ENGLISH TRANSLATION

OPERATIONAL GUIDELINES FOR DIGITAL SATELLITE BROADCASTING

ARIB TECHNICAL REPORT

ARIB TR-B15 Version 4.1

(Fascicle 4)

Established on October 26th, 1999
Revised on March 29th, 2000 Version 1.1
Revised on May 31st, 2001 Version 1.2
Revised on July 27th, 2001 Version 2.0
Revised on January 24th, 2002 Version 2.1
Revised on March 28th, 2002 Version 2.2
Revised on July 25th, 2002 Version 2.3
Revised on September 26th, 2002 Version 2.4
Revised on March 26th, 2003 Version 2.5
Revised on June 5th, 2003 Version 2.6
Revised on July 29th, 2003 Version 2.7
Revised on October 16th, 2003 Version 2.8
Revised on February 5th, 2004 Version 2.9
Revised on July 22nd, 2004 Version 3.0
Revised on September 28th, 2004 Version 3.1
Revised on December 14th, 2004 Version 3.2
Revised on March 24th, 2005 Version 3.3
Revised on September 29th, 2005 Version 3.4
Revised on November 30 th 2005 Version 3.5
Revised on March 14th, 2006 Version 3.6
Revised on May 29th, 2006 Version 3.7
Revised on September 28th, 2006 Version 3.8
Revised on December 12th, 2006 Version 3.9
Revised on May 29th, 2007 Version 4.0
Revised on September 26th, 2007 Version 4.1

Association of Radio Industries and Businesses

General Notes to the English translation of ARIB Standards and Technical Reports

1. The copyright of this document is ascribed to the Association of Radio Industries and Businesses (ARIB).

2. All rights reserved. No part of this document may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, without the prior written permission of ARIB.

3. The ARIB Standards and ARIB Technical Reports are usually written in Japanese and approved by the ARIB Standard Assembly. This document is a translation into English of the approved document for the purpose of convenience of users. If there are any discrepancies in the content, expressions, etc., between the Japanese original and this translated document, the Japanese original shall prevail.

4. The establishment, revision and abolishment of ARIB Standards and Technical Reports are approved at the ARIB Standard Assembly, which meets several times a year. Approved ARIB Standards and Technical Reports, in their original language, are made publicly available in hard copy, CDs or through web posting, generally in about one month after the date of approval. The original document of this translation may have been further revised and therefore users are encouraged to check the latest version at an appropriate page under the following URL:

http://www.arib.or.jp/english/index.html

Preface

Association of Radio Industries and Businesses has defined the basic technical requirements such as standard specifications of radio equipment that relates to various radio utilization systems as the "Standard Rules" and "Technical Reports" with the participation of broadcasting equipment manufacturers, broadcasters, radio equipment manufacturers, electronic communications companies, and users.

The "Technical Reports" defines in concrete form the measurement, operation and other methods of the radio equipment as the Consumer Specification in order to assure the appropriate quality and interchangeability of radio equipment, based on the "Standard Rules" that define both the government's technical standards and private voluntary standards.

This Technical Report defines the operations in BS digital broadcasting stations and broadband CS digital broadcasting stations, and the function requirement specifications of BS and broadband CS digital broadcasting dual-purpose receivers. In order to ensure the fairness and transparency in the standardization stage, we have established this Report by consensus of all interested parties of both Japanese and non-Japanese radio equipment manufacturers, electric communications companies, broadcasters, users and others.

This Technical Report consists of the following parts and volumes:

Part 1 Operation Rules for BS Digital Broadcasting

- Volume 1 BS Digital Broadcasting for Download Operation Rules
- Volume 2 Functional Requirement Specification of BS Digital Receivers
- Volume 3 BS Digital Broadcasting for Data Broadcasting Operation Rules
- Volume 4 BS Digital Broadcasting for PSI/SI Operation Rules
- Volume 5 BS Digital Broadcasting for Specifications and Operation Rules of Conditional Access System (CAS) Receivers
- Volume 6 BS Digital Broadcasting for Interactive Communication Rules
- Volume 7 BS Digital Broadcasting for Transmission Operation Rules
- Volume 8 BS Digital Broadcasting for Contents Protection Rules

Part 2 Operation Rules of Broadband CS Digital Broadcasting and Functional Requirement Specifications of BS and Broadband CS Digital-Broadcasting Dual-Purpose Receivers

- Volume 1 Broadband CS Digital Broadcasting for Download Operation Rules
- Volume 2 Functional Requirement Specification of BS and Broadband CS Dual-Purpose Digital Receivers
- Volume 3 Data Broadcasting Operation Rules for BS and Broadband CS Digital-Broadcasting Dual-Purpose Receivers
- Volume 4 Broadband CS Digital Broadcasting for PSI/SI Operation Rules
- Volume 5 Broadband CS Digital Broadcasting for Conditional Access System (CAS) Operation Rules and Receiver Specifications

Volume 6 Broadband CS Digital Broadcasting for Interactive Communication Rules

Volume 7 Broadband CS Digital Broadcasting for Transmission Operation Rules

Volume 8 Contents Protection Rules for BS and Broadband CS Digital-Broadcasting Dual-Purpose Receivers

We hope that the radio equipment manufacturers, broadcasters, users and others make positive use of this Technical Report.

Table of Contents

(This page is intentionally left blank.)

Part 2

Operational Guidelines for Broadband CS Digital Broadcasting and Functional Specification of BS and Broadband CS Digital-Broadcasting Dual-Purpose Receivers

* Part 2 of this Guide describes the differences from and additions to BS digital broadcasting in operations of broadband CS digital broadcasting, and also describes the additions to BS digital signal receive functions to be implemented on BS and broadband CS digital-broadcasting dual-purpose receivers.
  If text "Same as Part 1" is shown and if the corresponding text in Part 1 of this Guide describes the BS receivers only, such text shall be read as the "BS and broadband CS" receivers in Part 2 of this Guide.

Classification of operations, receiver functions and receivers

Part 2 of this Guide describes the operations, receiver functions, and the receivers themselves in the following categories.

- Operation classification
  - Basic function operations

    A combination of operations of basic TV broadcasting, audio broadcasting and data broadcasting, and operations of interactive communications in BASIC system is called the basic function operations.

  - IP communication operations

    The interactive communication based on the TCP/IP system is called the IP communication operations.

  - Extended support of IP communication operations by terrestrial, BS and broadband CS digital-broadcasting tri-purpose receivers

    The extended part of IP communication operations, which have been expanded primarily in terrestrial digital TV broadcasting, is called the extension of support by terrestrial, BS and broadband CS digital-broadcasting tri-purpose receivers for IP communication operations.

  - Advanced function type-1 operation

    A combination of basic function operations, IP communication operations, and the operations to accumulate data broadcasting contents is called the advanced function type-1 operations.

  - The support operations of terrestrial, BS and broadband CD digital-broadcasting tri-purpose receivers (the digital-broadcasting tri-purpose receiver support operations)

    A combination of basic function operations, the extended part of terrestrial digital TV broadcasting operations, and the extended part of IP communication operations is called the extended operations of terrestrial, BS and broadband CS digital-broadcasting tri-purpose receivers, and it is called in a short form as the tri-purpose receiver support operations.

- Classification of receiver functions
  - Basic functions

    The receiver's functions for basic function operations are called the basic functions.

○ IP communication functions

The receiver's functions for IP communication operations are called the IP communication functions.

○ Data broadcasting accumulation functions

The receiver's functions for data broadcasting contents accumulation operations are called the data broadcasting accumulation functions.

○ Extended support of basic functions of terrestrial, BS and broadband CS digital-broadcasting tri-purpose receivers

The extended support of basic functions for support operations of terrestrial, BS and broadband CS digital-broadcasting tri-purpose receivers is called the extended support of basic functions of terrestrial, BS and broadband CS digital-broadcasting tri-purpose receivers.

○ Extended support of IP communication functions of terrestrial, BS and broadband CS digital-broadcasting tri-purpose receivers

The extended part of IP communication functions for terrestrial, BS and broadband CS digital-broadcasting tri-purpose receiver support operations is called the extended support of IP communication functions of terrestrial, BS and broadband CS digital-broadcasting tri-purpose receivers.

(C) Data broadcasting accumulation function	
(B) IP communication function	(B+) Extended support of IP communication functions using the terrestrial, BS and broadband CS digital-broadcasting tri-purpose receivers
(A) Basic functions	(A+) Extended support of basic functions using the terrestrial, BS and broadband CS digital-broadcasting tri-purpose receivers

- Classification of BS and broadband CD digital-broadcasting tri-purpose receivers

  The classification defined below does not restrict any addition or combination of functions of BS and broadband CS digital-broadcasting dual-purpose receivers that are not defined by this Technical Report.

  The support of data broadcasting accumulation functions and IP communication functions by BS and broadband CS digital-broadcasting dual-purpose receivers is optional. There can be two types of BS and broadband CS digital-broadcasting dual-purpose receivers: the basic function receivers and the advanced function type-1 receivers.

○ Basic function receivers

  The BS and broadband CS digital-broadcasting dual-purpose receivers that support the basic function operations are called the basic function receivers.

○ Advanced function type-1 receivers

  The BS and broadband CS digital-broadcasting dual-purpose receivers that support the advanced function type-1 operations are called the advanced function type-1 receivers.

- Terrestrial and BS/broadband CS digital-broadcasting multi-purpose receivers

  The terrestrial and BS and broadband CS digital-broadcasting multi-purpose receivers support the terrestrial and BS and broadband CS digital-broadcasting multi-purpose receiver operations (the digital-broadcasting multi-purpose receiver support operations).

- Relationship of support between operations, receiver functions, and receivers

  The relationship of support between operations, receiver functions, and receivers can be simplified as shown on the table below.

  This table defines the support of receiver functions required for each operation and receiver and, therefore, it does not limit the implementation of optional receiver functions for each operation and receiver classification.

<table>
<tr><th>Operation</th><th>Receiver Function</th><th colspan="2">Receiver</th></tr>
<tr><td>Basic function operation</td><td>(A) Basic functions</td><td>Basic function receiver</td><td rowspan="4">BS and broadband CS digital-broadcasting dual-purpose receiver</td></tr>
<tr><td rowspan="3">High-functional type 1 operation</td><td>(A) Basic functions</td><td rowspan="3">Advanced function type-1 receiver</td></tr>
<tr><td>(B) IP communication functions</td></tr>
<tr><td>(C) Data broadcasting accumulation functions</td></tr>
<tr><td rowspan="4">Support operations of terrestrial, BS and broadband CD digital-broadcasting tri-purpose receiver (multi-purpose receiver support operations)</td><td>(A) Basic functions</td><td colspan="2" rowspan="4">Terrestrial, BS and broadband CS digital-broadcasting tri-purpose receivers</td></tr>
<tr><td>(A+) Extended support of basic functions of terrestrial, BS and broadband CS digital-broadcasting tri-purpose receivers</td></tr>
<tr><td>(B) IP communication functions</td></tr>
<tr><td>(B+) Extended support of IP communication functions of terrestrial, BS and broadband CS digital-broadcasting tri-purpose receivers</td></tr>
</table>

- Description of IP communication operations and IP communication functions

  In Part 2 of this Guide, the description of IP communication operations and IP communication functions is identified by "[IP]" (without double quotation marks).

- Description of extended support of both IP communication operations by terrestrial, BS and broadband CS digital-broadcasting tri-purpose receivers and IP communication functions by terrestrial, BS and broadband CS digital-broadcasting tri-purpose receivers

  In Part 2 of this Guide, the description of extended support of both IP communication operations by terrestrial, BS and broadband CS digital-broadcasting tri-purpose receivers and IP communication functions by terrestrial, BS and broadband CS digital-broadcasting tri-purpose receivers is identified by "[IP extension]" (without double quotation marks).

Volume 1

Broadband CS Digital Broadcast Download Operation Rules

Contents

1 Introduction

1.1 Preface

Information update service for the receiver in the broadband CS digital broadcast is performed based on the Ministry of Internal Affairs and Communications ordinance and announcement as well as the following rules defined by the Association of Radio Industries and Businesses (hereinafter, referred to as ARIB): the "Receiver for Digital Broadcasting Standard" (ARIB STD-B21), "Data Coding and Transmission Specification for Digital Broadcasting Standard" (ARIB STD-B24", and "Service Information for Digital Broadcasting System Standard" (ARIB STD-B10). However, this document, "Broadband CS Digital Broadcast Download Operation Rules", has been drawn out because it is necessary to separately define detailed operations for detail design of the receiver.

For detailed operation and other items, see the service clause defined by "The Association for Promotion of Digital Broadcasting (Dpa)."

1.2 Purpose

This document defines the transmission standards and the rules for receiver for the broadband CS digital broadcast conforming to the "Receiver for Digital Broadcasting Standard", STD-B21, defined by ARIB.

1.3 Scope

This standard document is applied to the transmission system for the information update service in the receiver which is provided in the broadband CS digital broadcast and the operation and transmission standards for various types of download contents.

2 Related Documents

The same as Part 1.

3 Definitions

Receiver software	This consists of software used in the receiver. Application, library, OS, driver, data, and other items are included.
Common data in all receivers	This data is stored in the receiver and used in common by all receivers. Logo data, genre code table, program property code table, reserved word table, and other items are included. These types of data are stored in non-volatile memory.
Logo	This refers to a logo mark which is defined for each network, service provider, or service that is used in common with all receivers for EPG or program selection. A log mark used for network is called a network logo and that which is used for each service provider or service is called a service logo.

Logo ID	Logo ID is an ID which is given for logo data used by each service provider. Logo ID is managed by the association of broadcasters in an integrated manner. All six logo types use one logo ID in common. Logo ID is numbered and the number is unique in each BS and broadband CS.
Logo type	Logo type refers to logo data which is provided for each distinct display format, such as SDTV and HDTV. Six logo types are defined.
Genre code	Genre code is a code which is used for content_nibble_level_1 (4 bit) and conent_nibble_level2 field (4 bit) and represents the genre. This is used for the content descriptor.
Program property code	This code is used for he user_nibble field (8 bit) and represents the genre. This is used for the content descriptor.
Reserved word	This refers to terms defined in advance which are used to describe a program, such as “leading performer”, “producer”, and “story”.
Module information	This is information related to the module which is described in moduleInforByte in DII and will be downloaded.
Announcement information	This is information used for announcement purpose, such as original_network_id of downloading, service ID, schedule information, the type of a receiver which is supposed to be updated. This is sent using SDTT.
Schedule information	This information contains download start time and download duration which are stored in the schedule loop of SDTT.
Compulsory download	Compulsory downloading is required.
Select (optional) download	Possible download items are displayed in the selection screen and downloading is executed according to the audience’s selection.
License information	According to the receiver’s execution license function, this information determines whether it is possible to unconditionally execute compulsory download or not.

4 Purpose and Assumptions for Downloading

- Receiver software update

  Software for the receiver is updated. This includes bug fix, transmission, or modification of defects due to difference in understanding related to operation, improvements in display, response speed, and improvements in operability.

- Update of data to be used in common with all receivers

  Logo data for broadcasters, program genre code table, program property code table, and reserved word table, which are use in common among all receivers, are updated.

(1) Update of genre code table and program property code table

   a. Areas which are defined is not updated. Areas are only added.

   b. When describing contents to define each table, maximum length of characters are set to 20 characters. Maximum length of characters for updated data is also set to 20 characters.

   c. For program property code, this is applicable only when content_nibble is 0xE0. In addition, actual display is assumed for wording for character information.

(2) Update of reserved words

   a. Areas which are defined is not updated. Areas are only added.

b. The length of reserved words is 8 characters and no more than 16 bytes. This is also applicable to updated data.

c. The reserved words refer to the item name which is coded in the extended format of the event descriptor in SI and hence shall not be coded.

(3) Update of logo data

a. Logo data can be added and defined logo data can be changed.

b. Logo data is compressed by a service provider. The upper limit of data size after compression is set to 1/2 for the large logo and to 3/4 for the small logo. In addition, it is also possible for multiple items of service_id to share one logo data. For BS, the number of service providers and services which are assumed for the BS-5 satellite stage are also taken into account. Hence, the number of services and logo data types which should be retained in non-volatile memory is set to 1,000 and 300, respectively. For the broadband CS, the number of services and logo data types is set to 400 and 200, respectively. Logo data is managed in the receiver based on the logo ID (9 bit). All six logo types use one logo ID in common. The logo ID is unique in the BS or in the broadband CS.

c. Table 4-1 shows the size patterns of the logo.[1,2] In addition, the logo data for services which are not listed in the NIT cannot be sent.

Table 4-1 Size patterns of the logo mark to be transmitted (logo type)

Type of a logo mark	Vertical dot number	Horizontal dot number	Horizontal to vertical ratio of the assumed image element	Horizontal to vertical ratio for display	Logo_type value	Memory byte needed for one logo
HD large	36	64	Square pixel	9 : 16	0x05	1152
HD small	27	48	Square pixel	9 : 16	0x02	972
SD4:3 Large	36	72	1.118 : 1	9 : 16	0x03	1296
SD4:3 Small	24	48	1.118 : 1	9 : 16	0x00	864
SD16:9 Large	36	54	1.118 : 1.333	9 : 16	0x04	972
SD16:9 Small	24	36	1.118 : 1.333	9 : 16	0x01	648

Design and color shall be the same in the service even when the size pattern is different. Colors which can be used to design logo data shall be common fixed colors (128 colors). Colors other then these colors cannot be used.

Logo mark data before compression is expressed by setting color for 1 dot at 8 bit. A fixed color pallet in which the common fixed colors are defined is used. Here, a color value for 1 dot is converted to that of the color actually displayed. The common fixed colors and color pallet is conformant to “Common fixed colors and Conversion Table (Third volume Adhoc#3)”.

“PNG” is used to compress the logo mark. PNG is defined in the “W3C Recommendation 10/01/1996 Version 1.0” and implemented based on the following format.

[1] 960x540 is assumed for the logo size pattern for HD as screen resolution.
[2] For the 720P format, the same logo size pattern as HD is used.

1) Chunks to be used shall be only IHDR, IDAT, and IEND.

2) IHDR shall be described as follows:

Width:	4 bytes	Horizontal dot number is described.
Height:	4 bytes	Vertical dot number is described.
Color depth:	1 byte	This is set to 8 in operation.
Color type:	1 byte	This is conformant to the third volume.
Compression method:	1 byte	This is set to 0 in operation.
Filtering method:	1 byte	This is set to 0 in operation.
Interlace method:	1 byte	This is set to 0 in operation.

d. When there is any change in the logo ID, reference service ID, or logo data, all the logo is transmitted. The updated result is transmitted, not a difference between the original data and updated data. In addition, for the log ID, whose reference service ID has disappeared due to updating, data is replaced when it is reused.

Example 1) When the logo with (logo ID; 10, reference service ID; A, B, C, logo data; X) is changed to that with (logo ID; 10, reference service ID; A, logo data; X) and (logo ID; 11, reference service ID; B, C, logo data; Y), data to be downloaded will be the logo with (logo ID; 10, reference service ID; A, logo data; X) and (logo ID; 11, reference service ID; B, C, logo data; Y).

Example 2) When the logo with (logo ID; 10, reference service ID; A, logo data; X) and (logo ID; 11, reference service ID; B, C, logo data; Y) is changed to that with (logo ID; 10, reference service ID; A, B, logo data; X), data to be downloaded will be the logo with (logo ID; 10, reference service ID; A, B, logo data; X).

5 Guidelines for the Download Transmission

5.1 Transmitting announcement information

SDTT (Software Download Trigger Table) should be used for announcing the download schedule. The network through which the download data is transmitted should be designated (by using original_network_id) within the SDTT that is deployed on all the transport streams. The receiver moves to the specified network based on the SDTT that is obtained. In the BS and broadband CS digital broadcast services, download contents are transmitted only with network_id=0x0004.

5.1.1 Transmission path

Same as Part 1.

5.1.2 Operation of the SDTT (Software Download Trigger Table)

original_network_id which is used to transmit download contents, ts_id, and service_id that are described in the SDTT should be limited to 0x0004, 0x4031, and 929 respectively at the moment.

The maximum length of each section in the SDTT is 4096 bytes. The multi-section in each sub table should be allowed when the receiver software is updated, provided that the total number of sections including the receiver software update data and common data in all receivers should be 180 at the maximum.

5.1.2.1 For receiver software update

Same as Part 1.

5.1.2.2 For common data in all receivers

The sub table for the common data in all receivers consists of a single section. The number of loop for the schedule information should be 0. The SDTT should be sent only when the carousel is being sent that transmits the download contents. The download of the common data in all receivers should be treated as a model named “common to all the receivers.” Therefore, those marker_id and model_id should be used that represent “common to all the receivers” (i.e., 0xfffe[3] for the BS and 0xfffc4 for the Broadband CS).

Operation of version_id is described in the section 5.1.4.2.group_id should always be “0” and no operation of group_id should be performed for common data common in all receivers.

The number of download contents descriptor (num_of_contents) should be “1.”compatibility_flag and text_info_flag in the download contents descriptor should be basically “0”, and these information can be ignored by receivers. Description in module_info_byte is the same as moduleInfoByte in DII, in which only the Name descriptor should be basically overlaid while other descriptors can be ignored by receivers. The private data length should be basically “0”, and this information can be ignored by receivers. In addition, add_on in the download contents descriptor should be always “0”, which should not be operated.

