicates the order of release in ASCII notation 4th byte: Reserved for future use (fixed at 0x00)						
Fault status	0x88	Indicates an encountered abnormality (sensor trouble, etc.)	Unsigned char	1	Get	○	○	
		Fault encountered = 0x41, no fault encountered = 0x42						
Fault content	0x89	Fault content	Unsigned short	2	Get			
		0x0000～0x03E8 (0～1000)						
Manufacturer code	0x8A	Stipulated in 3 bytes	Unsigned char	3	Get	○		
		(To be specified by the ECHONET Consortium)						
Place-of-business code	0x8B	Stipulated in 3-byte place-of-business code	Unsigned char	3	Get			
		(Specified individually by each manufacturer)						
Product code	0x8C	Stipulated in ASCII code	Unsigned char	12	Get			
		(Specified individually by each manufacturer)						
Serial number	0x8D	Stipulated in ASCII code	Unsigned char	12	Get			
		(Specified individually by each manufacturer)						
Date of manufacture	0x8E	Stipulated in 4 bytes	Unsigned char	4	Get			
		Indicates the date in YYMD format (1 byte per character). YY: Year (07CF for 1999) M: Month (0C for December) D: Day (14 for 20th)						
SetM property map	0x9B	See 9.1	Unsigned char	Max. 17	Get	○		
GetM property map	0x9C	See 9.1	Unsigned char	Max. 17	Get	○		
Status Change Announcement property map	0x9D	See 9.1	Unsigned char	Max. 17	Get	○		
Set property map	0x9E	See 9.1	Unsigned char	Max. 17	Get	○		
Get property map	0x9F	See 9.1	Unsigned char	Max. 17	Get	○		

NOTE In announcement at status change, O denotes mandatory processing when the property is implemented.

8.3.2 Operating status property

The device object super class “operating status” property indicates the operating status (ON/OFF) of the functions unique to each class in the actual device. In nodes implementing each device object class, when the functions unique to each class begin operation along with the node, this property can be implemented with a fixed value of 0x30. (However, the operating status of node communication functions is indicated in the node profile object “operating status” property.)

8.3.3 Installation location property

The “installation location” property shows the location setting the device with the 1-byte bitmap information. This property is a required property rewritten from other nodes. The value shall be broadcasted all together within the domain when it changes.

The "freely defined" specification bit, the “installation location” code and the “location number” are assigned to 8 bits of the “installation location” property. However, when all bits become 0, they are the specific code showing "not set" and, when all bits become 1, they are the specific code showing installation location unspecified.

The content shown by each bit is explained as follows. Table 10 shows the relations between the “installation location”, the “freely defined specifications bit”, the “installation location code” and the “location number”.

- Freely defined specifications bit（b7）

  Consists of one-bit (b7). When b7=1, the “installation location code” and the “location number” are freely defined and can be freely defined.

  When b7=0, the “installation location code” and the “location number” indicate the device installation location with the specification of Table 10.

- Installation location code（b3～b6）

  Consists of four bits (b3～b6). When b7=1, it is freely defined.

  When b7=0, it indicates the device installation location with the specification of Table 10.

- Location number（b0～b2）

  Consists of three bits (b0～b2). When b7=1, it is freely defined. When b7=0 and there are the same kinds of spaces, it becomes the number for the identification. For example, when there are two rest rooms, these rest rooms can be identified if the location number of the ground-floor rest room is specified as 001b and the location number of the second-floor rest room is specified as 010b.

  In addition, when b7=0 and the “location number” field is 000b, the “installation location property” is initialized on the assumption that the device is located within the “installation location” shown in the “installation location” code. This is described as the “installation location not set code”.

When the kind of device installation location is not assumed and the “installation location property” is initialized, the value must be installation location not set code (0x00). Or when the special kind is inappropriately set as the device installation location, the value of “installation location property” shall be installation location unspecified code (0xFF).