5.1.3 Send cycle, transmission capacity

Same as Part 1.

5.1.4 Updating the SDTT

Same as Part 1.

[3] For example, common data in all BS-dedicated receivers (BS logos, etc.) and common data in all receivers for all media (genre code (content_nibble), etc.).
[4] For example, common data in all Broadband CS-dedicated receivers (CS logos, CS specific genres (user_nibble), etc.) and common data in all receivers for all media (genre code (content_nibble), etc.).

5.1.5 TS packetization and transmission rules of the SDTT

Same as Part 1.

5.1.6 Version number

Same as Part 1.

5.2 Transmitting download contents

Same as Part 1.

5.2.1 Transmission path

original_network_id which is used to transmit download contents, ts_id, and service_id should be limited to 0x0004, 0x4031, and 929 respectively at the moment.

5.2.2 Transmission capacity

Same as Part 1.

5.2.3 Implementation time, implementation period, send cycle

Same as Part 1.

5.2.3.1 For receiver software update

Same as Part 1 except for Figure 5-2.

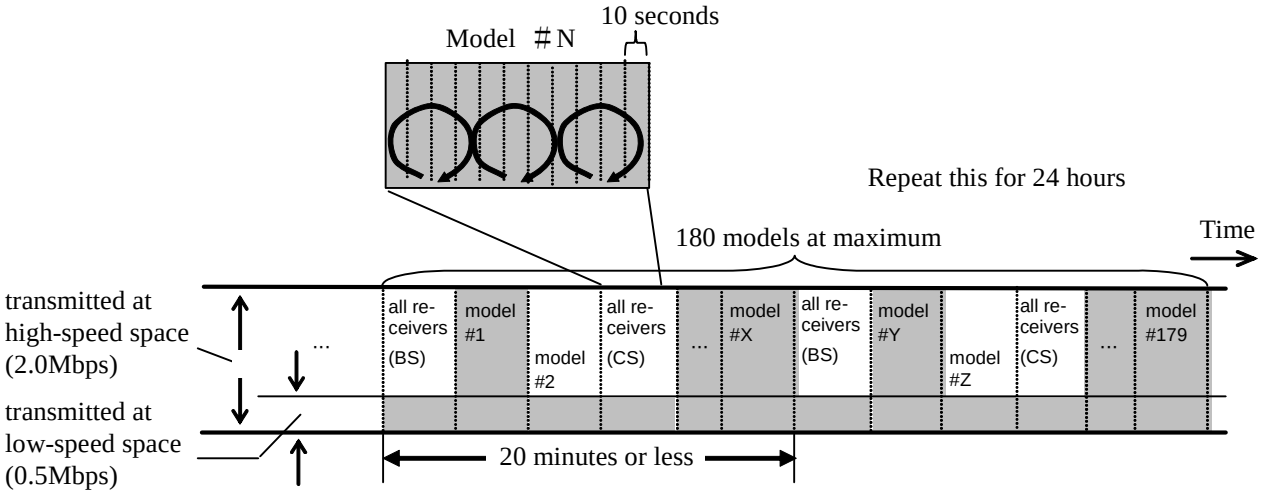


Figure 5-2 Reference model of the download contents transmission schedule

(Sample schedule when common data in all receivers, model #2, and model #Z are transmitted at low-speed and the others are transmitted at high-speed)

5.2.3.2 For common data in all receivers

Same as Part 1.

5.2.4 Assigning PID, tag values to download contents

Two types of value pairs of PID and tag values of download contents are used for common data in all receivers and eight types of those are used for the receiver software (total of 10 types of PID-tag value pairs) to ensure that the download contents shall be captured by receivers.

Download contents for common data in all receivers may be sent consecutively.

Eight types of PID-tag value pairs are assigned to the receiver software for each model in the order of transmission in a cyclic manner.

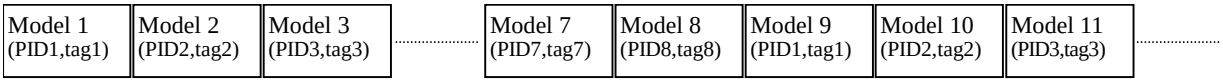


Figure 5-4 Assigning PID-tag value pairs (without common data in all receivers)

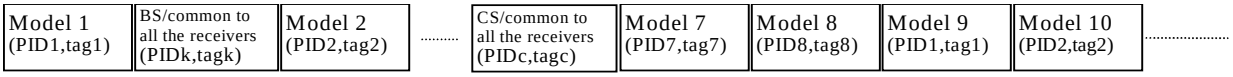


Figure 5-5 Assigning PID-tag value pairs (with common data in all receivers)

If the number of models to be updated is eight or less, insert the dummy as described below. A dummy should be 10 seconds and be a null packet, a packet containing only adaptation field, or a packet of blank carousel.

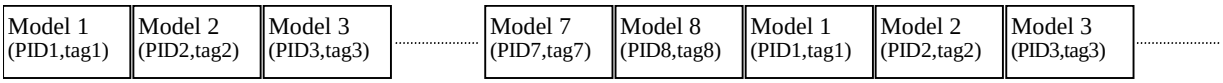


Figure 5-6 Assigning PID-tag value pairs when the number of models to be updated is eight or less

If the number of models to be sent is not a multiple of 8, dummies should be sent so that the number of models is a multiple of 8, repeatedly.

Example) If the number of models is 70, two dummies (PID7, PID8) should be sent, which should be repeated at 72.

Also use dummies to adjust so that the PID-tag value pairs shall be assigned in a cyclic manner for daily contents.

5.2.5 Configuration of the module and carousel

Same as Part 1.

5.2.6 Operation of DII (DownloadInfoIndication)

5.2.6.1 For receiver software update

Same as Part 1.

5.2.6.2 For common data in all receivers

Transmission of compatibilityDescriptor to specify the model to be downloaded is required in order to ensure download reliability and transmit module information. Values of maker_id, model_id, version_id, group_id, and download_id should be the same as those in the SDTT. Type descriptor should be omitted and Name descriptor should be required in ModuleInfobyte. Value of version shall be complied with Section 5.1.4.2. Table 5-2 shows the naming rule of the Name descriptor and Table 5-3 shows the relationship between the Name descriptor and logo data in case of logo data.

Table 5-2 Relationship between the Name descriptor and download contents

Download contents	Name descriptor	Remarks
Genre code table	GENRE	See Table 5-4 (use content_nibble)
Program property code table	FEATURE	See Table 5-5.
	KEYWORD	See Table 5-6.
Reserved word	LOGO-xx	See Table 5-3 and 5-6.
Channel logo		Where “xx” is logo_type.
CS genre code	CS_GENRE	See Table 5-4 (use user_nibble)
CS reserved word	CS_KEYWORD	See Table 5-6.
CS channel logo	CS_LOGO-xx	See Table 5-3 and 5-6.
		Where “xx” is logo_type.

Table 5-3 Relationship between the Name descriptor and download contents for logo data

Logo type	Name descriptor
HD large	LOGO-05
HD small	LOGO-02
SD4:3 large	LOGO-03
SD4:3 small	LOGO-00
SD16:9 large	LOGO-04
SD16:9 small	LOGO-01
CS_HD large	CS_LOGO-05
CS_HD small	CS_LOGO-02
CS_SD4:3 large	CS_LOGO-03
CS_SD4:3 small	CS_LOGO-00
CS_SD16:9 large	CS_LOGO-04
CS_SD16:9 small	CS_LOGO-01

5.2.7 Operation of DDB (DownloadDataBlock)

Same as Part 1.

5.2.7.1 For receiver software update

Same as Part 1.

5.2.7.2 For common data in all receivers

Table 5-4, Table 5-5, and Table 5-6 show data format for the genre code table, program property code table, reserved word table, and logo data.

Table 5-4 Syntax of the genre code table and program property table

Data structure	Number of bytes
CommonTableDataModule(){	
number_of_loop	1
for(i=0; i< number_of_loop; i++){	
table_code	1
level_1_name_length	1
for(j=0; j<level_1_name_length; j++) {	
name_char.	1
}	
level_2_name_length	1
for(j=0; j< level_2_name_length; j++) {	
name_char.	1
}	
}	
}	

number_of_loop (number of code loops): Indicates number of loops of the subsequent code information.

table_code (code): Indicates the content code that is newly specified.

For the genre code table, for example, one byte data including the major division and medium division. For the program property table, for example, one byte data including the major division and medium division.

level_1_name_length (length of the major division): Indicates the number of bytes of the subsequent major division name. If adding only a medium division, this value should be “0” and the major division name shall not be coded.

name_char. (description of the major division): Name of the major division is described in a set of text information fields. Coding of characters should follow the coding rule of character strings for SI. See the SI/EPG document for character coding.

level_2_name_length (length of the medium division): Indicates the number of bytes of the subsequent medium division name.

name_char. (description of the medium division): Name of the medium division is described in a set of text information fields. Coding of characters should follow the coding rule of character strings for SI.

Table 5-5 Syntax of the download data block for the reserved word table

Data structure	Number of bytes
KeywordTableDataModule(){	
number_of_loop	1
for(i=0; i< number_of_loop; i++){	
name_length	1
for(j=0; j<name_length; j++) {	
name_char.	1
}	
}	
}	

number_of_loop (number of loops): Indicates number of loops of the subsequent reserved word information.

name_length (length of the reserved word name): Indicates the number of bytes of the subsequent reserved word name.

name_char. (description of the reserved word name): Contents of the reserved word are described in a set of text information fields. Coding of characters should follow the coding rule of character strings for SI.

Table 5-6 Syntax of the download data block for the logo data

Data structure	Number of bytes
LogoDataModule(){	
logo_type	1
number_of_loop	2
for(i=0; i< number_of_loop; i++){	
logo_id	2
number_of_services	1
for (j=0; j<number_of_services; j++) {	
original_network_id	2
transport_stream_id	2
service_id	2
}	
data_size	2
for(j=0;j< data_size; j++) {	
data_byte	1
}	
}	
}	

logo_type (logo type): Indicates the type of the logo. See Table 4-1 for logo_type.

number_of_loop (number of loops): Indicates number of loops of the subsequent logo information.

logo_id (logo ID): Value to identify the logo data in the receiver. The upper 7 bits are reserved and the ID value is assigned to the lower 9 bits (TBD). All the reserved bits should be set to "1."

number_of_services (number of services): Number of services that use the subsequent logos. This allows multiple services to share a single logo.

original_network_id (original network ID): Designates the original network that uses the logo data.

transport_stream_id (transport ID): Specify transport stream that uses the logo data. Specify "0xffff" when transmitting the network logo.

service_id (service ID): A unique ID that corresponds to the service. Specify "0xffff" when transmitting the network logo.

data_size (logo data size): Indicates the number of bytes of the subsequent logo data. If this value is "0", the logo data of the specified service_id should be deleted.

5.3 Send timing of the announcement information and download contents

Same as Part 1.

5.4 Emergency stop of the information update service within the receiver

Same as Part 1.

5.5 Suspension of the information update service within the receiver

Same as Part 1.

5.6 Operation of the summer time

Same as Part 1.

5.7 Security

Same as Part 1.

6 Receiver Guidelines for Receiving Downloads

6.1 Memory specification

(1) Ensure the sufficient memory buffer that allows the specified transmission rate in order to receive the announcement information and download software.

(2) Ensure the memory space for the common data in all receivers (genre code table, program property code table, reserved word table), specifically, 10 kilo bytes for the BS receiver, 30 kilo bytes for BS and

broadband CS digital-broadcasting dual-purpose receiver, and 40 kilo bytes for the terrestrial, BS and broadband CS digital-broadcasting tri-purpose receiver. However, memories for the genre code table, reserved word table, and program property code that are operated in all the transmission media in common can be shared. For details, see Section 6.3 “Guidelines for receiving common data with dual/tri-purpose receivers. ”Also ensure the memory space that is required for the logo data. It depends on the implementation of the receiver which logo data from among the six types that are transferred should be obtained. Table 6-1 shows the required memory space by logo types.

(3) As a countermeasure for the error encountered in the download process for updating the receiver software during the bug fix, a 2-bank memory module that uses two banks of non-volatile memory to allow to restore the state before downloading, or a 1-bank + alpha memory module that has a bank of rewrite area for downloading and resides a built-in program on the memory should be employed.

(4) The logo data store area that is no longer used by other services might be overwritten to add new logo data for a new service in the future.

Table 6-1 Size of the logo data

(Logo: 300 types for BS, 200 types for broadband CS, Number of services: 1000 for BS, 400 for broadband CS)

Type of the logo mark	BS	Broadband CS
HD large	354 KB	234 KB
HD small	300 KB	198 KB
SD4:3 large	397 KB	262 KB
SD4:3 small	267 KB	176 KB
SD16:9 large	300 KB	198 KB
SD16:9 small	202 KB	133 KB

Calculation: For example, the number of bytes per logo in Table 4-1 “Size pattern (logo type) of the logo mark to be sent” is multiplied by 300, to which the reference table of 8-byte (original_network_id, transport_stream_id, service_id, and logo_id) multiplied by 1000 is added.

For hardware requirements and performance, see ARIB STD-B21 12.3.2 “Hardware requirements and performance.”

For implementation of the flash memory, see ARIB STD-B21 Appendix-3 5.1.1.3 “Implementation of the flash memory.”

6.2 Operation specification

Same as Part 1.

6.3 Guidelines for receiving common data with dual/tri-purpose receivers

6.3.1 Supporting media for the genre code, program property code, and reserved word

The genre code table is managed and operated with all the transmission media in common. As described in Volume 4, tables including the program property code and reserved word are uniformly managed by the terrestrial/BS/broadband CS broadcasting services. The respective codes, however, can be individually operated. The code that is operated only with one transmission media should be regarded as “Undefined” in other media, which means that the same code should not be operated separately as different contents.

6.3.2 Version control of the common data in receivers

When downloading the common data, dedicated receiver should be considered. When adding new codes that are commonly used with the terrestrial and BS/broadband CS broadcasting services, downloads should be provided via both transmission paths. If a new code is to be added to either one of the services, download should be provided only via the relevant transmission path. As the version number is controlled for the common data as a whole including the logo, genre code table, program property code table, and reserved word in the BS/broadband CS broadcasting, while it is controlled for the common data as a whole including only the genre code table, program property code table, and reserved word in the terrestrial broadcasting, the version number of the common data differs in terrestrial and BS/broadband CS broadcasting services. Therefore, for BS/broadband CS dual-purpose digital receivers, only the versions for the BS/broadband CS digital-broadcasting services may be controlled, while for terrestrial/BS/broadband CS tri-purpose digital receivers, common data versions of both services must be separately controlled.

6.3.3 Download operation

For the BS/broadband CS digital-broadcasting dual-purpose receivers, common data versions of the BS digital broadcasting is controlled and the download is performed when the contents with version upgrade are distributed.

For the terrestrial/BS/broadband CS digital-broadcasting tri-purpose receivers, common data versions of both terrestrial and BS/broadband CS broadcasting services are controlled, and download is performed from the respective transmission media when the contents with version upgrade are distributed.

The common data table within the terrestrial/BS/broadband CS digital-broadcasting tri-purpose receivers holds only a single table common to all the media and manages and accumulates the downloaded common data by merging them. If, however, the code that is operated only with the terrestrial digital broadcasting is used in SI of the BS/broadband CS digital-broadcasting by mistake, or in case of vice versa, operation of the receiver should be committed to the product planning.

7 Operation Guideline for the Information Update Services in the Receivers

7.1 Guideline for uploading

7.1.1 Submission of the download software

Same as Part 1.

7.1.2 Quality check

Same as Part 1.

7.1.3 Data management of common data in all receivers

Same as Part 1.

7.1.4 Creation and distribution of announcement information

Same as Part 1.

7.1.5 Scope of responsibility

Same as Part 1.

7.1.6 Download cost

Same as Part 1.

7.1.7 Fare-paying service of download

Same as Part 1.

7.1.8 Preliminary test wave transmission of download

In case of updating a receiver software, test can be conducted by specifying model_id or version_id of the target that is not marketed.

In case of data common to all the receivers, test can be conducted by specifying maker_id and model_id to 0xfffd for BS, and 0xfffb for the broadband CS.

7.2 Engineering service

Same as Part 1.

Volume 2

Function Specification for BS and Broadband CS Digital-Broadcasting Dual-Purpose Receiver

Contents

(This page is intentionally left blank.)

1 Introduction

1.1 Preface

This volume describes function specifications mainly for the broadband CS digital-broadcasting reception function of a BS and broadband CS digital-broadcasting dual-purpose receiver. The broadcasters that provide broadband CS digital-broadcasting services should assume that the function specifications for the reception function described herein are the standard. The priorities set by broadcasters regarding function specifications (mandatory: A, optional: B) are shown in the table below.

It depends on the product planning of each manufacturer whether or not to install functions as defined, to provide equivalent functions using methods other than those specified, or to install functions beyond those specified in this specification. There are no restrictions in this regard. However, broadcasters should be aware that such non-compliance with this specification may result in a problem.

Broadcasting programs in Japan provided through various services involves various rights such as copyrights and neighboring copyrights. It is important to establish a comprehensive system to protect these rights to contents for the purpose of providing high quality programs and promoting sound development and progress of broadcasting. From this perspective, it is desired that receivers are designed to ensure the uniqueness of broadcasting programs and that programs are presented as intended.

For more information about ensuring uniqueness, see Section 7.3, "Broadcasting Programs and Guarantee of Uniqueness of Contents," Volume 2, Part 1.

Table 1-1 Priority of receiver functions

Contents of the receiver function specification	BS digital-broadcasting reception function		Broadband CS digital-broadcasting reception function	
	Priority	Comments	Priority	Comments
4 User Interface Requirements				
4.1 Prerequisite System	A		A	
4.2 Remote Controller	A		A	
4.3 Time Management	A		A	
4.4 EPG				
4.4.1 Common Element	A		A	
4.4.2 Program Guide	A		A	
4.4.3 Program Search	B	Extended genre codes for broadband CS are not supported.	B	
4.4.4 Program Information Display	B		B	
4.4.5 Programming Display	B		B	
4.5 Program Channel Selection	A		A	
4.5.1 Channel Selection	A		A	
4.5.2 Program Guide	A		A	
4.5.3 Switching Network	A		A	
4.6 Changing Image/Voice/Subtitle	A		A	
4.7 Compatibility with Various TV Broadcasting Mode				

4.7.1 Reception of Hierarchical Modulation Transmission	A/B	Reception = A, Automatic switching = B (Manual switching is acceptable.)	-	The support of this item is not planned for broadband CS digital broadcast.
4.7.2 Reception of Emergency Warning System (EWS)	B		B	
4.7.3 Reception of Temporary Service	A		A	
4.7.4 Reception of Event Relay	B		B	
4.7.5 Reception of Multi-view TV Broadcasting Service	B		B	
4.7.6 Reception of CA Alternative Service	B		A	
4.7.7 Reception of Bookmark Service				
4.7.7.1 Reception of Bookmark Writing Service	B		A	Writing to NVRAM is mandatory.
4.7.7.2 Reception of Bookmark List Service	B		A	Optional if the application is installed in the receiver.
4.7.7.3 Bookmark Function in Receiver Application	B		B	
4.8 Reception of Data Broadcasting Service	A		A	
4.9 Reception of Interactive Data Broadcasting Service	A	*1)	A	*1)
4.10 Reception of Subtitles and Captions	A	Captions, being used for flash news, have high priority.	A	Captions, being used for flash news, have high priority.
4.11 Programming	B		B	
4.12 Conditional Access Service	A	*1)	A	*1)
4.13 User Setting Function				
4.13.1 Secret Number	A		A	
4.13.2 Parental Control Level	A		A	
4.13.3 Antenna Setting	A/B	Manual setting = A C/N display = B	A/B	Manual setting = A C/N display = B
4.13.4 Aspect Ratio of TV To Be Connected	A		A	
4.13.5 Settings of Telephone Line	A	*1)	A	*1)
4.13.6 Setting of Audience Residential Area	A		A	
4.13.7 PPV Purchase Limit	B		B	
4.13.8 Download Permit Setting	A		A	
4.13.9 Caption Display Selection	B		B	
4.13.10 Clear Function of Personal Information	A		A	
4.14 Error Message	A		A	
4.15 Bulletin Board Information	TBD		A	
5 Hardware and Software Requirements				
5.1 Tuner	A		A	
5.2 TS Decoder	A		A	
5.3 Graphic Image Decoding Process and Output	A		A	

5.4 Voice Decoding Process and Output	A	B for digital audio output.	A	B for digital audio output.
5.5 Memory	A		A	
5.5.1 RAM	A		A	
5.5.2 NVRAM	A		A	
5.6 Character Font	A		A	
5.6.1 Data Broadcasting Service	A		A	
5.6.2 EPG	A		A	
5.7 Receiver Preinstalled Sound	A		A	
5.8 High-speed Digital Interface	B		B	
5.9 CA Module Interfaces	A	See Volume 5.	A	See Volume 5.
5.10 Copy Control				
5.10.1 Analog Video Output	A		A	
5.10.2 Digital Audio Output	(A)	A if installing digital audio output function.	(A)	A if installing digital audio output function.
5.10.3 High-speed Digital Interface	(A)	A if installing a high-speed digital interface.	(A)	A if installing a high-speed digital interface.
5.10.4 Digital Video Output	(A)	A if installing digital video output function.	(A)	A if installing digital video output function.
5.10.5 Digital Video/Audio Output	(A)	A if installing digital video/audio output function.	(A)	A if installing digital video/audio output function.
5.11 Download Functions	A		A	
5.12 Receiving Services at Shipping	A		A	
5.13 System Test	A		A	
5.13.1 IC Card Test	A		A	
5.13.2 Telephone Line Connection Test	A	*1)	A	*1)
5.14 Accumulation Function	B		B	
5.15 Others				
5.15.1 Screen Display Priority	A		A	
5.15.2 Processing Priority in Power Stand-by Mode	A	*1)	A	*1)
5.15.3 Reset Button	B		B	
5.15.4 RGB Analog Terminal	B		B	
5.15.5 Digital Video Terminal	B		B	
5.10.5 Digital Video/Audio Terminal	B		B	
6 PSI/SI Operation Specifications for Partial TS Output	(A)	A if installing a high-speed digital interface.	(A)	A if installing a high-speed digital interface.