The values 0x01 to 0x07 are reserved for future use.

Table 10 – Relationship between the space name of the installation location and the assigned bit

MSB LSB

Installation location	Freely defined specifications bit	Installation location code				Location number		
	b7	b6	b5	b4	b3	b2	b1	b0
Living room	0	0	0	0	1	"000b"～"111b" ("000b" means that no location number is set)		
Dining room	0	0	0	1	0			
Kitchen	0	0	0	1	1			
Bathroom	0	0	1	0	0			
Toilet	0	0	1	0	1			
Washbowl	0	0	1	1	0			
Corridor	0	0	1	1	1			
Room	0	1	0	0	0			
Stairs	0	1	0	0	1			
Hall	0	1	0	1	0			
Spare room	0	1	0	1	1			
Garden/exterior	0	1	1	0	0			
Carport	0	1	1	0	1			
Veranda/balcony	0	1	1	1	0			
Other	0	1	1	1	1			
Freely defined[a]	1	"0000000b"～"1111110b"						
Not set	0	0	0	0	0	0	0	0
Installation location not specified	1	1	1	1	1	1	1	1
For future reserved	"00000001b"～"00000111b"							

[a] "Freely defined" locations are provided mainly for use in stores and small and medium- and small-sized buildings. They can be freely defined by vendors.

8.3.4 Specification version information

Indicates the applicable specification version number with a 2-byte binary value and the order of the appendix release number with a 1-byte ASCII code.

The first byte indicates the major version number (digits to the left of the decimal point). The second byte indicates the minor version number (digits to the right of the decimal point). The third byte indicates the release number. To indicate Version 2.10 release a, for instance, the contents of the first, second, and third bytes would be 0x02 (2), 0x0A (10), and 0x61 (a), respectively.

The fourth byte, which is reserved for future expansion, is fixed at 0x00 in Version 2.10.

8.3.5 Fault-status property

The "fault-status" property of the device object super class indicates the occurrence of an error in an actual device. The property code used as a property value is 0x41 when an error exists or 0x42 when no error exists.

8.3.6 Fault-content property

The value of the fault-content property will be assigned using the codes shown in Table 11.

Table 11 – Fault-content property value assignments

Fault-content property value (decimal)	Fault content	
0x0000 (0)	No error	No error
0x0001 (1)		Turn off operating/power switch or unplug device and restart
0x0002 (2)		Press reset button and restart
0x0003 (3)		Improper settings
0x0004 (4)		Replenish
0x0005 (5)		Clean (filter, etc.)
0x0006 (6)		Replace battery
0x0007～0x0009 (7～9)		Reserved for future use
0x000a～0x0013 (10～19)	Error	Abnormal phenomenon/safety device operation
0x0014～0x001D (20～29)		Switch fault
0x001E～0x003B (30～59)		Sensor fault
0x003C～0x0059 (60～89)		Functional component fault
0x005A～0x006E (90～110)		Control board fault
0x006F～0x03E8		Available to user
0x03E9～0xFFFF	Reserved for future use	

8.3.7 Manufacturer code property

The property value of the manufacturer code property uses 3-byte codes to indicate individual manufacturers. The ECHONET Consortium assigns a manufacturer-specific property value to each ECHONET Consortium member.

8.3.8 Place-of-business code property

The property value of the place-of-business code property uses 3-byte codes to indicate the place of business of individual manufacturers. The property value of the place-of-business code property is not stipulated by the ECHONET Consortium but, instead, will be stipulated by individual manufacturers.

8.3.9 Product code property

The property value of the product code property uses 12-byte ASCII codes to indicate the products of various manufacturers. The property value of the product code property is not stipulated by the ECHONET Consortium but, instead, will be stipulated by individual manufacturers.

8.3.10 Serial number property

The property value of the serial number property uses 12-byte ASCII codes to indicate the product serial numbers of various manufacturers. The property value of the serial number property is not stipulated by the ECHONET Consortium but, instead, will be stipulated by individual manufacturers.

8.3.11 Date-of-manufacture property

The property value of the date-of-manufacture property uses four bytes to indicate the date of manufacture of various manufacturer products. Specifically, it uses two bytes to indicate the year and one byte each to indicate the month and day.

8.3.12 Property map property

The device object super class provides five property maps, which define the information for describing the services that can be offered by the properties disclosed by the objects.

Four of the five property maps, namely, the "set property map", "get property map", "setM property map", and "getM property map", provide the information that indicates the relationship between the properties disclosed by the implemented objects and access rules (see 7.1.9; hereinafter referred to as ARs) stipulated as product specifications.

The "status change announcement property map" indicates that an intra-domain general broadcast should be performed when the property value changes.

The map description formats are shown in 9.1.

The property maps are defined as stated below.

a) Set property map

This property map indicates the properties relating to the "set" AR.

b) Get property map

This property map indicates the properties relating to the "get" AR.

c) SetM property map

This property map indicates the properties relating to the "setM" AR.

d) GetM property map

This property map indicates the properties relating to the "GgtM" AR.

e) Status change announcement property map

This property map lists the properties that are set for a general broadcast of changes in their values. In addition to the intra-domain general broadcast stipulated in the "status change announce" column for ECHONET specifications for various object properties supported by product specifications, properties for making a "status change announcement" uniquely in compliance with product specifications are included as well. This property map does not include a status notification that is set by the "communication definition object for specifying the status notification method", which is stated later.

No associated property maps are stipulated for the "AddM", "DelM", "AddMS", "Anno", "AnnoM", and "CheckM" ARs.

9 Supplementary information

The following references can be obtained at the following address.

(1) *JEITA ET-2101 Home Bus System*, Japan Electronics and Information Technology Industries Association, Tel: +81-3-3518-6434

(2) *JEITA ET-2101 Home Bus System (Addendum)*, Japan Electronics and Information Technology Industries Association, Tel: +81-3-3518-6434

(3) *JEITA RC-5202 Data Outlet for Home Bus System*, Japan Electronics and Information Technology Industries Association, Tel:+81-3-3518-6434

(4) *JEMA 1439 Housekeeping Command Code Assignment for Use in Home Bus System*, Japan Electronics and Information Technology Industries Association, Tel: +81-3-3518-4841

9.1 Property map description format

When there are fewer than 16 properties, description format 1 below is followed; when there are 16 or more, description format 2 is followed.

Description format 1

Byte 1: Number of properties. Displayed in binary.

Byte 2 and higher: List of property codes (1-byte code).

Description format 2

Byte 1: Number of properties. Displayed in binary.

Bytes 2–17: In the 16-byte table below, the bit location showing existing property codes is set to 1, and properties are listed in order starting with Byte 2.

	Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
Byte 2	80	90	A0	B0	C0	D0	E0	F0
Byte 3	81	91	A1	B1	C1	D1	E1	F1
Byte 4	82	92	A2	B2	C2	D2	E2	F2
Byte 5	83	93	A3	B3	C3	D3	E3	F3
Byte 6	84	94	A4	B4	C4	D4	E4	F4
Byte 7	85	95	A5	B5	C5	D5	E5	F5
Byte 8	86	96	A6	B6	C6	D6	E6	F6
Byte 9	87	97	A7	B7	C7	D7	E7	F7
Byte 10	88	98	A8	B8	C8	D8	E8	F8
Byte 11	89	99	A9	B9	C9	D9	E9	F9
Byte 12	8A	9A	AA	BA	CA	DA	EA	FA
Byte 13	8B	9B	AB	BB	CB	DB	EB	FB
Byte 14	8C	9C	AC	BC	CC	DC	EC	FC
Byte 15	8D	9D	AD	BD	CD	DD	ED	FD
Byte 16	8E	9E	AE	BE	CE	DE	EE	FE
Byte 17	8F	9F	AF	BF	CF	DF	EF	FF

NOTE For each bit, 0 = no property; 1 = property exists.