*1) The priority of this function conforms to Table 1-1, Volume 2, Part 1.

1.2 Purpose

This volume provides the specifications for a BS and broadband CS digital-broadcasting dual-purpose receiver that conforms to the ARIB STD-B21, "Receiver for Digital Broadcasting."

1.3 Scope

This specification applies mainly to the broadband CS digital-broadcasting reception function of a BS and broadband CS digital-broadcasting dual-purpose receiver.

2 Related Documents

Same as Part 1.

3 Definitions

BS digital tuner	BS digital tuner is defined as the equipment with the function to extract a channel from IF signals, demodulate the carrier, select and decode a program and output baseband signals, which supports the reception of BS digital broadcasting in a frequency band of 11.7 GHz to 12.2 GHz. It is also known as the STB or IRD.
BS and broadband CS digital-broadcasting dual-purpose receiver	BS and broadband CS digital-broadcasting dual-purpose receiver is defined as the equipment with the function to extract a channel from IF signals, demodulate the carrier, select and decode a program and output baseband signals, which supports the reception of both BS digital broadcasting in a frequency band of 11.7 GHz to 12.2 GHz and broadband CS digital broadcast in a frequency band of 12.2 GHz to 12.75 GHz with a frequency bandwidth of 34.5 MHz.
CA alternative service	CA alternative service is a service that directs viewers to "Information channels" operated by broadcasting companies when scrambled channels are selected and the viewer is not a subscriber to the service.
Bookmark writing service	Service to broadcast "bookmark writing contents" with the following features: - Present bookmark icons with the timing that has been specified in the contents, following the broadcast contents. - According to the buttons pressed by the viewer, write the URI, etc. of the channel broadcasting related information to the contents that are currently displayed to the bookmark area of NVRAM.
Bookmark list service	Service to broadcast "bookmark list display contents" which have the following features: - Display bookmarked items as a list. - When viewers select a desired bookmark from the list, obtain the URI from NVRAM bookmark information and select the channel that broadcasts detailed information. - Provides viewers with a bookmark management function.
PSI	Program Specific Information:PSI is defined as information (comprised of four tables: PAT, PMT, NIT and CAT) necessary to select specific programs. PSI is defined by the MPEG system standard and the Ministry of Internal Affairs and Communications ordinances.
SI	Service information:SI is defined as various information designed to improve the convenience of program selection. SI is defined by the Ministry of Internal Affairs and Communications ordinances and specified by the ARIB standard. The information also includes MPEG-2 PSI information in addition to an expansion of the AIRB standard.
EPG	Electronic Program Guide:EPG is defined as the program information displayed by receiver units using the SI information transmitted by each broadcasting station to be used when selecting a program.

ES	Elementary Stream:ES is defined as the coded video, audio or independent data in PES packet. One ES is carried in a sequence of PES packets with the same stream ID.
Direct channel selection	Direct channel selection is defined as one of the methods for selecting a channel on the receiver. Number buttons on the remote controller of the receiver are used to directly specify a service ID in order to select a service.
Up/down channel selection	Up/down channel selection is defined as a method for selecting a channel using the UP/DOWN buttons on the remote controller. Pressing the UP/DOWN buttons puts the services in the order of service_id.
One-touch channel selection	One-touch channel selection is defined as one of the methods for selecting a channel on the receiver. Pressing a button on the remote controller to which a service provider or a service is assigned enables direct selection of the service.
Subtitle	Subtitle is defined as the service of captioning on TV video broadcast such text related to the broadcast contents.
Caption	Caption is defined as the service of captioning asynchronous subtitles to the main video, audio, and independent data. Possible contents are flash news, service information, time signal, etc.
Hierarchical modulation	Hierarchical modulation is defined as a transmission method consisting of a combination of TC8PSK or such high-capacity transmission methods and QPSK or BPSK or such low C/N transmission methods.
Emergency warning system (EWS)	Emergency warning system is used for disaster broadcasts. The start control signal, for example, is used to forcibly start receiver units to receive the broadcasts.
Temporary service	Temporary service is defined as the service provided temporarily on a channel other than ordinary service channels. Ordinary service is not provided and this services is provided only temporarily.
Multi-view TV	Multi-view TV is defined as a method of switching between multiple combinations of video and audio signals provided in one service, each of which as intended by a broadcasting station.
CAS	Conditional Access System:CAS is defined as a system that controls reception of services (service channels) and events (programs). CAS is indispensable for broadcasting chargeable programs and protected free programs.
PPV	Pay Per View: PPV is the system for chargeable broadcasting, in which viewers pay for individual program or program group according to their viewing style.
Bulletin board information	Bulletin board information is defined as a broadcast message transmitted to each network of viewers. A viewer's operation returns a list of bulletin board information titles transmitted on the network during reception and displays the bulletin board information for a message selected by the viewer.
IEEE1394	IEEE Std 1394-1995: A serial bus interface suited for high speed, real-time transfer, standardized by the IEEE Standard for a High Performance Serial Bus.
Partial TS	Partial Transport Stream:Partial TS is defined as a bit stream obtained by removing transport packets that do not relate to specially selected one or more programs from MPEG transport packets.
SIT	Selection Information Table:SIT is a table that lists partial TS stream information and the information regarding services and events transmitted in the stream.
DIT	Discontinuity Information Table:DIT is a table inserted at the transition point where the partial transport stream becomes discontinuous.
CGMS	Copy Generation Management System: CGMS is defined as generation management information and system used for copy control. Generation management refers to a method of managing contents using copy control information consisting of three major classifications: Copy Free, Copy Once, and Copy Prohibited.

Macrovision	Macrovision is a copy control technology developed by Macrovision Corporation. This system enables normal display of an image if a display is connected but prevents normal recording if a recorder is connected (by deteriorating the image quality significantly). This technology makes use of two methods: pseudo-sync pulses and color stripes.
VESA	Video Electronics Standards Association: A group that defines and promotes the standards for displays and display interfaces.
DVI	Digital Visual Interface:An interface standard specified by the DDWG.
DDWG	Digital Interface Working Group: An industry group that promotes the standardization of digital interfaces.
HDCP	High-bandwidth Digital Content Protection: The content protection system for transmitting digital video signal and digital video/audio signal according to DVI or HDMI.
HDMI	Hi-Definition Multimedia Interface: A digital interface standard specified by the HDMI founder.
DTCP	Digital Transmission Content Protection: The content protection system based on authentication and encryption for transmitting and recording content via a digital interface.
Protected free program	Protected free program is defined as a free program for secure content transmission that ensures content right protection without customer management.
DLNA	Digital Living Network Alliance: A group that defines and promotes the implementation guidelines for home network equipment.

4 User Interface Requirements

4.1 Prerequisite System

BS digital broadcasting receiving system targeting entire area in Japan as service coverage after launching geostationary orbit satellite BS-4 of which orbital location is at longitude 110 degree east.

In reference to the specification and operation of broadcasting signal to be received by the receiver based on this guide, see ARIB STB B32 “Video Coding, Audio Coding and Multiplexing Specifications for Digital Broadcasting” and Part 2 Volume 7 in this guide.

In addition, it should equip a function that can distinguish the signal defined as broadcasting signal based on “ARIB STD-B21 Figure 13-1 Identification Flow of Broadcasting/Non-broadcasting” by the system management descriptor to be delivered by PSI.

4.2 Remote Controller

It is desirable to be able to control the main functions of receiver with a remote controller (hereinafter referred to as RC) operation. RC button has devices to realize the functions shown below in addition to the specification listed in “ARIB STD-B21 5.2.17. Remote Controller and Channel Access (1) Necessary buttons”. Here shows suggested example of RC, but this does not restrict additional buttons to be put in.

1) Basic Operation
   - Power button for turning the receiver ON/OFF (stand-by).

- Button for moving the cursor UP/DOWN/LEFT/RIGHT. (Arrow Button)
  (Operation is supported by joystick as well.)
- Button for confirming the item where a cursor is positioned as a selected item. (Enter Button)

2) Channel Selection
- Network switch button. (For the single button, switch by toggling in the order of network ID is supported for the entire network.)
- Numeric button used for selecting channels by inputting channel number. (10 keys)
- Channel UP/DOWN button.
- A one-touch button that allows users to select the pre-set service ID with a single operation. *1
  (For example, 12 among A to L.)

3) Operation of EPG and Menu
- Button for displaying program list. (EPG Button)
- Button for system menu display. (Menu Button)

4) Data Broadcasting Service

See “Volume 3, 4.3 Remote Controller”.

Following buttons are used for the data broadcasting service.

Data button, arrow button, enter button, 10 keys, color button, and return button.

In reference to the color button, the order should be blue, red, green, and yellow from left to right. Additionally, in order to be able to identify the color by letter, provide a measure to put the letter of corresponding color such as B for blue, R for red, G for green, and Y for yellow.

5) Others
- Button for selecting corresponding image. (Image Button) *2
- Button for switching the voice ES and bilingual mode. (Voice Button)
- Button for switching subtitle ON/OFF and subtitle language. (Subtitle Button)

*1 One-touch button

In reference to the one-touch button, only the suggested example (A to L) will be shown here without specifying button display or order of button placement since a linkage with program list (newspaper and magazines) should be considered as well. Additionally, it is desirable to support the function that audience can customize the button after purchase.

*2 Image button

The following switching function will be accompanied. Implementation method is the product planning matter.

(1) Switching multiple TV services

Switch between the services simultaneously provided within the same TS using another service ID by the broadcasting company that provides the service being viewed with toggling operation.

(2) Switching special services

Switch between the special services simultaneously provided within the same TS by the broadcasting company that provides the service being viewed with toggling operation.

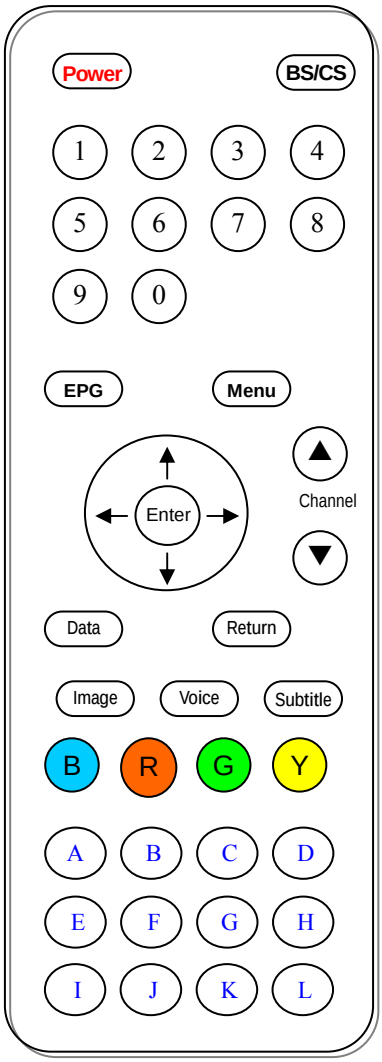
(3) Switching Main / Sub in multi-view TV

For the multi-view service being viewed, collectively switch the component grouped by component group descriptor.

(4) Switching image component

Switch the image component in the service being viewed in the case where component group is not specified or during the layer modulation.

RC example (For BS / Broadband CS digital tuner)



RC example (For BS Broadband CS built-in TV)

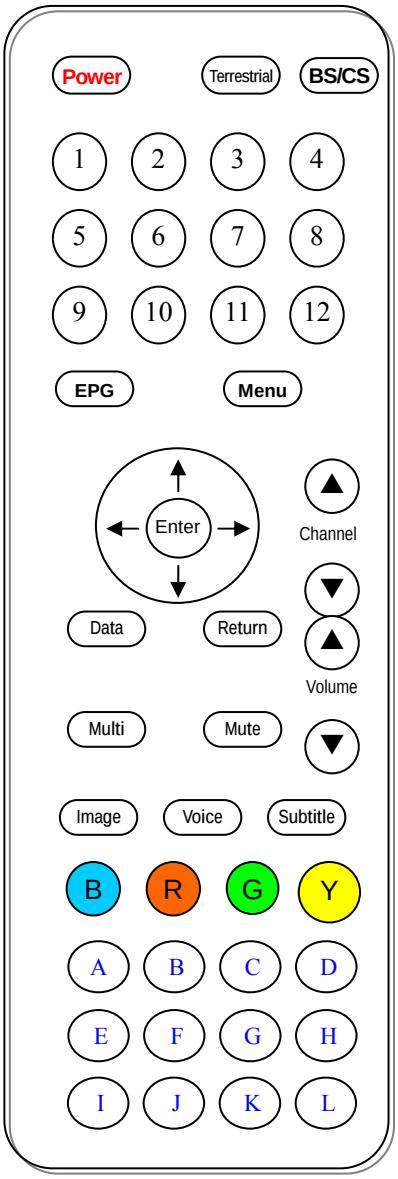


Figure 4-1 Remote Controller Example

4.3 Time Management

Same as Part 1.

4.4 EPG

4.4.1 Common Element

1) Interference for the operation of program selection due to the abnormal transmission of SI table should be avoided. Even if the SI information is not successfully delivered, PSI information should prevent the channel selection / display operation being interrupted.
2) When displaying the program across the media (TV broadcasting / voice broadcasting / data broadcasting), the applicable media type should be identified.
3) To display EPG in 8-bit CLUT index color character / plain graphics as with the data broadcasting display, use the receiver-dependent 32 colors and common fixed 128 colors as described in “Volume 3, 4.2.1 Resolution and Restriction of Each Plane Constituting Display Screen". Assigning receiver-dependent 32 colors is maker-dependent.

   <Reference: Assigning 8-bit CLUT Index Colors>

   See “Volume 3, 4.2.1 Table 1 Resolution of Screen Plane”.

   Common fixed color: 128 colors

   For the subtitle and logo, only the common fixed color can be used. The common fixed color can be used for EPG and data broadcasting service as well.

   Receiver-dependent color: 32 colors

   They are used for EPG and menu of receiver by a maker.

   Setting is maker-dependent.

   Contracted broadcasting company setting color: 96 colors

   They are used for the graphic characters of data broadcasting service by a contracted broadcasting company.

   The setting depends on each contracted broadcasting company.

   When EPG is displayed on the 8-bit CLUT subtitle plane by a receiver, the 128 colors other than the common fixed 128 colors can be freely selected. For receivers that display EPG on the plane other than subtitle plane or graphic character plane, or the receivers that support a function to display colors in higher resolution than 8-bit CLUT, the colors to be used for EPG can be freely selected.
4) During the display of EPG screen by SI information of all stations in BS, do not interrupt the image / voice for the program selected. It does not apply to the seamless EPG screen across the network in broadband CS or in the case of SI operation by short-cycle TS. For the EPG screen display method that will not interrupt the image, for example, there is a way to display the image by reducing its size or by covering image with the EPG image applying α blend.

Displaying data broadcasting service (excluding captions) screen as opposed to images, there may be an instance where EPG and graphic character display of data broadcasting service conflict each other. Therefore, when EPG screen is displayed, interruption for the data broadcasting service is permissible as long as it is not disrupting.

5) To display program listing and cross-sectional channel listing of contracted broadcasting companies, it is desirable to have the currently selected (being received) channel displayed at the most noticeable position on the screen.

6) It is desirable to have the service logo displayed on EPG screen as much as possible. The logo can be displayed by changing the size (number of vertical / horizontal dots) based on the logo data maintained, but it is important not to modify the original design as much as possible and keep the aspect ratio unchanged. It is also important to display the color without any modification.

   However, to display a service logo on the receiver EPG using the common fixed colors designated for service logo, which include transparent color (α value = 0) and semi-transparent color (α value = 128), the following processing will be permitted.

   - Transparent color: Process as non-drawing color. In other words, do not draw in the pixel where transparent color is assigned. It means that the OSD of EPG background can be seen through.
   - Semi-transparent color: Process as opaque color. In other words, in the pixel where semi-transparent color (α value = 128) is assigned, make a drawing treating the pixel as α = 255.

7) To store up all-station SI in the receiver, there might be an instance where obsolete information is displayed on EPG due to the difference between current time and the time when all-station SI was stored. It is desirable to note in the instruction manual of receiver such as “Due to a program change without advance notice, the EPG contents and actual broadcasting may not correspond”.

8) When caption is displayed by the service selected, it is desirable to keep the caption displayed even during the EPG screen display by SI information.

9) When the text_char area is omitted in the component descriptor as well as in the voice component descriptor, the default character will be “image” and “voice” respectively. However, for the dual-mono, it will be “Primary voice CR (line feed code) secondary voice”.

4.4.2 Program Listing

1) It should support the display of all programs of contracted broadcasting companies within the applicable network sent by SI. However, this does not apply to the unsupported programs for reception such as data broadcasting service.

2) Even a short program should always be displayed in some form to notify that the program exists.

3) For lengthy programs or a program over 24-hour period, the existence of these programs should be identified even any of the time slot in the broadcasting hours is displayed on EPG.

4) To display the program listing in the same format as TV / radio section of newspapers, it is desirable to follow the same format (10 characters per line in 2-byte characters) of newspapers.
5) Program name (program title + program subtitle) should be displayed in 40 characters for long-hour program. Mainly due to the display limitation, the case where it is cut off at 20 characters (less than 20 characters for the program under 30 minutes) is permitted.
6) Whether the program can be viewed with charge or free of charge should be displayed. It is desirable to display the applicable fee in some form for the program requires additional charge.
7) It is desirable to support the display of program attribute. The attribute here means image mode, voice mode, existence of additional data, subtitle, paid / free, digital copy enabled or not, and parental control, etc.
8) If program information is refreshed, it is desirable to display the accurate information on the program list as soon as possible.
9) Loop scroll is the most appropriate method of channel scrolling in the program list.
10) To display data broadcasting program in the program guide, keep the followings in mind.
    - Whether to combine or separate the data broadcasting program listing and TV broadcasting program listing depends on product planning.
    - For the data added programs, the program listing should show that there is a corresponding data broadcasting service.
    - In case there is a data program or local content subject to CA, indicate them in the program list display.

4.4.3 Program Search

1) It is desirable to equip a function for program search based on the genre of programs to be transmitted, using content_nibble_level_1 (major division) and content_nibble_level_2 (medium division) of content_descriptor as well as user_nibble_1 and user_nibble_2 of the extended genre code for broadband CS digital broadcasting. In this case, only the information by major division should be able to generate the program search.

4.4.4 Program Information Display

Same as Part 1.

4.4.5 Reserved Program Display

Same as Part 1.

4.5 Program Channel Selection

Basic operation of program selection is shown below, but this does not restrict the other methods of channel selection since this feature depends on product planning of a maker. However, it is desirable to design the user interface with the convenience of viewers in consideration such as implementing a function for up / down channel selection that enables viewers to select channels across the network.

4.5.1 Channel Selection

Same as Part 1.

4.5.2 Program Listing

Same as Part 1.

4.5.3 Switching Network

Switching between at least two networks in BS digital broadcasting and broadband CS digital broadcasting using network-switching button should be supported.

When the 3-digit service ID is entered using the 10 keys between the multiple networks in the broadband CS digital broadcasting, auto-switching the network should be supported if the transfer of such CH is across the network.

4.6 Changing Image / Voice / Subtitle

Same as Part 1.

4.7 Compatibility with Various TV Broadcasting Mode

4.7.1 Reception of Hierarchical Modulation

See “ARIB STD-B21 6.3 Receiver's Function of Hierarchical Modulation in Digital Satellite Broadcasting” and “Volume 7, 7.1 Operation of Hierarchical Modulation”.

- Required function for reception

(1) Demodulation of multiple modulation methods

(2) Invalidating high layer by monitoring error rate of 8PSK

(3) Decoding of low layer image and voice. However, the function for outputting the ones of same stream type in the high layer and low layer simultaneously will not be required.

(4) PSI monitoring and auto-switching the stream when the high layer is invalidated by layer transmission descriptor.

Whether to implement an auto-switching from the high layer to low layer will depend on product planning.

(5) Function for displaying that low layer is being received
(Message such as “It has switched to the low layer image mode".)

- Layer detection

(1) Receiver determines the layer level based on the error rate of 8PSK in 1-career or information of the same condition detected at the demodulation area. Evaluation of QPSK/BPSK error status is not indispensable.