9.2 All router data description format

Byte 1: Number of routers
Byte 2 and higher: The following router data set exists for all routers.
(Router data Byte 1: Router ID
Byte 2: Number of connected subnets (n)
Byte 3–[(2 * n)+2]: Held EA data (for n cases)

9.3 Instance list description format

Relevant instance code location bits are set to 1 and non-relevant bits to 0. The relevant class code (most significant 2 bytes of EOJ) is stipulated as an array element number.

The self-node instance list page 1 (EPC=0xD0) is for disclosing data for instance numbers 0x00–0x7F.

Self-node instance list page 1 (EPC=0xD0) description format

	Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
Byte 2	00	01	02	03	04	05	06	07
Byte 3	08	09	0A	0B	0C	0D	0E	0F
Byte 4	10	11	12	13	14	15	16	17
Byte 5	18	19	1A	1B	1C	1D	1E	1F
Byte 6	20	21	22	23	24	25	26	27
Byte 7	28	29	2A	2B	2C	2D	2E	2F
Byte 8	30	31	32	33	34	35	36	37
Byte 9	38	39	3A	3B	3C	3D	3E	3F
Byte 10	40	41	42	43	44	45	46	47
Byte 11	48	49	4A	4B	4C	4D	4E	4F
Byte 12	50	51	52	53	54	55	56	57
Byte 13	58	59	5A	5B	5C	5D	5E	5F
Byte 14	60	61	62	63	64	65	66	67
Byte 15	68	39	3A	3B	3C	3D	3E	3F
Byte 16	70	71	72	73	74	75	76	77
Byte 17	78	79	7A	7B	7C	7D	7E	7F

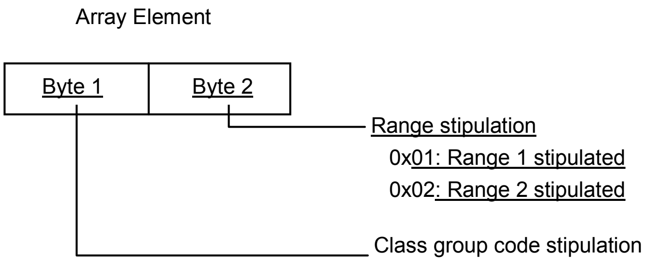
NOTE For each bit, 0 = no property; 1 = property exists.

9.4 Class list description format

The relevant class code location bits of EOJ Byte 2 are set to 1 and the non-relevant bits are set to 0.

When Range 1 is stipulated in the element, the format shown in b) below is used.

The relevant class group code (most significant byte of EOJ) is stipulated as the most significant byte of the array element number, and the afore-mentioned range is stipulated by the least significant byte (see following diagram).



IEC 1165/06

a) Format when range 1 is stipulated

Byte 1: Number of classes belonging to stipulated class group

	Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
Byte 2	00	01	02	03	04	05	06	07
Byte 3	08	09	0A	0B	0C	0D	0E	0F
Byte 4	10	11	12	13	14	15	16	17
Byte 5	18	19	1A	1B	1C	1D	1E	1F
Byte 6	20	21	22	23	24	25	26	27
Byte 7	28	29	2A	2B	2C	2D	2E	2F
Byte 8	30	31	32	33	34	35	36	37
Byte 9	38	39	3A	3B	3C	3D	3E	3F
Byte 10	40	41	42	43	44	45	46	47
Byte 11	48	49	4A	4B	4C	4D	4E	4F
Byte 12	50	51	52	53	54	55	56	57
Byte 13	58	59	5A	5B	5C	5D	5E	5F
Byte 14	60	61	62	63	64	65	66	67
Byte 15	68	39	3A	3B	3C	3D	3E	3F
Byte 16	70	71	72	73	74	75	76	77
Byte 17	78	79	7A	7B	7C	7D	7E	7F