(2) Identify if there is any hierarchical modulation using this information and layer transmission descriptor in the PMT to retrieve the layer-specific ESPID. Only this PMT has the information whether the current service uses the hierarchical modulation or not from the transmitter side, and it does not have other special information.

(3) Do not prevent the users from selecting the low layer intentionally using a function that enables users to select multiple ES.

* Transmitting still picture

Still picture by MPEG2 I-picture may be transmitted as MPEG-TS under the following conditions. In this case, the receiver should support the still picture display.

- I-picture is always accompanied with sequence header and end code.
- Video decode control descriptor is set for PMT and the value of still picture flag field is set to “1”.

4.7.2 Reception of Emergency Warning System (EWS)

Same as Part 1.

4.7.3 Reception of Special Service

Same as Part 1.

4.7.4 Reception of Event Relay

Same as Part 1.

4.7.5 Reception of Multi-view TV Broadcasting

Same as Part 1.

4.7.6 Reception of CA Alternative Service

See Volume 5.

- The function name when this function is explained to users in the instruction manual will be “Guide Channel Switch Function”.

4.7.7 Reception of Bookmark Service

4.7.7.1 Reception of Bookmark Record Service

See Volume 3.

4.7.7.2 Reception of Bookmark List Service

See Volume 3.

4.7.7.3 Bookmark Function in Receiver Application

Implementation of bookmark function as receiver-specific resident application is allowed.

Implementation entirely depends on product planning without any regulations. Example of implementation is shown below.

(1) Bookmark Record Function

The function that records address information (network id / service id / event id, etc.) of the data-broadcasting screen that is being received in the NVRAM bookmark area using a receiver application would be an example for this function. In this case, it should be able to merge the information recorded by bookmark record service.

(2) Bookmark List Display Function

- A function for viewing the bookmark information recorded at NVRAM bookmark area as list using a receiver application.
- A function that provides viewers with the method of selecting bookmark of their choice from the listings and enables an auto-select of channels by retrieving the URI from bookmark information.
- Management functions such as deleting bookmark.

4.8 Reception of Data Broadcasting Service

Same as Part 1.

4.9 Reception of Interactive Data Broadcasting Service

Same as Part 1.

4.10 Reception of Subtitles and Captions

Same as Part 1.

4.11 Programming

Same as Part 1.

4.12 Conditional Access Service

Same as Part 1.

4.13 User Setting Function

The screen where users can enable the following settings should be equipped. All set values will be stored in NVRAM, and BS digital broadcasting and broadband CS digital broadcasting will share the same information.

4.13.1 Security Code

Same as Part 1.

4.13.2 Parental Control Level

Same as Part 1.

4.13.3 Antenna Settings

Same as Part 1.

4.13.4 Aspect Ratio of TV To Be Connected

Same as Part 1.

4.13.5 Settings of Telephone Line

Same as Part 1.

4.13.6 Settings of Audience Residential Area

Same as Part 1.

4.13.7 PPV Purchase Limit

Same as Part 1.

4.13.8 Download Permit Settings

Same as Part 1.

4.13.9 Caption Display Selection

Same as Part 1.

4.13.10 Clear Function of Personal Information

Same as Part 1.

4.14 Error Message

In case an error of which cause is listed in the attached table occurs, display the error message and error code on the screen. In this case, display of error code during the reception of broadband CS digital broadcasting will be a requirement while its method (such as displaying as a part of message, etc.) will depend on product planning of each maker. Additionally, see examples of message in the below table for the message to be displayed. (It is not intended to enforce the use.) To display error code during the reception of BS digital broadcasting service, see Part 1, Volume 2, 4.14 Error Message in this guide.

In reference to the error messages and error codes concerning IC card, see Volume 5.

Table 4-1 Error Message and Error Code List

Cause	Example of Error Message Displayed on Screen	Error Code	Troubleshoot
Non-broadcasting program is selected.	This channel is not available because it is not a broadcasting channel.	E200	This channel (program) is not available.
Due to the weather condition such as rain or thunder, reception level is temporary weakened. Poor contact of antenna cable or connector.	It has switched to the low layered image.	E201	Once the received signal level is recovered, it will switch back to the high layered image automatically. Please standby. Check the antenna wire.
Reception is temporary interrupted by weather condition such as rain or thunder. Disconnection of antenna cable or connector. Incorrect antenna settings.	Signal cannot be received.	E202	Check the antenna wire. Check the antenna settings.
Core line of antenna wire is shorted out.	Please check the connection with antenna.	E209	Check the antenna wire.
Broadcasting time has ended.	(Note 1)	E203	Check the broadcasting hours with program guide.
The selected channel does not exist.	This channel does not exist.	E204	Check the channel with program guide.
Function of the receiver is not compatible with the service of channel selected.	This receiver cannot receive this channel.	E210	Select a different channel from the one that you have selected.
Connection or setting of telephone line is incorrect.	Connection to center has failed.	E301	Check the connection and setting of telephone line and try a conduction test.

(During playback of data broadcasting) BML document cannot be retrieved.	Data cannot be received.	E400	Select a different channel from the one that you are currently viewing and then turn to the data- broadcasting channel where the error occurred once again.
(During playback of data broadcasting) The BML engine of receiver does not support the version of BML document retrieved.	This receiver cannot display the data.	E401	End the data-broadcasting channel currently viewing and select another channel.
(During playback of data broadcasting) Execution error has occurred during the playback of contents. External reference data cannot be retrieved.	Data display has failed.	E402	Select a different channel from the one that you are currently viewing and then turn to the data- broadcasting channel where the error occurred once again.

(Note 1): In accordance with the inactive state of broadcasting described in “Part 2 Volume 7, 7.6 Handling of Inactive Broadcasting” in this guide, examples of error message are shown below.

(1) Example of the inactive-1 state error message will be “Broadcasting is not active”.
(2) An error message example in the inactive-2 state will be “The broadcasting cannot be received”.
(3) Example of the inactive-3 state error message will be “Broadcasting is not active”.
(4) An error message example in the no signal state will be “The broadcasting cannot be received”.

Additionally, if it is difficult to implement multiple error messages, the error message of (1) inactive-1 and (3) inactive-3 can be “The broadcasting cannot be received”.

When the receiver side can identify the cause of (2) inactive-2 and (4) no signal, it might be a good idea to display a supplemental message (such as “due to the degraded receive condition”) so that the viewers have better understanding in addition to the error message.

4.15 Bulletin Board Information

In reference to the NBIT transmission, see Volume 4.

In addition, this function is displayed as “board” for GUI. When this function is explained to users in the instruction manual, this function is described as "Notice from broadcasting station”.

- Overview

There is an instance where broadcast messages for viewers are transmitted per network unit by NBIT. The message by NBIT is intended to present announcement from broadcasting companies by user operation. Storage by receiver and notification of content change will depend on product planning.

- Receiver Function

The receiver should equip a function for user operation that receives NBIT transmitted through the network being received, shows the listing of bulletin information titles, and displays the description of bulletin information for the message selected by a viewer.

- Display Processing

The network to be displayed should be clearly indicated by displaying the network logo in order to avoid any confusion for the viewers. Transmit the bulletin information with an assumption that the title will be displayed at 20 characters across x 1 line and description of contents will be displayed at 20 characters across x 10 lines.

- Identification of Information

As information_type, service_id, content_nibble, and user_nibble may be granted. These are intended for the receiver to display a service logo or genre icon in a list, but whether to utilize this feature or their details will not be specified.

5 Hardware and Software Requirements

5.1 Tuner

- Install an IF input system.
- Tune to 10.678GHz, BS converter and Broadband CS converter's local frequency.
- See "ARIB STD-B21 5.2.1 to 5.2.5" for specifications of the tuner part.- See "ARIB STD-B21 5.2.6" for the front-end signal process.

5.2 TS Decoder

Same as Part 1.

5.3 Graphic Image Decoding Process and Output

Same as Part 1.

5.4 Voice Decoding Process and Output

Same as Part 1.

5.5 Memory

5.5.1 RAM

Same as Part 1.

5.5.2 NVRAM

- See Volume 1, 6.1 "Memory Rules" for the memory used for download of software and receiver common data.

- See Volume 3, 8.2 "The Operations of NVRAM Commonly Used by MM Services" for support for the data broadcast.
- See Volume 5, 4.3 "Memory" for the memory used for receiving mails.
- There are no limitations on implementing more NVRAM than mentioned above according to the product planning.

		BS and broadband CS digital-broadcasting dual-purpose receiver	
		for BS	for Broadband CS
data broadcasting	provider common area	1K byte	4K bytes 2K bytes x 2 networks
	provider specific area	20K bytes 1K byte x 20 providers	54K bytes 3K bytes x 18 providers
	bookmark storage area	30 or more bookmarks (basic information, extended information) The record format within NVRAM depends on receivers.	
CAS	EMM mail storage area	for both BS and Broadcast CS 20.48K bytes 800 bytes x 24 + 1.28K byte mail management area	
EPG	logo bitmap/genre code/reserved words etc.	product planning	

Note: Accommodations of future increases of BS transponders and the operation of Broadband CS left-hand circular transponder, and so on will be treated on product planning accordingly. They should be discussed separately as needed and be specified later on.

The accommodation scope for increases in the number of providers and services in relation to the operation changes within the currently allowed transponders should also be treated on product planning.

5.6 Character Font

Same as Part 1.

5.7 Receiver built in Sound

Same as Part 1.

5.8 Fast Digital Interface

Same as Part 1.

5.8.1 Output Control of Partial TS

Same as Part 1.

5.8.2 PSI/SI Table Operation Specifications for Partial TS Output

Same as Part 1.

5.8.3 IEEE1394 Control Commands

(1) Tuner Subunit Identifier Descriptor

- number_of_subsystem_labels

  Enables you to identify each satellite broadcasting (for example, BS/CS) by giving them their own subsystem_label. In the case of the receiver capable of processing multiple broadcasts, for Broadband CS receiver, input a value of corresponding CS network numbers plus 1 for the BS digital network.

- subsystem_label

  Enables you to list all receivable services by satellite broadcast types (for example, BS/CS), which allows the satellite broadcast receiver to distinguish each receivable broadcast services and notify them. For Broadband CS receiver, list all CS networks and the BS satellite broadcast.

  The length of the subsystem_label is fixed 9 character long and the value corresponds each Network ID. The characters which can be used are the ASCII alphanumerics. For BS digital broadcast, use subsystem_label=JPNBS0004 (0004 is the Network_ID). For Broadband CS, if there are two networks, use “JPNCS0006” and “JPNCS0007”.

(2) Tuner Status Descriptor

- searching, moving, no_RF

  While the searching flag is "1", the validity of tuner's set values such as network_id and service_id is dependant on the implementation of the receiver. When reading the Tuner's status information such as network_id/service_id of the Tuner_Status_Descriptor in order to know the tuning state, the controller should wait until the searching flag becomes "0".

- currently_available

  When the receiver cannot find the specified service on the network, after the tuning action to the network_id/service_id combination specified by the controller as the argument of DSIT, it sets the currently_available bit within the system_specific_multiplex_selection_ attributes to "0" at the next content update time for Tuner_Status_Descriptor after completing the tuning action.

  In the case of Broadband CS, however, which may operate across multiple networks, the above action, that is, to set the currently_available bit within the system_specific_multiplex_selection_ attributes to "0" at the next contents update time after completing the tuning action, might also take place when the receiver cannot find the specified service, after the tuning action using another network_id within the Broadband CS, instead of the network_id specified by the receiver as the argument of DSIT as the

receiver's option.

- org_network_id/service_id

  The org_network_id and the service_id fields contain the values of network_id and service_id of the tuned network.

(3) AV/C Tuner Commands

- system_specific_service_selection_attributes

  The system_specific_service_selection_attributes specifies org_network_id and service_id by default and the network_id and the service_id if requested at tuning.

  In the case of Broadband CS, however, which may operate across multiple networks, the tuning action might also take place by identifying the org_network_id in any way from among the Broadband CS digital broadcast services using the method inside the receiver, when the receiver option specifies the org_network_id as 0x0006 and a Broadband CS digital broadcast service is specified from this specified org_network_id by the receiver side, and there is no indicated service_id in the specified org_network_id. In this case, however, the org_network_id of the Tuner Status Descriptor's system_specific_service_selection_attributes should also reflect the appropriate value. If this optional command cannot be executed for some reasons, setting the currently_available bit within the Tuner_Status_Descriptor's system_specific_multiplex_selection_attributes to "0" should indicate that the tuning cannot have been carried out.

  When the status field in the DSIT response frame is status==0x01, the controller checks to see if the service of the requested network_id/service_id by its DSIT command as the receiver's Tuner_Status_Descriptor was selected or not if it needs to confirm the tuning state. See "ARIB STD-B21 9.1.5.2" for the check items and the checking operations for the Tuner_Status_Descriptor of the above-mentioned controller.

5.8.4 IP Interface Specifications

Same as Part 1.

5.9 CA Module Interfaces

Same as Part 1.

5.10 Copy Control

Same as Part 1.

5.11 Download Functions

Same as Part 1.

5.12 Receiving Services at Shipping

The following table shows the transponders and TS and service IDs for the default services that would be received when installing and adjusting the receiver at the viewer's home in the Broadband CS digital broadcast environment. Also, same as Part 1 for BS digital broadcast.

Network_ID	0x0006	0x0007
transponder number	ND2 (12.291GHz)	ND4 (12.331GHz)
TS_ID	0x6020	0x7040
Service_ID (decimal number)	001	100

5.13 System Test

Same as Part 1.

5.14 Accumulation Function

Same as Part 1.

5.15 Others

Same as Part 1.

6 PSI/SI Table Operation Specifications for Partial TS Output

6.1 Output operation specifications

Same as Part 1.

6.2 Specifications for table operation

6.2.1 PAT

Same as Part 1.

6.2.2 PMT

6.2.2.1 Structure and operation of PMT

Same as Part 1.

6.2.2.2 Descriptors entered on PMT

Descriptors to be entered on the PMT are listed on Table 6-10.

Table 6-10 Descriptors entered on PMT

Tag	Descriptor	Entry conditions	Loop
0x09	Conditional Access System (CAS) descriptor	X	-
0x42	Staff descriptor	○	D
0x52	Stream ID descriptor	♦	2
0x55	Parental rate descriptor	♦	1
0xC0	Hierarchical transmission descriptor	○	2
0xC1	Digital copy control descriptor	●	D
0xC6	Target area descriptor	○	D
0xC8	Video decode control descriptor	● *1	2
0xDE	Content availability descriptor	●	1
0xFC	Emergency Warning Signal (EWS) descriptor	○	1
0xFD	Data coding system descriptor	●	2

●: Must always be entered on the table if it is inserted in the broadcasting and if the pertinent component is output.

○: May or may not be entered on the table.

X: Must not be entered on the table.

♦: Desirable to be entered on the table.

1: Must be inserted into the first loop.

2: Must be inserted into the second loop.

D: May be inserted into the first and second loops.

6.2.2.3 Descriptors inserted into the first loop of PMT (program loop)

In the following descriptor explanation, for the structure of descriptors, the meaning of each field, and the basic rules for output operations, see Volume 4 of this publication.

(1) Digital copy control descriptor

See Volume 4 “Digital Copy Control Descriptors”.

Usage:

Provide the digital copy control information, describe the maximum transmission rate, or provide both of them for the overall service. The descriptor that has been sent by broadcasting must be entered as it is.

Output operation rule:

- If this ES is subject to the digital copy control and if it is described in the original broadcasting, it must always be inserted in the same way as described in the broadcasting.

  For the process in PPV system, however, see Section 4.11.3 “Copy Control for PPV” in Volume 5 of this publication.

(2) Emergency Warning Signal (EWS) descriptor

Usage:

Indicate the emergency warning signal (EWS) broadcasting service or the EWS test service.

Output operation rule:

- This descriptor should be deleted although its output is optional.

(3) Target area descriptor

Usage:

Describe information about the target area of the overall service

Output operation rule:

- The descriptor is used if the “service_type” is data service (0xC0) of broadcasting and if the target area of this service is described. Its output is optional for the partial TS.

(4) Content availability descriptor

Usage:

See Part 2 “Content Availability Descriptors” in Volume 4 of this publication.

Output operation rule:

The descriptor is used to provide the control information about storage and output of the overall service. It is used together with the digital copy control descriptor.

(5) Parental rate descriptor

Usage:

- Describe an age for parental lock of an event.
- As this descriptor is not operated in broadcasting, it must be generated automatically in the receiver.

Output operation rules:

- The parental rate, that is described in the first one byte of private_data_byte field contained in the first loop limited reception descriptor of PMT for the event of broadcasting, must be used as the “rating” field value. The detailed operation must follow Section 31.4.2.7 in Volume 4 of this publication.
- The parental lock function is optional during partial TS reception.

6.2.2.4 Descriptors entered in second loop of PMT (ES loop)

Same as Part 1.

6.2.3 DIT (Discontinuity Information Table)

Same as Part 1.

6.2.4 SIT (Selection Information Table)

6.2.4.1 Structure and operation of SIT

Same as Part 1.

6.2.4.2 Descriptors entered on SIT

Same as Part 1.

6.2.4.3 Descriptors inserted into first loop of SIT (transmission_info loop)

(1) Partial transport stream descriptor

Usage:

Describe the stream information of partial TS.

Structure:

The structure of partial transport stream descriptor is shown on Table 6-17.

Table 6-17 Structure of partial transport stream descriptor

Data structure	Bits	Identifier
partial_transport_stream_descriptor () {		
descriptor_tag	8	uimsbf
descriptor_length	8	uimsbf
reserved_future_use	2	bslbf
peak_ratepeak_rate	22	uimsbf
reserved_future_use	2	bslbf
minumum_overall_smoothing_rate	22	uimsbf
reserved_future_use	2	bslbf
maxmum_overall_smoothing_buffer	14	uimsbf
}		

Meanings of each field:

The meaning of each field shall follow the “ARIB STD-B21 9.1.8.3” standard.

Output operation rule:

- The descriptor must always be inserted in the first loop of SIT.

The output operation rules of each field are defined on Table 6-18.

Table 6-18 Output operation rules of partial transport stream descriptor

Output operation rules of each field	
descriptor_tag	Describe “0x63”.
descriptor_length	Describe the length of this descriptor.
peak_rate	Describe the peak packet rate of partial TS. At least, the higher limit of this peak rate must be described. This 22-bit field is coded into a positive integer in units of 400 bits per second.
minimum_overall_smoothing_rate	Describe the leak rate of the minimum overall smoothing buffer for overall partial transport packets. This 22-bit field is coded into a positive integer in units of 400 bits per second. “0x3FFFFF” must be described. This “0x3FFFFF” means no definition.
maximum_overall_smoothing_buffer	Describe the minimum smoothing buffer size of overall partial transport packets. This 14-bit field is coded into a positive integer in units of 1 byte. “0x3FFF” must be described. “0x3FFF” must be undefined.

(2) Network identification descriptor

Usage:

Identify the source network where the partial TS has been generated.

Structure:

The structure of network identification descriptor is shown on Table 6-19.

Table 6-19 Structure of network identification descriptor

Data structure	Bits	Identifier
network_identification_descriptor () {		
descriptor_tag	8	uimsbf
descriptor_length	8	uimsbf
country_code	24	bslbf
media_type	16	bslbf
network_id	16	uimsbf
for (i = 0;i< N;i++) {		
private_data	8	bslbf
}		
}		

Meanings of each field:

The meaning of each field shall follow the “ARIB STD-B21 9.1.8.3” standard.

Output operation rule:

- This description must be inserted into SIT.

The output operation rules of each field are defined on Table 6-20.

Table 6-20 Output operation rules of network identification descriptor

Output operation rules of each field	
descriptor_tag	Describe “0xC2”.
descriptor_length	Describe the length of network identification descriptor.
country_code	Describe a country code of the distribution system for the generated partial TS. Japan code “0x4A504E” must be described.
media_type	Describe a media type of the distribution system for the generated partial TS. The BS digital code “0x4253” must be described.
network_id	Describe the network identification value of the distribution system for the generated partial TS. A value described in the NIT must be used.
private_data	Unused.

(3) Partial transport stream time descriptor

Usage:

Describe the information about the time when the partial TS was generated if it is described in the first loop of SIT.

Structure:

The structure of partial transport stream time descriptor is shown on Table 6-21.

Table 6-21 Structure of partial transport stream time descriptor

Data structure	Bits	Identifier
partialTS_time_descriptor () {		
descriptor_tag	8	uimsbf
descriptor_length	8	uimsbf
event_version_number	8	uimsbf
event_start_time	40	bslbf
duration	24	uimsbf
offset	24	bslbf
reserved	5	bslbf
offset_flag	1	bslbf
other_descriptor_status	1	bslbf
JST_time_flag	1	bslbf
if (JST_time_flag ==1) {		
JST_time	40	bslbf
}		
}		

Meanings of each field:

The meaning of each field shall follow the “ARIB STD-B21 9.1.8.3” standard.

Output operation rules:

- The descriptor should be inserted.
- The “JST_time” insertion period should not exceed 10 seconds.

- This descriptor should not be inserted in the second loop if it is inserted in the first loop of SIT. However, if multiple descriptors are inserted, the “JST_time” must be inserted in the first loop. But the time information of service must be inserted in the second loop, without entering the “JST_time”.
- If only the partial transport stream time descriptor is changed but the other descriptors are not changed in the SIT, the other_descriptor_status must be set to “0”.
- If it is inserted in the first loop of SIT, all of event_version_number, event_start_time, and duration of this descriptor are invalid.
- The JST_time insertion time error must be within 2 seconds.