NOTE For each bit, 0 = no instance; 1 = instance exists.

b) Format when range 2 is stipulated

Byte 1: Number of classes belonging to stipulated class group

	Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
Bvte 2	８０	８１	８２	８３	８４	８５	８６	８７
Byte 3	８８	８９	８A	８B	８C	８D	８E	８F
Byte 4	９０	９１	９２	９３	９４	９５	９６	９７
Byte 5	９８	９９	９A	９B	９C	９D	９E	９F
Byte 6	A０	A１	A２	A３	A４	A５	A６	A７
Byte 7	A８	A９	AA	AB	AC	AD	AE	AF
Byte 8	B０	B１	B２	B３	B４	B５	B６	B７
Byte 9	B８	B９	BA	BB	BC	BD	BE	BF
Byte 10	C０	C１	C２	C３	C４	C５	C６	C７
Byte 11	C８	C９	CA	CB	CC	CD	CE	CF
Byte 12	D０	D１	D２	D３	D４	D５	D６	D７
Byte 13	D８	D９	DA	DB	DC	DD	DE	DF
Byte 14	E０	E１	E２	E３	E４	E５	E６	E７
Byte 15	E８	E９	EA	EB	EC	ED	EE	EF
Byte 16	F０	F１	F２	F３	F４	F５	F６	F７
Byte 17	F８	F９	FA	FB	FC	FD	FE	FF

NOTE For each bit, 0 = no instance; 1 = instance exists.

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Standards Survey

The IEC would like to offer you the best quality standards possible. To make sure that we continue to meet your needs, your feedback is essential. Would you please take a minute to answer the questions overleaf and fax them to us at +41 22 919 03 00 or mail them to the address below. Thank you!

Customer Service Centre (CSC)
International Electrotechnical Commission
3, rue de Varembé
1211 Genève 20
Switzerland

or

Fax to: **IEC**/CSC at +41 22 919 03 00

Thank you for your contribution to the standards-making process.

Nicht frankieren
Ne pas affranchir

Non affrancare
No stamp required

A Prioritaire

RÉPONSE PAYÉE

SUISSE

Customer Service Centre (CSC)
International Electrotechnical Commission
3, rue de Varembé
1211 GENEVA 20
Switzerland

Q1 Please report on **ONE STANDARD** and **ONE STANDARD ONLY**. Enter the exact number of the standard: *(e.g. 60601-1-1)*

....

Q2 Please tell us in what capacity(ies) you bought the standard *(tick all that apply).* I am the/a:

purchasing agent □
librarian □
researcher □
design engineer □
safety engineer □
testing engineer □
marketing specialist □
other...

Q3 I work for/in/as a:
(tick all that apply)

manufacturing □
consultant □
government □
test/certification facility □
public utility □
education □
military □
other...

Q4 This standard will be used for:
(tick all that apply)

general reference □
product research □
product design/development □
specifications □
tenders □
quality assessment □
certification □
technical documentation □
thesis □
manufacturing □
other...

Q5 This standard meets my needs:
(tick one)

not at all □
nearly □
fairly well □
exactly □

Q6 If you ticked NOT AT ALL in Question 5 the reason is: *(tick all that apply)*

standard is out of date □
standard is incomplete □
standard is too academic □
standard is too superficial □
title is misleading □
I made the wrong choice □
other ....

Q7 Please assess the standard in the following categories, using the numbers:
(1) unacceptable,
(2) below average,
(3) average,
(4) above average,
(5) exceptional,
(6) not applicable

timeliness ....
quality of writing....................................
technical contents.................................
logic of arrangement of contents ....
tables, charts, graphs, figures...............
other ....

Q8 I read/use the: *(tick one)*

French text only □
English text only □
both English and French texts □

Q9 Please share any comment on any aspect of the IEC that you would like us to know:

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