The output operation rules of each field are defined on Table 6-22.

Table 6-22 Output operation rules of partial transport stream time descriptor

Output operation rules of each field	
descriptor_tag	Describe “0xC3”.
descriptor_length	Describe the length of partial transport stream time descriptor.
event_version_number	This field is made invalid if already described in the first loop of SIT.
event_start_time	This field is made invalid if already described in the first loop of SIT. “0xFFFFFFFFFF” must be described.
duration	This field is made invalid if already described in the first loop of SIT. “0xFFFFFF” must be described.
offset	An offset time must be inserted into this field if the summer time is applied to the “JST_time”. The local_time_offset of the local time offset descriptor of TOT must be entered as it is. If the offset time is not applied, “0x000000” must be entered. For the summer time operation details, see Volume 4.
offset_flag	An addition or subtraction of offset time to/from the JST_time must be shown as follows. 0: Adds an offset value to the JST_time. 1: Subtracts an offset value from the JST_time.
other_descriptor_status	The status of descriptors except for the descriptor inserted into SIT must be shown as follows. 0: The other descriptor states are not changed. 1: The other descriptor states are changed.
JST_time_flag	The appearance of JST_time in the subsequent field must be shown. Value 1 means that JST_time appears in the subsequent field.
JST_time	The partial TS output time must be described. The JST_time described in TOT must be entered as it is. If the JST_time is refreshed, its error must be within 2 seconds.

6.2.4.4 Descriptors inserted into the second loop of SIT (service loop)

Same as Part 1.

7 Description

Same as Part 1.

8 ANNEX

Same as Part 1.

（This page is intentionally left blank.）

Volume 3

Data Broadcasting Operation Rules for the BS and Broadband CS Digital-Broadcasting Dual-Purpose Receiver

Contents

1 Introduction

1.1 Preface

Data broadcasting service for the broadband CS digital broadcast is performed based on the Ministry of Internal Affairs and Communications ordinance and announcement as well as the following rules defined by the Association of Radio Industries and Businesses (hereinafter, referred to as ARIB): the “Data Coding and Transmission Specification for Digital Broadcasting Standard” (ARIB STD-B24) and “Service Information for Digital Broadcasting System Standard” (ARIB STD-B10). However, to utilize the standards widely, it is necessary to specify detailed operations separately. Thus, this document, “Data Broadcasting Operation Rules for the BS and Broadband CS Digital-Broadcasting Dual-Purpose Receiver” has been drawn out.

On the assumption that flexibility of data broadcast program organization for each consigning broadcasters and expandability of the future development of data broadcasting service are ensured, the operation rules specified here aim at providing guideline for the specification of signal transmission and specification of the receiver, which will ensure the operation of data broadcasting service in the broadband CS digital broadcast. The specification of data transmission of data broadcasting programs provided by consigning broadband CS digital broadcasters shall be conformant to the operation rules.

The receiver shared with the BS broadcast is assumed to be the receiver for the broadband CS broadcast. Therefore, it is possible to use extended new functions in the CS broadcast in the BS broadcast as well. This is called the “BS level 2 operation”, and described in conjunction with this document.

Interoperability is assumed for the BS level 2 operation, which allows existing receivers or existing BS operations to continue to be used without having any change made. Thus, this shall be positioned as an option in the shared receiver as well.

In the broadband CS broadcast, the following two types of operations are defined: the basic function operation, which realizes the same function as the BS broadcast, and the high-functional type 1 operation. In addition to the basic function operation, the high-functional type 1 operation can also respond to the fused broadcasting and communication service based on the IP communication function and the data storage type service based on the large-volume storage media. The former is defined from Chapter 1 to Chapter 9 in this document. For the latter, in addition to this, differences from the basic function operation are defined in Chapter 10. In addition, in regards to the digital broadcast receiver shared by the BS and broadband CS broadcast as well, the following two types of receivers are assumed: the basic function receiver, which supports the former basic function operation, and the high-functional type 1 receiver, which supports not only the former but also the latter.

In the receiver shared by the BS and broadband CS digital broadcast, it is desirable that due considerations are given so that transmitted signals can be received according to this operation rule and signals that are not defined will not cause any improper operation.

1.2 Purpose

This document defines the transmission standard and receiver rule in the broadband CS digital broadcast and BS digital broadcast level 2 operation, which is compliant with the standards specified by the ARIB, “Data Coding and Transmission Specification for Digital Broadcasting Standard” (ARIB STD-B24) and “Service Information for Digital Broadcasting System Standard” (ARIB STD-B10).

1.3 Scope

This standard document is applied to the transmission system in the level 2 operation of the data broadcasting service which is provided by the broadband CS digital broadcast and BS digital broadcast, the transmission standard related to the encoding method, and the reception function in the digital broadcasting receiver shared by the BS and broadband CS broadcast.

2 Related Documents

The contents of this document define the data broadcasting operation in digital broadcast as specified below.

(1) ARIB STD-B21 version 3.0 “Receiver for Digital Broadcasting”

(2) ARIB STD-B10 Version 3.2 “Service Information for Digital Broadcasting System”

(3) ARIB STD-B20 Version 3.0 “Transmission System for Digital Satellite Broadcasting”

(4) ARIB STD-B24 Version 3.2 “Data Coding and Transmission Specification for Digital Broadcasting”

(5) ARIB STD-B25 Version 3.0 “Conditional Access System Specifications for Digital Broadcasting”

(6) ARIB STD-B32 Version 1.1 “Video Coding, Audio Coding and Multiplexing Specifications for Digital Broadcasting”

3 Definitions

The following term definitions are used for this standard.

16: 9	The ratio of the horizontal and vertical length of the display screen. Horizontal length of 16 to vertical length of 9.
4: 3	The ratio of the horizontal and vertical length of the display screen. Horizontal length of 4 to vertical length of 3.
8PSK	8 phase modulation. The method to relate 8 values to be transmitted to 8 types of phase variation of the carrier wave. Normally, Trellis Code Modulation (TC8PSK) is used.
8-bit character code	Overhead to switch character coding set is less as compared to the 7-bit character code. Transmission efficiency has been enhanced in this code schema.
ARIB (Association of Radio Industries and Businesses)	Association of Radio Industries and Businesses. This institution standardizes and regulates technologies related to the use of radio waves in Japan. Broadcasting companies, telecommunications carriers, and manufacturers belong to this association.
CLUT (Color Look Up Table)	This table converts color information which is represented by index values to physical values.

DAVIC (Digital Audio-Visual Council)	This is a name of an organization with a purpose of defining standard methods of a system which bilaterally transmits digitalized information with a MPEG format.
DRCS (Dynamically Redefinable Character Sets)	This method is used to transmit external characters based on a pattern. This method is used as a standard of character coding in text broadcasting and data broadcasting.
ES (Elementary Stream)	Elementary stream. ES corresponds to the coded video, audio or data in PES packet. One ES is carried in a sequence of PES packets with the same stream ID.
EUC-JP	This is a Japanese character code which is coded in conformity with the ISO 2022.
ISO (International Organization for Standardization)	International Organization for Standardization.
I frame (Intra Frame)	This frame consists of compressed data which is completed within the frame.
MNG (Multiple-image Network Graphics)	This is a file format for animation graphics. This is called “MNG.”Multiple PNG images are included. It is possible to display the images in a sequential order and to repeat it.
MPEG (Moving Pictures Expert Group)-1	MPEG-1. This is a data compression coding technology which includes video and audio data. This is standardized by the International Organization for Standardization (ISO/IEC 11172).
MPEG (Moving Pictures Expert Group)-2	MPEG -2. This is a data compression coding technology which includes video and audio data. This is standardized by the International Organization for Standardization (ISO/IEC 13818).
PES (Packetized Elementary Stream)	Packetized stream. This is video images, audio, and independent data which are packetized with variable length.
PID (Packet Identifier)	Packet ID (Identifier). This is 13-bit stream identification information, indicating an attribute of individual stream of a corresponding packet.
PNG (Portable Network Graphics)	This is a graphic file format which replaces the GIF format. This is called “PNG.” Nonlossy compression is enabled. The file format consists of 8-byte signature and a chunk of data following the signature.
TS (Transport Stream)	This is a transport stream which is defined by the MPEG system standard (ISO/IEC 13818-1). One transponder contains multiple TSs and these are identified based on the TMCC signal.
V.22bis	This is a modulation method of full duplex modem for telephone with up to 2400bps which is defined by the ITU-T recommendation.
Event	Programs. This is an event defined in the ARIB STD-B10.
Common fixed color	A common color on the receiver's color pallet, such as colors used for logo display.
Color set by each provider	The index values and combinations of CLUT can be set by each provider.
Receiver-dependent color	The index values and combinations of CLUT can be set for each receiver.
Horizontal and vertical image element duplex display	One pixel data is displayed in four pixel areas of horizontal and vertical area.
First (second, third, fourth) standard kanji	This is a defined standard for the character code. This is defined by JIS X0208 and other standards.
Data carousel	This method is defined in the ISO/IEC 13818-6, which repeatedly delivers data, to download various types of data through broadcasting.
Transport stream	See the section of TS.
Going-up circuit	This is a circuit which connects from the receiver to the center equipment using a modem or other equipment.
Partial transport stream	A bit stream obtained by removing transport packets that do not relate to specially selected one or more programs from MPEG transport packets.

Font	A set of characters. This is distinguished based on a font type and size.
Font size	The same as design frame.
Basic procedure (Code Independent Mode)	This is a communication procedure which has been developed for host computers and terminals whose data transmission procedure is basic. The communication procedure which minimizes errors in data transmission is installed.
Multiple sections	For this format, data is transmitted with 2 or more sections embedded in one TS packet.
Data-added TV program	Video and audio are mainly used for this TV program. Additional data is broadcasted in the same event. Link-type data program might be specified with hyperlink descriptor. In addition, a TV program here includes programs in which audio is mainly used.
TV program	This is a video and audio program in which additional data does not exist. Link-type data program might be specified with hyperlink descriptor.
Independent data program	This is a TV program in which multimedia data is mainly used or data broadcasting program in which hyper link is not specified for the data-added TV program. Sometimes video and audio components for a TV program are shared.
Link-type data program	This is a program which accumulates multimedia data for which accumulation is assumed separately from TV program which is viewed with this data or data-added TV. Support for this is optional.
Other data programs	Data programs other than the above which are considered in the future.
Related data broadcasting	This is a name for a data part of data-added TV program and link-type data program. This is a data broadcasting service which assumes to be viewed in conjunction with video.
Video part of data-added TV program	Parts of data-added TV program which is not data.
Additional data	Data part of data-added TV program
Video recording	To record broadcasting services into storage media, such as the D-VHS or HDD, in a format of transport stream or partial transport stream. For basic receivers, the recording function is optional. (To refer to analog recording, “analog recording” is clearly specified.)
Viewing reservation	Based on SI information, a program to be viewed is reserved on an event basis.
Recording reservation	Based on SI information, a program to be recorded is reserved on an event basis.
Accumulation	Data is accumulated into files (such as RAM/NVRAM/HDD).
Real-time viewing	Data is retrieved on as needed basis from data carrousel to be viewed.
Viewing after accumulation	Modules for data carrousel are accumulated. After accumulation is completed, the content is viewed.
Independent viewing	Accumulated contents are viewed by themselves without presenting video and audio stream which can be referenced from the contents.
Data event	The period during which a BML document or a set of BML documents is transmitted in a component. This has nothing to do with an SI event. A data event is switched according to update of data_event_id of DII which is transmitted by a component.
Local contents	This is a data carrousel which is transmitted in a data event in a component.
Contents	This is an abstract concept of a set of local contents during an event period which is transmitted by a component. This is identified by the EIT data content descriptor.
Entry component, entry carrousel	A component whose component tag value is specified as 0x40 in the PMT 2nd loop is called entry component. In addition, data carrousel to be transmitted in this component is called entry carrousel.

Startup module	Module with moduleID=0.
Startup document	Out of BML documents which are transmitted through data carrousel, a document which is replayed and presented first as a default. This is included in the startup module.
Data broadcasting engine	This is receiver software which retrieves and interprets multimedia data (BML documents) and presents it to viewer.
Data event message	This is an interrupt event. Data broadcasting engine generates this event to presented BML documents due to a signal change of a transmitted data, such as switch of a data event.
Stream format identification	This is a stream format identification which is defined by the ISO/IEC 13818-1.
Data carrousel	This is a data carrousel transmission system defined by the third volume of the ARIB STD-B-24.
Video PES	Data structure which is used to transmit coded video image defined in the ISO/IEC 13818-1.
Low layer service	Services which can be received in the low C/N using the hierarchy modulation technology.
Chunk	This is blocked information in the PNG and MNG file format.
Audio PES	Data structure which is used to transmit coded audio defined in the ISO/IEC 13818-1.
Flash caption	Service of captioning on TV video broadcast such text which needs emergency with a purpose of urgent report.
Subtitle	Service of captioning on TV video broadcast such text related to the broadcast contents.
Caption	Service of captioning asynchronous subtitles to the main video, audio, and independent data. Possible contents are flash news, service information, time signal, etc.
Urgent channel	Original organization services remain. The bit rate is reduced and thus extra bandwidth is generated. This service is provided using that space by setting urgent SDTV channel. Urgent report services.
Multiview	Related contents are simultaneously broadcasted by setting HDTV channels at multiple SDTVs (up to 3), such as in the case of golf live with having a total channel (main)/17 hall (sub 1)/18 hall (sub 2).
CA alternative service	When viewer selects non-free channels which are managed by non-free broadcasting company, the service which directs viewer to other channels which are managed by the non-free broadcasting companies if the following conditions are applied. (1) No contract is made with the non-free broadcasting companies. (2) The contract is made with the non-free broadcasting company, but for the selected channel, no contract is made.
Bookmark writing service	Service to broadcast "bookmark writing contents" with the following features: - Present bookmark icons with the timing that has been specified in the contents, following the broadcast contents. - According to the buttons pressed by the viewer, write the URI, etc. of the channel broadcasting related information to the contents that are currently displayed to the bookmark area of NVRAM.

Bookmark list service	Service to broadcast "bookmark list display contents" which have the following features: - Display bookmarked items as a list. - When viewers select a desired bookmark from the list, obtain the URI from NVRAM bookmark information and select the channel that broadcasts detailed information. - Provides viewers with a bookmark management function. - Bookmark list service is not limited to a service type, but refers to a service which is provided by the bookmark list display content.
Pre-list service	Service to broadcast "pre-list display contents" which have the following features: - Display services which provide bookmark list services (organization channels) as a list. - When viewers select a desired channel from the list, select designated services (organization channel) and display bookmark list service.
Bookmark list data service	Service which is broadcasted through the service type 0xAA (bookmark list data service) which focuses on “bookmark list display content.”
Basic function operation	In the broadband CS, the operation which realized almost the same functional level of BS.
High-functional type 1 operation	In the broadband CS, in addition to the basic function operation, broadcasting and communication fusion service through IP communication function and accumulation data service using a large volume storage media are supported in this operation.

4 Functionalities that the Base Receiver should be Equipped with to Receive Data Broadcasting

4.1 Configuration of the receiver

Same as Part I.

4.2 Presentation function

Same as Part 1.

4.3 Remote controller

4.3.1 Keys used in the data broadcasting

Table 4.7 shows the types of remote controller keys used in the data broadcasting and guidelines for creating contents. To prevent users from being confused, do not allow a button to have many meanings. When allowing a button to have multiple meanings, it is desirable to explicitly show the user explanations of operations within the contents.

It is recommended that BS/CS Dual-Purpose Receiver has a bookmark button as a remote controller key used in the data broadcasting. Putting in the bookmark button shall be optional.

Table 4-7 Remote controller keys used in the data broadcasting

Key type	Guideline
(Up/Down/Left/ Right arrow keys)	Moves in the up, down, left, or right direction.
0 to 9 (Numeric keys)	Enters the numeric value.
Enter	Separates operations.(Enter)
Back	Cancels the operation.
	Backspaces the character which the user entered. (or batch deletion of characters)
	Suspends interactive calls. (*) Operation should be instructed by the receiver (it is recommended to show the message in the contents that the connection will be suspended by pressing the Back key) while the connection is being established, and by the contents after the connection has been established.
	(*) BML document can be used for "Back" operation. However, consider whether the destination exists.
Data	Switches display/hide of the multimedia data broadcasting.
Blue, Red, Green, Yellow (Color keys)	Selects an operation (Enter). (*) For the button layout on the remote controller, the order should be blue, red, green, and yellow from left to right. Additionally, in order to be able to identify the color by letter, provide a measure to put the letter of corresponding color such as B for blue, R for red, G for green, and Y for yellow.
Bookmark (optional)	Records the bookmark.

4.3.2 Masking the keys

Same as Part 1.

4.4 TS Decoder

Same as Part 1.

4.5 Memory size required for the receiver

For BS basic receiver, the requirements of memory size for the receiver are defined separately as a minimum specification and recommended specification, from the standpoint of broad use of receivers. A minimum specification is applied to those receivers that no malfunction or fault is expected in the reception and presentation of all the contents of data broadcasting. The recommended specification is applied to those receivers that could obtain practical responses in services that are assumed at the time of 2000.

For CS receivers, separate specifications such as minimum and recommended should not be used.

For layouts and definitions of memories for respective receivers, see 4.1.2 Reference model.

4.5.1 RAM

As shown in the reference model, various types of memories are used for receivers. This section describes specifications of those memories that are assumed to use RAMs, specifically of Bcontents and XfrBA. Table 4-9 shows sizes of RAMs. For details, see 4.1.2 Reference model.

Table 4-9 RAMs

Model	Specifications
Bcontents	For BS, minimum of more than or equal 2MB, more than or equal 8MB is recommended. For CS, more than or equal 4MB.
XfrBA	256KB

For the buffer size for subtitles and captions, see chapter 7.

4.5.2 NVRAM

As shown as reference models, BproNV and BcontentsNV are major non-volatile memories that are used for receivers related to the data broadcasting. BproNV holds information on each receiver user and information specific to providers, while BcontentsNV accumulates MM contents. For details of the former, see Section 8.2 for BS, and 8.10 for CS. The provider specific area (information specific to the provider) of the receiver should be configured in such a manner, that allows to read/write from the MM contents (including the accumulated MM contents) obtained from broadcasting and that does not allow viewers to read/write by using another function of the receiver or using a function of another equipment to be connected to the receiver. To satisfy the above restrictions, it is recommended that such area shall be located in the internal storage of the receiver such as NVRAM. Employment of BcontensNV and its capacity should depend on receiver, since the accumulation function of BcontentsNV is optional.

For details, see 4.1.2 Reference model.

In addition, the bookmark area common to BS and CS is used as BproNV in BS/CS dual-Purpose receivers. For details, see Section 8.10.3.

NVRAM on a receiver is a device to which data can be written only a limited number of times. Writing data to such a device more times than it can be written will cause a malfunction and shorten the life span of the receiver. Therefore it is desirable to pay adequate attention to avoid excessive writing to NVRAM. This is described in more detail in Appendix 4.

4.6 Modem

Same as Part 1.

5 Operation of Data Transmission System

This chapter mainly describes new definitions, differences or operation restrictions in terms of operation of transmission system of XML-based multimedia coding system based on the specifications in the compliant documents listed below. In this chapter, data broadcasting service means multimedia data broadcasting service enabled by the XML-based multimedia coding system. For items otherwise not specified, specifications in the compliant documents are applied.

- ARIB STD-B10 Version 3.2 “Service Information for Digital Broadcasting System”
- ARIB STD-B24 Version 3.2 “Data Coding and Transmission Specification for Digital Broadcasting”

This chapter specifies operations of data transmission system as a basic function operation for BS/CS dual-purpose receivers with basic functions. In this document, operations of data program that assumes prior accumulation (optional) are described basically in Chapter 9. Descriptions of prior accumulation in this chapter, however, are marked with ■ to distinguish them. Descriptions of data transmission system relating to the data service exclusively for accumulation, that assumes use of high-capacity accumulation media in the high-functional type 1 operation targeted for high-functional type 1 receivers are basically included in Chapter 10. Such descriptions in this chapter, however, are marked with ★ to distinguish them.

5.1 SI/PSI

5.1.1 Type of data broadcasting services

5.1.1.1 Data programs and TV programs

Same as Part 1.

5.1.1.2 Type of programs of data broadcasting services

Types of programs operated by the data broadcasting service are categorized as follows:

Table 5-1 Program types delivered by the data broadcasting service

Program type	Definition
Data-added TV program	Programs that have the data coding system descriptor placed on the component other than the top of the PMT 2nd loop. ■ Prior accumulation link-type data program might be specified with hyperlinks.
Independent data program	Programs that are broadcasted using the services of service_type=0xC0 (data service), plus 0xA7 (promotion data service), and 0xAA (bookmark list data service) and have data coding system descriptor of which is placed at the top component of the PMT 2nd loop.

Program type	Definition
■ Prior accumulation link-type data program	Data programs that are broadcasted using the services of service_type=0xA8 and from which hyperlinks are set to the TV programs or data-added TV programs using hyper_linkage_type=0x81 (combined_posterior_stream). It is assumed that hyperlinks are swapped with each other, so that the hyperlink from the destination TV program is provided on the corresponding prior accumulation link-type data program using hyper_linkage_type=0x80 (combined_prior_data). Detailed operations are specified in Chapter 9. (Support for hyperlinks by the basic receiver is optional.)
■ Prior accumulation independent data program	Data programs that are broadcasted using the service of service_type=0xA8 and the hyperlink descriptor of hyper_linkage_type=0x81 (combined_posterior_stream) is not placed on the EIT of such data programs. Detailed operations are specified in Chapter 9. (Support for hyperlinks by the basic receiver is optional.)
★ Data program exclusively for accumulation	Data programs that are broadcasted using the service_type=0xA9. Detailed operations are specified in Chapter 10. (Supported by the high-functional type 1 receivers)

■★ Independent data programs, prior accumulation link-type data programs/prior accumulation independent data programs, and data programs exclusively for accumulation should be distinguished based on the type of the services that are broadcasted.

5.1.1.3 Other types of programs of data broadcasting services

Same as Part 1.

5.1.1.4 service_type of the channels used for the data broadcasting programs

Service_type of services that provides various data programs are listed below.

1) Data-added TV programs are broadcasted using channels of service_type=0x01 or 0x02 (TV service or radio service), plus 0xA5 and 0xA6 for CS (promotion images, audio service).
2) Independent data programs are broadcasted using channels of service_type=0xC0, plus 0xA7 and 0xAA for CS (promotion data service and bookmark list data service).
   In BS level 2 operation, channel 0xAA (bookmark list data service) should be available. (TBD)
3) ■ Prior accumulation link-type data programs and prior accumulation independent data programs are broadcasted using dedicated channels of the 0xA8 service type. Reception of the broadcasting service via a channel of this service type by the receiver that has no prior accumulation function should depend on receiver.
4) ★ Data programs exclusively for accumulation are broadcasted using a dedicated channel of 0xA9 service type. Reception of the broadcasting service via a channel of this service type by the basic function receivers should depend on receiver.

5.1.2 Configuration of the contents of the data broadcasting service and operation of components

Same as Part 1.

5.1.3 Operation of series reservation for the data broadcasting service

Same as Part 1.

5.1.4 Operation of PMT unique to data broadcasting service

Same as Part 1.

5.1.5 Operation of PMT data coding system descriptor

Data coding system descriptors should be placed on the following components.

- Component that transmits subtitles and captions
- For detailed operations of data coding system descriptors that are placed on the component transmitting subtitles and captions, see the chapter describing subtitles and captions (Chapter 7).
- Component that transmits data carousels.
- Data coding system descriptors should not be placed on components other than described above.

Table 5-4 shows operations of data coding system descriptors.

Table 5-4 Operation of data coding system descriptor

Flag	Operation
data_component_id	0x0007 for BS 0x000B for CS
Contents of additional_data_component_info(additional_arib_bxml_info())	
transmission_format	00 (data carousel transmission system and event message transmission system)
entry_point_flag	- Always 1, only for component of component_tag=0x40. (Component of component_tag=0x40 transmits a module that contains documents to be firstly activated when the data broadcasting program is selected.) It should be “0” for other components. - The receiver obtains and presents the startup document of the data carousel that is transmitted by the component of component_tag=0x40 when the program is selected.
auto_start_flag	Should be operable. Referenced when selecting channel and when detected an entry component after PMT update. When auto_start_flag=0 is set, the receiver does not immediately startup the data broadcasting engine even if for receiving the data broadcasting program. Instead, it starts up by pressing the data button by the viewer. When auto_start_flag=1 is set, the receiver immediately starts up the data broadcasting engine. For independent data programs, auto_start_flag=1 should be always set.
document_resolution	Represents resolution and aspect ratio of the BML contents. Only the following three parameters should be used: 0011: 960*540 0100: 720*480(16:9) 0101: 720*480(4:3) For controlling the resolution and aspect for the data broadcasting programs, see 5.1.12.5.
use_xml	0 (disables transmission of XML using application-dependent tag).

Flag	Operation
Default_version_flag	For BS, this flag might be set as “1” and omit locating bml_major_version/bml_minor_version (default values are used for the version number). In this case, it should construed as bml_major_version=1 and bml_minor_version=0 to determine that the broadcasting can be received by the basic receiver. For CS, this flag should be always set to “0.”
independent_flag	Operation conforms to the standard. Set it to “1”, when the contents transmitted by this event can be independently viewed. Set it to “0”, when the contents cannot be independently viewed. The basic receiver that has no accumulation function does not need to reference this flag.
style_for_tv_flag	Operation conforms to the standard. If this flag is set to “0” (meaning, that it’s style cannot have TV function and contains only those contents that cannot be laid out in the TV receiver), it should be determined as unable to be viewed by the basic receiver.
bml_major_version, bml_minor_version	Operation conforms to the standard. For BS basic receivers, if these fields are placed, and bml_major_version is set to “1”, it should be determined as enable to be viewed. For BS/CS dual-purpose receivers, it should be determined as enable to be viewed if bml_major_version is set to “1” for receiving BS, and it is set to “2” for receiving CS.
ondemand_retrieval_flag	Operation conforms to the standard. Set it to “1”, when the contents transmitted by this component can be viewed real-time. Set it to “0”, when the contents cannot be viewed real-time. It should be always set to “1” for the entry component for the data-added TV programs. For basic receivers that has no accumulation function, when this flag is set to “1”, it should be determined as enable to be viewed, otherwise, as unable to be viewed.
file_storable_flag	Indicates whether the contents that are transmitted by the given component can be accumulated or not. 0: The given contents cannot be accumulated. 1: The given contents can be accumulated. "0" indicates that the contents are of the type that cannot be accumulated. Use this flag to specify the contents as unable to accumulate, if the contents are not the accumulation target such as the transmission of local contents which change during the event, or the contracted broadcasting company does not want the contents to be accumulated. The basic receiver that has no accumulation function does not need to reference this flag.
Operation of additional_arib_carousel_info()	
data_event_id	Not used for PMT. The value should be fixed to 0xF(1111).
event_section_flag	It should be always set to “1.”

5.1.6 Operation of the target area descriptor in PMT

Same as Part 1.

5.1.7 Operation of data contents descriptor for p/f EIT

- See Chapter 7 for operations of data contents descriptors relating to the subtitles and captions.
- There may be multiple data contents descriptors for a single event.
- The data contents descriptor may not be placed on the event, even if it provides a multimedia data

broadcasting service.

- Data contents descriptors may not be placed on all the contents that are broadcasted.
- Maximum number of data contents descriptors per event should be 32.

Table 5-5 shows operations of data contents descriptors for p/f EIT and table 5-2 shows the relationship between the contents and ES.

Table 5-5 Operation of data contents descriptors

Field	Operation
Entry_component	Specifies the components including the startup module of the given local contents.
Num_of_component_ref	It should not be referenced because num_of_component_ref of schedule EIT has no meaning for receivers.
Component_ref	Describes the components that transmit carousels other than entry carousels, and that transmit videos to be referenced, audio streams, and event messages. A fixed value should be placed in p/f EIT. The receiver does not need to reference this field of schedule EIT on recording/viewing reservation. Execution is performed with a value of p/f EIT. ■ See Chapter 9 for operations of accumulation reservation.
ISO_639_language_code	Fixed as jpn (Japanese).
text_length	Upper limit should be 80 (bytes). However, when displaying the titles of contents by receivers, at least 40 bytes of text should be displayed.
text_char	Describes titles of contents to be displayed in EPG.
Operation of arib_bxml_info()	
transmission_format	00 (data carousel transmission system and event message transmission system)
auto_start_flag	auto_start_flag in EIT should not be operated. It should be always set to "0."
document_resolution	Represents resolution and aspect ratio of the given contents. Only the following three parameters should be used: 0011: 960*540 0100: 720*480(16:9) 0101: 720*480(4:3) For controlling the resolution and aspect for the data broadcasting programs, see 5.1.12.5.
use_xml	0 (disables transmission of XML using application-dependent tag).
default_version_flagde	For BS, this flag might be set as "1" and omit locating bml_major_version/bml_minor_version (default values are used for the version number). In this case, it should construed as bml_major_version=1 and bml_minor_version=0 to determine that the broadcasting can be received by the basic receiver. For CS, this flag should be always set to "0."
independent_flag	Operation conforms to the standard. Set it to "1", when the contents transmitted by this event can be independently viewed. Set it to "0", when the contents cannot be independently viewed. The basic receiver that has no accumulation function does not need to reference this flag.
content_id_flag	Operation conforms to the standard. It should be set to "1" when content_id, content_version are placed in this descriptor, and set to "0" when they are not placed.

Field	Operation
associated_contents_flag	Operation conforms to the standard. It should be operated only for events in which data contents descriptor with this flag set to “1” exists, if the receiver displays in EPG or the like that the data broadcasting in conjunction with the TV program will be delivered.
Style_for_tv_flag	Operation conforms to the standard. If this flag is set to “0” (meaning, that it’s style cannot have TV function and contains only those contents that cannot be laid out in the TV receiver), it should be determined as unable to be viewed by the basic receiver.
update_flag	update_flag should not be operated. It should be always set to “0.”
ISO_639_language_code	Operation conforms to the standard.
content_id	Operation conforms to the standard.
content_version	content_version should be operated. However, content_version is not changed during the event time.
bml_major_version, bml_minor_version	Operation conforms to the standard. For BS basic receivers, if these fields are placed, and bml_major_version is set to “1”, it should be determined as enable to be viewed. For BS/CS dual-purpose receivers, it should be determined as enable to be viewed if bml_major_version is set to “1” for receiving BS, and it is set to “2” for receiving CS.
ondemand_retrieval_flag	Operation conforms to the standard. Set it to “1”, when the contents transmitted by this component can be viewed real-time. Set it to “0”, when the contents cannot be viewed real-time. It should be always set to “1” for the entry component for the data-added TV programs. For basic receivers that has no accumulation function, when this flag is set to “1”, it should be determined as enable to be viewed, otherwise, as unable to be viewed.
file_storable_flag	Indicates whether the given contents can be accumulated or not. 0: The given contents cannot be accumulated. 1: The given contents can be accumulated. "0" indicates that the contents are of the type that cannot be accumulated. Use this flag to specify the contents as unable to accumulate, if the contents are not the accumulation target such as the transmission of local contents which change during the event, or the contracted broadcasting company does not want the contents to be accumulated. The basic receiver that has no accumulation function does not need to reference this flag.
Operation of arib_carousel_info()	
Num_of_carousels	If num_of_carousels=0, it indicates that all the following carousel information are not determined. The fixed information (num_of_carousels≠0) should be put in p/f EIT. This value should not be referenced on recording/viewing reservation. ■ If num_of_carousels=0 is set in schedule EIT, accumulation reservation should not be allowed.
component_tag	Operation conforms to the standard. If contents are selected from EPG or the like, obtains and represents the startup document of the component specified by this tag-value.
event_section_flag	It should be always set to “1.”
component_size_flag	Operation conforms to the standard. If component_size field is not placed because operation is not determined, it should be set to “0.”
default_transaction_id_flag	It should be set to “0” (transaction_id will not be coded). In other words, transaction_id is not placed on this descriptor. DII with any transaction ID should be obtained.

Field	Operation
default_timeoutDII_flag	Operation conforms to the standard. This flag may be set to "0" and timeout_value_DII field may not be placed.
default_leak_rate_flag	It should be set to "0" (leak_rate field will not be placed). leak_rate shall not be operated and the transmission rate of the data carousel shall be specified in 5.1.2.6.
component_size	Operation conforms to the standard. If it is placed, it should be set to a fixed value. The fixed value should basically not be increased or decreased. Changing this value by increasing it shall not be permitted. If operation is not determined, it may be omitted and may not be placed. ■ In this case, accumulation reservation operation shall not be permitted.
transaction_id	(Should not be placed)
timeout_value_DII	If placement is omitted or 0xFFFFFFFF (no timeout value to be recommended) is specified, it should be construed that 5000 ms is specified. The contracted broadcasting company may send DII in a fixed cycle regardless of the length of carousel and operate timeout_value_DII with the fixed value.
leak_rate	(Should not be placed. See 5.1.2.6 for the transmission rate of the section data.)

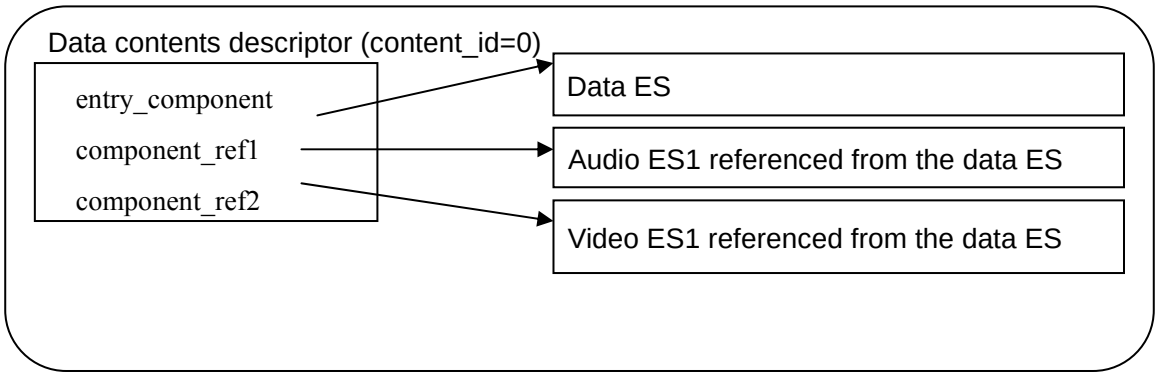


Figure 5-2　Relationship between contents and ES

5.1.8　Operation of schedule EIT data contents descriptor

Same as Part 1.

5.1.9　Operation of hyperlink descriptor for p/f EIT

Same as Part 1.

5.1.10　Operation of schedule EIT hyperlink descriptor

Same as Part 1.

5.1.11　Operation of EIT unique to data broadcasting service

Same as Part 1.

5.1.12 Related operations of receivers

5.1.12.1 Starting the data broadcasting engine

Same as Part 1.

5.1.12.2 Operation of receivers at the startup of data broadcasting program

Prerequisite data transmission operation specifications

- data_event_id that shall be placed in the PMT data coding system descriptor should have the fixed value of 0xF and not be operated.
- Component of component_tag=0x40 should be an entry component. The data carousel that is transmitted by the entry component shall be referred to as an entry carousel.
- The entry component should always exist and PID should not be changed.
- An entry component exists in a single event.

Basic operations of the receiver when the channel is selected (guidelines)

1. If ECM is specified for PMT 1st loop, it should be processed. The following process should be performed only when the program can be viewed by checking the subscription status or purchasing PPV.
2. If PMT 2nd loop contains TV video and audio signals (TV video: component_tag=0x00 to 0x0F, TV audio: component_tag=0x10 to 0x2F), they should be played.
3. Identifies the entry component (component_tag=0x40 component) from the components placed in PMT 2nd loop.
4. If data_component_id of the entry component data coding system descriptor is 0x0007 for BS, or 0x000B for CS, it should be determined as the data broadcasting program that uses the XML-based multimedia coding system, to proceed to the following process. If the data coding system that is not supported by the receiver is used, data broadcasting service will not start.
5. Check the value of auto_start_flag in the data coding system descriptor of the entry component, and immediately perform the following process if it is set as “1. ”If auto_start_flag is “0”, perform the following process at the point when the viewer presses the data button.
6. Perform the following comparator process from 7 through 11 to judge whether to start the data broadcasting engine.
7. Judge whether to present the data based on the BML/B-XML version number which is specified by the data coding system descriptor of the entry component. For BS, it should be determined as enable to be viewed if placement of bml_major_version /bml_minor_version is omitted or bml_major_version is set to “1”, otherwise, it should be determined as unable to be viewed. For CS, it should be determined as enable to be viewed if bml_major_version is set to “2”, otherwise, as unable to be viewed. If it is determined as unable to be viewed, data broadcasting service should not be presented.

8. If it is determined as unable to be viewed based on the on-demand view information specified by the data coding system descriptor of the entry component, data broadcasting service should not be presented.
9. For receivers that support target area specification for the multimedia data broadcasting service, if it is determined as out of the service area based on the specification of the area target descriptor of the entry component and the area information set on the receiver, data broadcasting service should not be presented but the message should be displayed on the receiver, telling the viewer accordingly. The contents of the message from the receiver and the display format should depend on receiver.
10. If 2nd loop ECM is specified for the entry component and the service is charged flat rate and not subscribed, data broadcasting service should not be presented.
11. If 2nd loop ECM is specified for the entry component and the service is charged by PPV and the PPV has not been purchased, data broadcasting service should not be presented. At this time, it is recommended that indication shall be made telling the viewer the existence of the paid data broadcasting service. The method and duration of indication shall depend on receiver.
12. If it is determined as enable to present data broadcasting service by checking 7 through 11, start up the data broadcasting engine to start obtaining and presenting the startup document of the entry component.
13. However, if the entry component is a blank carousel after starting the data broadcasting engine, operations should be as follows:(For the blank carousel, see 5.3.1.6.)
    - If auto_star_flag=0: When the blank carousel is detected for the entry carousel, stop the start process of the engine and return to the stand-by state, waiting for pressing of the data button by the viewer (as in step 5 above).
    - auto_start_flag=1: Continue to monitor the data event switch for the entry component until the data event switch occurs and the startup module is called. At this point, the startup document should be obtained and presented.

Operations of receivers when switching the component group (sub channels) of the multi-view programs (guidelines)

1. Presentation of the data broadcasting does not change even if the component group is switched. (Presentation of the document displayed before switching continues even after switching.)

Operations of receivers when selecting the contents from EPG and viewing or making a reservation (guidelines)

1. Present the viewer the candidate contents based on the data contents descriptor of EIT by EPG. In this case, the relevant data broadcasting program should be determined whether it can be viewed by the receiver based on the on-demand view information which is placed in the data contents descriptor. If it is

determined as unable to be viewed, such indication should be made and the program shall be excluded from the selection.

2. If it is a program that is currently on-air, start viewing the data broadcasting program by making a component specified by entry_component of the contents selected by the viewer, as a startup component. That is, the relevant component is judged for the BML version, on-demand view information, target area specification, and conditional access, and if such component is determined as enable to be viewed, the startup document should be obtained and presented.
3. If starting viewing the reserved program, perform operation of step 2 above from the start time of that program.

5.1.12.3 Operations of receivers when updating PMT

Operations of receivers when PMT update occurs during viewing the data broadcasting program:

- If the component being viewed is lost
  → Discard the document currently presented and start presenting the startup document of the entry carousel (entry carousel of the component group if multi-view programs other than component group 0 is being viewed).

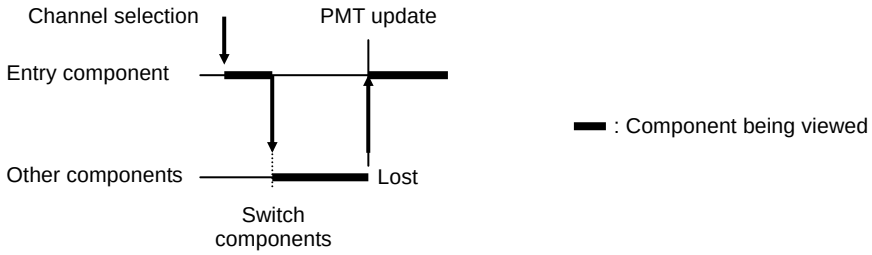


Figure 5-3 Operation if the component being viewed is lost due to PMT update

- If the entry component is lost
  → End the data broadcasting engine as there is no data broadcasting program any more.
- It is not needed to follow the update of contents of the data coding system descriptor (such as auto_start_flag).

Operations of receivers if PMT update occurs when viewing the TV program other than the data-added TV program:

- If the entry component is displayed
  → It is recommended to construe as the data broadcasting program has started and to perform step 4 onward in “Basic operations of the receiver when the channel is selected” of “5.1.12.2 Operation of

receivers at the startup of data broadcasting program. ”However, the data broadcasting engine does not need to be started, depending on the state of the receiver.

5.1.12.4 Handling of data buttons

Same as Part 1.

5.1.12.5 Resolution and aspect control in the data broadcasting program

Same as Part 1.

5.1.12.6 Operations of receivers when selecting a channel

Same as Part 1.

5.1.12.7 Reservation related operations for the data broadcasting programs (guidelines)

Same as Part 1.

5.1.12.8 Specifications for outputting and inputting the partial transport stream

Same as Part 1.

5.1.12.9 Preferred indications of EPG and others

Same as Part 1.

5.2 Operation of the independent PES transmission system

Same as Part 1.

5.3 Data carousel transmission system and event massage transmission system

5.3.1 Operation of data carousel transmission

Same as Part I.

5.3.1.1 Introduction of data events and local contents

Same as Part I.

5.3.1.2 Operation of data event

Same as Part I.

5.3.1.3 Starting and ending the local contents

Same as Part I.

5.3.1.4 Introduction of pull flag

Same as Part I.

5.3.1.5 Local contents and data contents descriptors

Same as Part I.

5.3.1.6 Operation of blank carousel

Same as Part I.

5.3.1.7 Basic operations of receivers while presenting the data broadcasting program

- The receiver always monitors the DII of the carousels transmitted by the following two components.

  1. DII of the components including modules currently being viewed

  2. DII of the entry component

  DII of the entry component is monitored to determine whether to forcibly return to the entry carousel at the timing of local contents' switching of the entry component.

- Process by the receiver when the data event of the component being viewed is switched

  The data broadcasting engine generates a data event message "DataEventChanged" on the document that is currently being presented. Then it discards the document currently presented and obtains and presents the startup document which is included in the module named moduleId=0. If the blank carousel is detected after switching the data event, monitor the DII update of the given component after discarding the document being presented. Obtain and present the startup document at the point when the data event will be switched again to get the non-blank carousel. However, any synchronous and asynchronous interrupt events other than unload interrupt events that occurred after "DataEventChanged" should be discarded.

  If epgTune/epgTuneToComponent/launchDocument/reloadActiveDocument function is used within the "DataEventChanged" event handler, follow the instruction of the function without obtaining a startup document.

- If data_event_id of the entry component currently monitored is updated while viewing a data component, the following process should be performed.

  - When the pull flag of the entry component DII is "1", return to the entry component. In other words, discard the module that is being presented and obtain and present the startup document that is contained in the module of moduleId=0 of the entry carousel. (Figure 5-6)
  - When the pull flag of the entry component DII is "0", continue to present the document that is currently presented. (Figure 5-6)
  - In either case, perform operations to "Process by the receiver when the data event of the component being viewed is switched" if the document of the entry component is viewed.

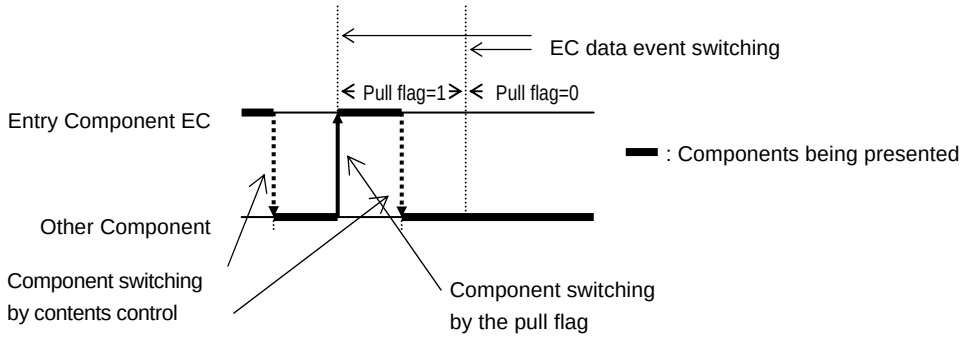


Figure 5-6 data_event_id update and pull flag of the entry component

5.3.2 Operation of DownloadInfoIndication (DII) message

- For presenting multi-media contents, reception of DIIs of the viewing carousel and the entry carousel shall be mandatory.
- See Figure 5-5 for the relationship between DII and local contents/data event
- The constant minimum send interval of DIIs in each component (excluding the switching time of the carousel) should be 100 ms due to the performance capacity of the receiver.
- Operation of DSMCC_section for transmitting DIIs conforms to the standard.
- The number of messages of DIIs (number of sections of DSMCC_section that transmit DIIs) should be 1 at the maximum. Thus, no dsmccAdaptationHeader() is placed.
- The module information is stored in the DII message in the ascending order for the moduleId (the moduleId is not necessarily numbered serially).
- Table 5-9 shows the operations of userNetworkMessage().

Table 5-9 Operations of DII:userNetworkMessage()

Field	Operation	Remarks
DsmccMessageHeader()		
ProtocolDiscriminator	Operation conforms to the standard.	0x11
DsmccType	Operation conforms to the standard.	0x03
MessageId	Operation conforms to the standard.	0x1002
transaction_id	Operation conforms to the standard. In principle, Transaction Number (lower 30 bits of transaction_id) is incremented by 1 in the following cases: - When the data event is switched - When at least one of the modules comprising the carousel is updated - When the number of modules comprising the carousel changes (including before and after numberOfModules=0)	Even if transaction_id is changed, contents_id of the data contents descriptor of EIT is not always updated.

Field	Operation	Remarks
DsmccAdaptionHeader()	Will not be used.	
Downloaded	Operation conforms to the standard. Refreshed at the swap timing of data events. bit31-28 data_event_id bit27-0 all 1 It is operated for identifying and switching the local contents as well as for associating local messages with local contents.	data_event_id is operated to switch the data events and to prevent the timely adjacent local contents from receiving event messages by mistake.
BlockSize	Operate as fixed value (4066).	4066
WindowSize	Operation conforms to the standard.	0
AckPeriod	Operation conforms to the standard.	0
TCDownloadWindow	Operation conforms to the standard.	0
TCDownloadScenario	Should be operable. Describes the module cycle with the longest send cycle among those comprising the carousel.	The timeout setting based on this value should be receiver dependent.
compatibilityDescriptor()	Operate without describing the contents. Only a 4-byte value of compatibilityDescriptorLength descriptorCount should be set.	compatibilityDescriptor Length=2 descriptorCount=0
NumberOfModules	1 The maximum number of modules transmitted with the data carousel should be 256. To indicate an empty carousel, numberOfModules=0 may be used. For the blank carousel, see 5.3.1.6.	
moduleId, moduleVersion	Operation conforms to the standard.	
ModuleSize	The maximum module size should be 1MB. See 5.3.3 for details.	
Module information area	Descriptors described later are placed here.	
Private data area	arib_bxml_private_data_descriptor() may be placed and operated as conformed to specifications in DIIs that are transmitted with the entry component of the event (with the tag value of 0x40). This descriptor shall not be placed in DIIs that are transmitted with other components. The receiver should discard the document currently being viewed and present the startup document of the entry carousel if the following three conditions are satisfied:(1) the data event of the entry carousel is switched (2) this descriptor exists (3) return_to_entry_flag is “1”. ProviderPrivate descriptor may be operated. In this case, network/broadcast carriers should describe their own supplemental information. See 5.3.1.4.	descriptor_tag 0xF0 descriptor_length 1 descriptor_tag 0xC4

Field	Operation	Remarks
Descriptors that are stored in the module information area		
Type descriptor	It should be placed if directly mapping a single resource to a single module. It is not mandatory for modules whose resource is stored in entity format.	
Name descriptor	Will not be used.	
Info descriptor	Will not be used.	
Module_Link descriptor	Will not be used.	
CRC descriptor	Will not be used.	
Download estimated time descriptor	It may be operated. In this case, specify the maximum send cycle of the relevant module.	Support by the basic function receiver should be optional.
Expire descriptor	Should be operable. See 5.3.6.2 for operations of receivers if this descriptor is specified.	
ActivationTime descriptor	Will not be used.	
CompressionType descriptor	Modules may be transmitted after compressed. Make sure to place this descriptor in such cases. If no module compression is performed, it shall not be placed. See 5.3.3 for details of module compression. Operation of compression_type 0: Compresses the module in zlib format.	
Control descriptor	Will not be used.	This descriptor shall not be placed even if contents other than BML1.0 are transmitted, considering the conventional receivers.
ProviderPrivate descriptor	It may be operated. In this case, network/broadcast carriers should describe their own supplemental information.	Support by the receiver should be optional.
StoreRoot descriptor	Will not be used.	
SubDirectory descriptor	Will not be used.	
Title descriptor	Will not be used.	
DataEncoding descriptor	Will not be used.	
TS descriptor with time stamp	Will not be used.	

5.3.3 Operation of DownloadDataBlock (DDB) message

Same as Part I.

5.3.4 Operation of event message

5.3.4.1 Purpose of operating event messages

Same as Part I.

5.3.4.2 Transmission of event messages

Same as Part I.

5.3.4.2 Transmission of general-purpose event messages

- From the BML document, either general-purpose event messages that are transmitted in the same component as the local contents that transmit the relevant document, or those transmitted in the different component can be used. In other words, only one type of component_tag for the general-purpose event messages can be specified by a single BML document.
- Identification using event_msg_group_id shall not be operated. It should be fixed to event_msg_group_id=0x000.
- Use private_data_byte.
- To prevent the timely adjacent local contents from receiving the wrong general-purpose event messages, the same value is scripted in the data_evant_id for the general-purpose event message as one in data_event_id for the target local contents. This also applies when the general-purpose event messages are transmitted in the different component from the local contents that use them.
- The maximum number of general-purpose event message descriptors that can be placed in one DSMCC_section should be 8.
- Setting of message_id=255 or setting to obtain any message_id by omitting message_id should not be performed when explicitly specifying 0-254 for message_id. If message_id would be obtained without specifying the value, message_version should also be omitted (or set to 255).
- When specifying message_id, the maximum number of general-purpose event messages that can be concurrently subscribed should be 8 for BS, and 16 for CS.
- When general-purpose event messages are transmitted, multiple sub tables having the same contents may be sent to avoid data drop. In this case, the transmission interval and the number of transmissions shall not be specified.
- It is recommended to ensure at least 100 ms (for BS) or 200 ms (for CS) of refresh interval of DSMCC_section for transmitting the general-purpose event messages within the same ES while considering data drop. However, if the refresh interval is assumed to be shorter than this principle, it is recommended that the sub table having the same contents shall be repeatedly transmitted multiple times. The specification of the above mentioned refresh interval represents a recommended interval value between the first transmission of any version of DSMCC_section and the next transmission of the updated version of DSMCC_section. It shall not specify the transmission interval of DSMCC_section of the adjacent different versions for updates.
- When transmitting a general-purpose event message specified by NPT, a trigger time later than the transmission of STCmax reference message (described later) should not be set before this message is transmitted. The general-purpose event message specified by NPT should not be transmitted between the period after the STCmax reference message is transmitted and before the first NPT reference message after STC revolves 0 time is transmitted.

5.3.4.4 Transmission of the NPT reference message

Same as Part I.

5.3.4.5 Processing event messages by the receiver

Same as Part I.

5.3.4.6 Operation of DSMCC_section()

Same as Part I.

5.3.4.7 Operation of the general-purpose event message descriptor

Same as Part I.

5.3.4.8 Operation of the NPT reference descriptor

Same as Part I.

5.3.5 Operation of IIT

Same as Part I.

5.3.6 Related operations of receivers

5.3.6.1 Operation of CM

When the CM is inserted during the data broadcasting program event, a data broadcasting service which differs from the original one may be delivered or the data broadcasting service may be temporarily suspended. In the former case, the context before the CM may be reproduced when resuming from the CM.

No particular specification as a data broadcasting transmission operation shall be specified, but contents control using such functions as switching local contents, event message, or writing information to Greg should be used to support such cases.

5.3.6.2 Expire descriptor (DII) and operations of receivers

Same as Part I.

5.3.6.3 Filtering resource used for receiving data broadcasting

Same as Part I.

5.4 Charge pattern for the data broadcasting service

5.4.1 Charge pattern to operate

Same as Part I.

5.4.2 Receiver requirements

Same as Part I.

5.5 Data broadcasting service in low layer transmission

Not used for CS.

Other descriptions on layer transmission shall also be applied only to BS.

5.6 Multi-view operation and data broadcasting service

Same as Part I.

5.7 Special programming channels and data broadcasting service

Same as Part I.

5.8 Interactive transmission protocol used for the data broadcasting service

Same as Part I.

6 Operation of Mono-media Encoding

Same as Part I.

7 Operation of Coding Subtitles and Captions

7.1 Scope and definition of the service

In the BS digital broadcasting and broadband CS digital broadcasting, the following two services for titles and captions are provided.

Subtitle: Subtitle service synchronized with the main video, audio, and data (e.g. translation subtitles)

Caption: Subtitle service that is not synchronized with the main video, audio, and data signals (e.g. flash news, service information, time signals)

7.2 Operation of organization and transmission

Same as Part I.

7.3 Resolution of videos and display format of subtitles and captions

Same as Part I.

7.4 Characters used for subtitles and captions

Same as Part I.

7.5 Control codes used for subtitles and captions

Same as Part I.

7.6 Operation of DRCS

Same as Part I.

7.7 Operation of initialization

Same as Part I.

7.8 Mono-media used for subtitles and captions

Same as Part I.

7.9 Preferred operations of receivers

Same as Part I.

8 Operation of Multimedia Encoding

8.1 Introduction

Same as Part 1.

8.2 Operation of NVRAM for Common Use in MM Service in BS

Part of the NVRAM to be used for storage of permanent information is allocated to a BS broadcaster common area and a BS broadcaster exclusive area shown in Table 8-1.What data should be stored in the broadcaster common and exclusive areas depends on content according to the definitions made between the broadcasting companies or by broadcasting companies on its own accord.

Table 8-1 NVRAM used as a BS broadcaster common area and a BS broadcaster exclusive area

Type	Meaning	NVRAM space
BS broadcaster common area	An area that can be commonly used by all the broadcasters	1KB (64-byte fixed-length block *16)
BS broadcaster exclusive area	An area to be exclusively used by a broadcaster	- 1 KB per broadcaster (64-byte fixed-length block *16) - Number of broadcasters: 64 (See Note)

Note: For a BS and CS dual-purpose receiver, the number of broadcasters that use BS broadcaster exclusive areas is 20.

See Section 8.10 for the BS Level 2 operation because the bookmark function is used.

NVRAM on a receiver is a device to which data can be written only a limited number of times. Writing data to such a device more often than the writing limit will cause a malfunction and shorten the life span of the receiver. Therefore it is desirable to pay adequate attention to avoid excessive writing to NVRAM. This is described in more detail in Appendix 4.

8.2.1 Identification of BS broadcaster common area

Same as Part 1.

8.2.2 Identification of BS broadcaster exclusive area

Same as Part 1.

8.2.3 Operation of access right information to BS digital broadcasting company exclusive area for broadband CS digital broadcasting company

Same as Part 1.

8.2.4 Use of viewer residential area information by MM service

The "viewer residential area information" which is expected to be stored in NVRAM due to the initial setting function of a receiver can be read or written by the MM service using the following URI.

nvram://receiverinfo/<regiontype>

Table 8-4 shows text strings that can be specified as <regiontype>. See Volume 2 for details of viewer residential area information.

Table 8-4 Types of viewer residential area information

<*regiontype*>	Type	Enabling or disabling of read/write by MM service	Field type
prefecture	Prefecture code corresponding to the target area descriptor (Bit position in the prefecture specification bit map (ARIB STD-B10, Appendix G, Table G-2))	Only read enabled as a number	U:1B
regioncode	Region code corresponding to the emergency information signals (The Ordinance for Regulating Radio Equipment, Article 9-3, Paragraph 5; The Ordinance for Regulating the Operations of Radio Stations, Article 138; Ministerial Ordinance of MPT No. 405 of 1985)	Only read enabled as a number	U:2B (Applicable to the lower 12 bits. All the upper four bits should be set to "0.")
zipcode	Postal code (7 digits)	Read/write enabled as a 7-digit fixed-length string. (Example: 5001234)	S:7B

- If the values for the broadcaster common area and the broadcaster exclusive area are not set, a null string (0 when read as a number) is returned. While the viewer residential area information is not set, 255 is returned if regiontype is set to prefecture, 0 if set to regioncode, and a null string if set to zipcode.
- For broadband CS, the same operation as for BS should be used.

8.3 Use of Remote Controller Keys by MM Service

8.3.1 Possible values for used-key-list characteristic

The following table shows the correspondence between the remote controller keys and the <key-group> values that can be specified in the style characteristic "used-key-list" used for the exclusive control processing of the remote controller keys between the BML browser and the tuning function.

Table 8-5 Possible values for key-group

<key-group>	Meaning
Basic	Arrow keys (up, down, right, and left), Enter key, and Back key
data-button	Color keys (blue, red, green, and yellow) and Bookmark key
numeric-tuning	Numeric tuning keys (0 to 9, 10, 11, 12, etc.)
other-tuning	Tuning-related keys (one-touch tuning button, channel up/down keys, and video key)

- It is prohibited to control the "Data" button using the used-key-list characteristic. If the "Data" button is pressed while the BML browser is activated, the processing is handled by the BML browser.
- If there is any other tuning function key than shown in the above table, whether it should be included in

other-tuning depends on receiver.

- It is desirable that the other-tuning group includes keys for network switching to other media and direct turning keys.

8.3.2 Correspondence between remote controller keys, key codes, and access keys

Table 8-6 shows the mapping of remote controller keys, key codes, and specifiable access key characters that can be used by the MM service.

Table 8-6 Correspondence between remote controller keys, key codes, and access keys

Remote controller key	Key code	Access key character
Up arrow	1	N/A
Down arrow	2	N/A
Left arrow	3	N/A
Right arrow	4	N/A
0 to 9,10,11,12	5-17	N/A
"Enter"	18	N/A
"Back"	19	‘X’
"Data"	20	N/A
Color key (Blue)	21	‘B’
Color key (Red)	22	‘R’
Color key (Green)	23	‘G’
Color key (Yellow)	24	‘Y’
Bookmark key	100	N/A
Tuning-related keys belonging to other-tuning	150-	N/A

- Pressing the "Data" button causes only an interrupt event DataButtonPressed and not an interrupt event keydown or keyup.
- The numeric tuning key other than 0 to 9 and the turning-related keys must be used by online-communications contents only to detect the tuning operation. Key codes to be assigned to tuning-related keys depend on receiver.

8.3.3 Guidelines for contents using selection with color keys

When you create a content with color keys used as the only means for selection, the color keys to be selected by viewers must be identifiable not only with the difference of colors but also with characters or other means indicating the concerned colors.

8.4 Operation of BML Version

A BML document to be used in the basic function operation has the following version number. For BS, bml_major_version=1, bml_minor_version=0 is the default version number.For CS, no default version

number is set.

Table 8-7 BML document version

Type	Value (BS)	Value (CS)
bml_major_version	1	2
bml_minor_version	0	0

8.5 Operation of lockModuleOnMemory() and setCachePriority()

Same as Part 1.

8.6 Transmission of DRCS Pattern Data

Same as Part 1.

8.7 Operation of Name Space

- The reference to other services is enabled only with the following extended functions for broadcasting.

  epgTune, epgIsReserved, epgReserve, epgCancelReservation,
  epgRecIsReserved,epgRecReserve, epgRecCancelReservation, epgTuneToComponent
- Shorthands (see ARB STD-B24, Volume 2, 9.2) are used for all the cases except for references to the other services listed in the above except the data broadcasting services that require the accumulation function and arguments for the broadcasting extended functions with event specification arguments.
- event_id is always omitted except for arguments for the broadcasting extended functions with event specification arguments. The module update monitoring (ModuleUpdated), lock of a module on memory (lockModuleOnMemory), cache (setCachePriority), and resource reference to mono-media, etc. referenced by a BML document shall be used only for modules transmitted by the same component as in the document currently presented.
- In the href attribute of the anchor element of launchDocument(), only a BML document transmitted in a component included in the same service as the document currently presented can be specified. For information on a receiver that supports the prior accumulation function, see 9.2.11.1.

  The maximum number of resources that a content can keep simultaneously in the content memory of a receiver shall be 384. To meet this restriction, it is desirable to keep the total number of resources (with unique name spaces) during one data event at 384 or less. However, if the above restriction on a receiver can be certainly met during content creation, the total number of resources during one data event can be more than 384.
- If an instruction to lock more resources than the above is issued using lockModuleOnMemory(), etc. despite the above restriction, the receiver may fail to comply.

  The resources described in this section are the following two:

- Resources directly mapped to a module
- Resources stored in a module in the HTTP/1.1 entity format

8.8 Operation of BML Element Extension Module (Interrupt Event)

Same as Part 1.

8.9 Operation of Procedure Description Language

Same as Part 1.

8.10 Operation of NVRAM for Common Use in MM Service on BS and CS Dual-Purpose Receiver

Part of the NVRAM to be used for storage of permanent information on a dual-purpose receiver is allocated to a broadband CS digital broadcasting company common area (hereinafter, CS broadcaster common area), a broadband CS digital broadcasting company exclusive area (hereinafter, CS broadcaster exclusive area), and a bookmark area shown in Table 8-9.

The bookmark area is commonly used for CS and BS level 2 operations.

NVRAM on a receiver is a device to which data can be written only a limited number of times. Writing data to such a device more often than the writing limit will cause a malfunction and shorten the life span of the receiver. Therefore it is desirable to pay adequate attention to avoid excessive writing to NVRAM. This is described in more detail in Appendix 4.

Table 8-9 NVRAM added for BS and CS dual-purpose receiver

Type	Meaning	NVRAM space
Broadband CS digital broadcasting company common area	An area that can be commonly used by all the broadcasting companies belonging to the same network	- 2 KB per network (64-byte fixed-length block x 32) - Number of networks: 2
Broadband CS digital broadcasting company exclusive area	An area to be exclusively used by a broadcasting company	- About 3 KB per broadcasting company (64-byte fixed-length block x 47) - Number of broadcasting companies: 18
Bookmark area	An area that can be used by a bookmark service	- Variable-length block of 320 bytes at the maximum x 30 or more

8.10.1 Identification of broadband CS digital broadcasting company common area

When an MM service needs to read/write information from/to a CS broadcaster common area, readPersistentArray()/writePersistentArray() is used, treating a single fixed-length block as if it is a single file. An MM service reads/writes information from/to a CS broadcaster common area in fixed-length block units. To identify a fixed-length block, use a URI in the following format:

nvram://[<orignal_network_id>;]cs_common/<block_number>

<block_number>: 0 to 31

If <orignal_network_id>; is omitted, original_network_id of the stream into which the current content on playback is transmitted is assumed instead. For CS, use a URI without <orignal_network_id>; in the following format:

nvram://cs_common/<block_number>

When an extended function for broadcasting for access to a CS broadcaster common area (readPersistentArray() or writePersistentArray()) is executed by specifying URI in other formats than the one described above, no reading access nor writing access to NVRAM is performed and readPersistentArray() returns null (failed) or writePersistentArray() returns NaN (failed). This means that the CS broadcaster common area of other networks cannot be referenced.

The operation of a CS broadcaster common area, which should be specified for each network, is not specified in this standard.

8.10.2 Identification of broadband CS digital broadcasting company exclusive area

For CS, a permanent storage area for which access right information can be controlled is provided as a CS broadcaster exclusive area. In the same way as for a CS broadcaster common area, an MM service reads/writes information from/to a CS broadcaster exclusive area in fixed-length block units. An area for writing block access information is not included in a CS broadcaster exclusive area. Reading/writing from/to fixed-length blocks are conducted according to access right information stored on a receiver. When reading/writing of information from/to a CS broadcaster exclusive area is conducted, readPersistentArrayWithAccessCheck()/writePersistentArrayWithAccessCheck() is used. When writePersistentArrayWithAccessCheck() is used to write to a CS broadcaster exclusive area, the access right information is referenced to judge access permission, and proprietary information is written for each broadcaster or for each service. When readPersistentArrayWithAccessCheck() is used to read from a CS broadcaster exclusive area, the access right information is referenced to judge access permission, and information is read from the concerned block. To judge access permission, checkAccessInfoOfPersistentArray() is used. To set access right information, X_CSP_setAccessInfoToProviderArea() is used. To identify a fixed-length block, use a URI in the following format:See 8.10.4 for details on the operation of access right information.

nvrams://[<orignal_network_id>;]~/<block_number>

~: Broadcaster ID of a broadcaster that provides an MM service (broadcaster_id)

<block_number>: 0 to 46

If <orignal_network_id>; is omitted, original_network_id of the stream into which the current content on

playback is transmitted is assumed instead. For CS, use a URI without <orignal_network_id>; in the following format:

nvrams://~/<block_number>

Note: Do not use a URI (nvram://~/<block_number>) for which access right information cannot be controlled.

When an extended function for broadcasting for access to a CS broadcaster exclusive area (readPersistentArrayWithAccessCheck() or writePersistentArrayWithAccessCheck()) is executed by specifying URI in other formats than the one described above, no reading access nor writing access to NVRAM is performed and readPersistentArrayWithAccessCheck() returns null (failed) or writePersistentArrayWithAccessCheck() returns NaN (failed). This means that the CS broadcaster exclusive area of other broadcasters cannot be referenced.

When an extended function for broadcasting for access to a CS broadcaster exclusive area (readPersistentArrayWithAccessCheck() or writePersistentArrayWithAccessCheck()) is executed and then no permission of access is judged after comparing two service_ids included in the access right information for the concerned block and in the stream into which the current content on playback is transmitted, no reading access nor writing access to NVRAM is performed and readPersistentArrayWithAccessCheck() returns null (failed) or writePersistentArrayWithAccessCheck() returns NaN (failed). This means that the CS broadcaster exclusive area of a content transmitted in a service to which access is not permitted cannot be referenced.

Note: When playing back a content recorded on a digital recorder and having access right information to a CS broadcaster exclusive area that has been changed after the time of content recording, it is desirable not to use an extended function for broadcasting for access to a CS broadcasting exclusive area (readPersistentArrayWithAccessCheck(), writePersistentArrayWithAccessCheck(), or X_CSP_setAccessInfoToProviderArea()) because an extended function for broadcasting for access to a CS broadcasting exclusive area (readPersistentArrayWithAccessCheck(), writePersistentArrayWithAccessCheck(), or X_CSP_setAccessInfoToProviderArea()) may fail.

8.10.3 Identification of bookmark area

When an MM service needs to read/write information from/to a bookmark area, readBookmarkArray()/writeBookmarkArray() is used to read/write information in variable-length block units, treating a single variable-length block as if it is a single file. An MM service reads/writes information from/to a bookmark area in variable-length block units. To identify a variable-length block, use a URI in the following format:

nvram://bookmark/<block_number>

<block_number>: 0 to N (N is 29 or more.)

When an extended function for broadcasting for access to a bookmark area (readBookmarkArray() or

writeBookmarkArray()) is executed by specifying URI in other formats than the one described above, no reading access nor writing access to NVRAM is performed and readBookmarkArray() returns null (failed) or writeBookmarkArray() returns NaN (failed).
For details of operation of a bookmark service, see ARIB STD-B24, Volume 2, Appendix 1.

8.10.4 Operation of access right information to broadband CS digital broad casting company exclusive area

In a CS broadcaster exclusive area, access right information is set for each block. Reading/writing of information from/to a block of a CS broadcaster exclusive area is conducted according to this access right information. To set access right information, X_CSP_setAccessInfoToProviderArea() is used. In a BML document in which an extended function for broadcasting for access to a CS broadcaster exclusive area (readPersistentArrayWithAccessCheck() or writePersistentArrayWithAccessCheck()) is executed, set GlobalCode or onload to certainly execute X_CSP_setAccessInfoToProviderArea(). In a BML document in which X_CSP_setAccessInfoToProviderArea() is not executed, the operation of an extended function for broadcasting for access to a CS broadcaster exclusive area (readPersistentArrayWithAccessCheck() or writePersistentArrayWithAccessCheck()) depends on receiver. To check the access permission for each block, checkAccessInfoOfPersistentArray() is used.

- X_CSP_setAccessInfoToProviderArea(): Sets all the access rights to a CS broadcaster exclusive area for each broadcaster.

  Syntax:

  ```
  Number  X_CSP_setAccessInfoToProviderArea(
            input  String  filename
            input  String  structure
  )
  ```

  Arguments:

filename	The name of a file that stores access right information
structure	The specification of format of a file that stores access right information

  Returns:

1:	Successful
NaN:	Failed

  Description:

  Reads access right information from a file specified in filename according to a format specified in structure and sets all the access rights to each block of a CS broadcaster exclusive area. In filename, the name of a file that stores access right information should be specified according to the specification of name spaces in

ARIB STD-B24, Volume 2,Chapter 9. A file that stores access right information specified in filename must be in a fixed format and only "S:1V and U:2B" must be specified in structure. If any other specification is made,

X_CSP_setAccessInfoToProviderArea() returns NaN (failed). The file that stores access right information does not include the record length in the format of BinaryTable. The details of a file that stores access right information are described later. If executing this function causes a change in the access rights, it changes the access right information to the concerned block and destroys what has been written to the concerned block to initialize it. If executing this function does not cause any change in the access rights, it does not change the access right information to the concerned block and does not initialize the concerned block.

If the file specified in filename is a valid file, X_CSP_setAccessInfoToProviderArea() returns 1 (successful) whether or not changes are made in the access rights.

If the file specified in filename is an invalid file, X_CSP_setAccessInfoToProviderArea() returns NaN (failed) without changing the access right information. If the file specified in filename is a valid file but a failure occurs in the receiver processing (such as a failure in the current time acquisition processing), X_CSP_setAccessInfoToProviderArea() sometimes returns NaN (failed).

Note: When creating a BML document in which X_CSP_setAccessInfoToProviderArea() is called, take into consideration the fact that X_CSP_setAccessInfoToProviderArea() sometimes returns NaN. If the execution of X_CSP_setAccessInfoToProviderArea() fails, it is desirable not to execute an extended function for broadcasting for access to a CS broadcaster exclusive area (readPersistentArrayWithAccessCheck() or writePersistentArrayWithAccessCheck()).

- checkAccessInfoOfPersistentArray(): Returns whether access to a permanent storage area is permitted.

Syntax:

```
Number    checkAccessInfoOfPersistentArray(
              input    String  filename
)
```

Arguments:

filename	Specifies a block of a CS broadcaster exclusive area.

Returns:

2:	Read and write enabled
1:	Only read enabled
0:	Read and write disabled
NaN:	Failed

Description:

Checks whether a block specified in filename can be referenced according to access right information

stored on a receiver. Returns 2 if the block is read and write enabled. Returns 0 if the block is read and write disabled. Returns NaN if it fails to acquire access right information stored on a receiver. For broadband CS digital broadcasting, the return value is never 1. In filename, a file should be specified according to the specification of name spaces in ARIB STD-B24, Volume 2, Chapter 9.

- File that stores access right information

Access right information is always transmitted in a file that stores access right information (hereinafter, access right information table) accompanying a content in which X_CSP_setAccessInfoToProviderArea() is executed. An access right information table is transmitted using a media type "application/X-arib-btable."An access right information table provides the access right information to all the blocks of a CS broadcaster exclusive area allocated to broadcasters. An access right information table is managed by each broadcaster. An access right information table is used in a format shown in Table 8.10. Any access right information transmitted in other formats than the one shown in Table 8.8 is invalid. Note that a file created in this format is used only by X_CSP_setAccessInfoToProviderArea().

Table 8-10 Format of access right information table

Element	Property	Writing type
1	Update	S:1V
2	Service_id	U:2B

Update Update date and time for an access right information table.YYYYMMDDHHMM. (12-byte decimal string)

Service_id The specification of service_id of a service to which access is permitted. Specify 0xFFFF to permit access to all the services belonging to a broadcaster.

An access right information table consists of 47 records (as many records as the blocks of a CS broadcaster exclusive area allocated to broadcasters). A file with 46 records or less is judged as an invalid file. The access right information to Block 0 is stored in the first record, the one to Block 1 in the second record, the one to Block 2 in the third record, etc. and the one to Block 46 in the 47th record, each storing access right information in this order. Update is specified only in the first record. The byte length is set to 0 in Update in the second and subsequent records.

<Example of access right information table>

If the update date and time is 12:00, April 1, 2002 and the access right to all the blocks is 0xFFFF,

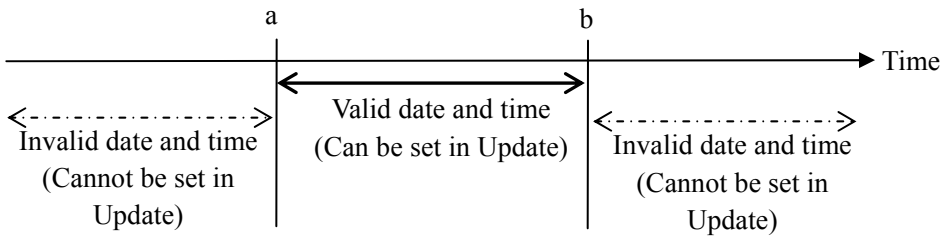
0C 32 30 30 32 30 34 30 31 31 32 30 30 FF FF
00 FF FF 00 FF FF 00 FF FF 00 FF FF 00 FF FF
and so forth

This example shows the field length (0x0C) in the first byte, update date and time in the second to 13th bytes, access right to Block 0 (0xFFFF) in the 14th and 15th bytes, field length (0x00) in the 16th byte, access right to Block 1 (0xFFFF) in the 17th and 18th bytes, field length (0x00) in the 19th byte, access right to Block 2 (0xFFFF) in the 20th and 21st bytes, and hereafter repetitions of the field length (0x00) and the access right (0xFFFF) up to Block 47.

In Update, set the creation date and time for an access right information table. If the date and time set in Update is past the update date and time of the access right information stored on a receiver, the access right information is judged to be updated. If the Update date and time is not past the latter date and time, it is judged to be invalid and therefore the access right information set in the access right information table is invalid. This means that the access right information table is an invalid file. A file that consists of 47 records in a format specified in Table 8-10 and has a valid date and time in Update is judged to be a valid file. Any other file is judged to be an invalid file.

- A valid date and time that can be set in Update is:
  Past the update date and time of the access right information stored on a receiver;and not past the data and time at which X_CSP_setAccessInfoToProviderArea() was executed.
  Example)
  - Valid date and time: a ≤ x≤ b
  - Invalid date and time: x < a, x> b

  x: Date and time to be set in Update
  a: Update date and time stored on a receiver
  b: Data and time at which X_CSP_setAccessInfoToProviderArea() was executed



- Operation of extended function for broadcasting for access to a CS broadcaster exclusive area
  An extended function for broadcasting for access to a CS broadcaster exclusive area

(writePersitentArrayWithAccessCheck(), readPersitentArrayWithAccessCheck(), or checkAccessInfoOfPersistentArray()) is executed according to the block-specific access right information stored on a receiver. The following describes the operation of an extended function for broadcasting for access to a CS broadcaster exclusive area (writePersitentArrayWithAccessCheck(), readPersitentArrayWithAccessCheck(), or checkAccessInfoOfPersistentArray()) for each setting value of access right information.

- If a receiver stores access right information of 0xFFFF to a block

  The block is read and write enabled in the contents transmitted in all the services belonging to a broadcaster.

- If a receiver stores other access right information than 0xFFFF to a block

  The block is read and write enabled in the services belonging to a broadcaster only if there is an agreement between the value of the block's access right information stored on a receiver and the service_id of a service in which a content is transmitted.

8.11 Operation of Bookmark Service

For CS, a bookmark service is provided. For BS, it is optional. (BS level 2 operation)

For details of operation of a bookmark service, see ARIB STD-B24, Volume 2, Appendix 1.

For BS level 2 operation, use a bookmark service only after checking the support of it by specifying bookmark.basic in the argument additionalinfo of getBrowserSupport().

8.11.1 Service type of bookmark list service

For CS and BS level 2 operation (TBD), the bookmark list service is broadcasted as a service type "bookmark list service" (service_type=0xAA). However, broadcasting companies who do not have a license for (independent) data services may broadcast the bookmark list contents in other service type in some cases.

8.11.2 Operation of pre-list

For CS, the pre-list is broadcasted as part of the contents of a channel broadcasted by a specific broadcasting company. In principle, the pre-list allows viewers to select all the bookmark list services provided in CS broadcasting. However, a specific bookmark list service may be excluded from the display of a specific pre-list by mutual agreement among broadcasters. Whether a bookmark list service on other media can be selected is optional.

For BS, a channel for broadcasting a pre-list is not specified and the operation is optional.

8.11.3 Registration of bookmark type

- Registration of broadcaster individual operation type

  When a broadcasting company registers and uses bookmark types of a new broadcaster individual operation type, a registration application is submitted to a specific organization that carries out registration and management tasks, so that any duplication of bookmark types can be prevented. See TBD for information on the above organization name and the registration method.(TBD)

8.11.4 Bookmark list display function by receiver application (optional)

The bookmark list display service is assumed to be realized in a content. Considering the convenience of viewers, however, a receiver should have a bookmark list display function as its application independent of a broadcasting content for reasons listed below. Also, this function should be available through a simple operation using, for example, a special-purpose key on a remote controller. For details of operation of this function, see ARIB STD-B24, Volume 2, Appendix 1.

8.11.5 General names related to bookmark service

The general names related to the bookmark service are as follows:

Table 8-11 General names related to bookmark service

Item	General name
Bookmark service	Bookmark service
Bookmark key	Bookmark button

8.11.6 Logo display in bookmark service

In a content, the existence of a bookmark should be indicated in a unified manner to draw the attention of viewers. Appendix 5 shows logos currently recommended for the above purpose. These recommended logos can be used for a receiver such as the display on a remote controller.

8.11.7 Buttons for bookmark writing (Bookmark buttons)

- A special Bookmark button and a blue button are used to record a bookmark.
- If a remote controller has a special Bookmark button, it is desirable that both this button and a blue button allow viewers to record a bookmark.
- If the remote controller does not have a special Bookmark button, a content should use a blue button as an alternate key for a Bookmark button.

8.12 Operation of Procedure Description Language in CS and BS Level 2 Operation

8.12.1 Scope of extended functions for broadcasting in CS and BS level 2 operation

Table 8-12 shows the operational scope of extended functions for broadcasting in broadband CS broadcasting.

Table 8-12 Operation of extended functions for broadcasting

	Function	CS Basic Function Operation	BS Level 2 Operation
Ureg pseudo object properties			
	Ureg[]	Yes	Yes
EPG-related functions			
	epgGetEventStartTime()	Yes	Yes
	epgGetEventDuration()	Yes	Yes
	epgTune()	Yes (Note 5)	Yes (Note 5)
	epgTuneToComponent()	Yes (Note 5)	Yes (Notes 5 and 6)
	epgTuneToDocument()	-	-
	epgIsReserved()	Yes	Yes
	epgReserve()	Yes	Yes
	epgCancelReservation()	Yes	Yes
	epgRecIsReserved()	Yes	Yes
	epgRecReserve()	Yes	Yes
	epgRecCancelReservation()	Yes	Yes
Program group index functions			
	grpIsReserved()	-	-
	grpReserve()	-	-
	grpCancelReservation()	-	-
	grpRecIsReserved()	-	-
	grpRecResrve()	-	-
	grpRecCancelReservation()	-	-
	grpGetNodeEventList()	-	-
	grpGetERTNodeName()	-	-
	grpGetERTNodeDescription()	-	-
	epgXTune()	-	-
Series reservation functions			
	seriesIsReserved()	-	-
	seriesReserve()	-	-
	seriesCancelReservation()	-	-
	seriesRecIsReserved()	-	-
	seriesRecResrve()	-	-
	seriesRecCancelReservation()	-	-
Persistent memory functions			
Persistent memory functions - Functions for controlling ordinary areas			
	readPersistentString()	-	-
	readPersistentNumber()	-	-
	readPersistentArray()	Yes	Yes
	writePersistentString()	-	-
	writePersistentNumber()	-	-
	writePersistentArray()	Yes	Yes
	copyPersistent()	-	-
	getPersistentInfoList()	-	-
	deletePersistent()	-	-
	getFreeSpace()	-	-
Persistent memory functions - Functions for controlling access-controlled areas			
	setAccessInfoOfPersistentArray()	-	-
	checkAccessInfoOfPersistentArray()	Yes (Note 2)	-
	writePersistentArrayWithAccessCheck()	Yes (Note 2)	-

	Function	CS Basic Function Operation	BS Level 2 Operation
	readPersistentArrayWithAccessCheck()	Yes (Note 2)	-
	X_CSP_setAccessInfoToProviderArea()	Yes (Note 2)	-
Extended APIs for accumulation			
Extended APIs for accumulation - Directory management functions			
	saveDirAs()	-	-
	saveDir()	-	-
	createDir()	-	-
	getParentDirName()	-	-
	getDirNames()	-	-
	isDirExisting()	-	-
Extended APIs for accumulation - File management functions			
	saveFileAs()	-	-
	saveFile()	-	-
	getFileNames()	-	-
	isFileExisting()	-	-
Extended APIs for accumulation - File input/output functions			
	writeArray()	-	-
	readArray()	-	-
Extended APIs for accumulation - Inquiry functions			
	getDirInfo()	-	-
	getFileInfo()	-	-
	getContentSource()	-	-
	getStorageInfo()	-	-
	getCarouselInfo()	-	-
	getModuleInfo()	-	-
Extended APIs for accumulation - Data carousel accumulation functions			
	saveCarouselAs()	-	-
	saveCarousel()	-	-
	saveModuleAs()	-	-
	saveModule()	-	-
	saveResourceAs()	-	-
	saveResource()	-	-
Interaction channel functions			
Interaction channel functions - PPP connection set-up			
Interaction channel functions - BASIC procedure			
	connect()	Yes	Yes
	disconnect()	Yes	Yes
	sendBinaryData()	-	-
	receiveBinaryData()	-	-
	sendTextData()	Yes	Yes
	receiveTextData()	Yes	Yes
	setDelayedTransmissionDataOverBASIC()	-	-
Interaction channel functions - Delayed call			
	registerTransmission()	-	-
	registerTransmissionStatus()	-	-
	getTransmissionStatus()	-	-
Interaction channel functions - Status look-up functions for delayed call functions applicable to BASIC procedures and IP connections			
	getDelayedTransmissionStatus()	-	-
	getDelayedTransmissionResult()	-	-
Interaction channel functions - Function for obtaining line connection status			
	getPrefixNumber()	Yes (Note 7)	Yes (Notes 6 and 7)
Interaction channel functions - Communication function using the mass calls reception service			
	vote()	Yes	Yes

	Function	CS Basic Function Operation	BS Level 2 Operation
Interaction channel functions - Functions for encrypted communication using CAS			
	startCASEncryption()	Yes	Yes
	endCASEncryption()	Yes	Yes
	transmitWithCASEncryption()	Yes	Yes
Interaction channel functions - Functions for communication with public key encryption not using CAS			
	setEncryptionKey()	-	-
	beginEncryption()	-	-
	endEncryption()	-	-
Interaction channel functions - Communication functions assuming TCP/IP			
	setISPParams()	-	-
	getISPParams()	-	-
	connectPPP()	-	-
	connectPPPWithISPParams()	-	-
	disconnectPPP()	-	-
	getConnectionType()	-	-
	isIPConnected()	-	-
	saveHttpServerFileAs()	-	-
	saveHttpServerFile()	-	-
	sendHttpServerFileAs()	-	-
	saveFtpServerFileAs()	-	-
	saveFtpServerFile()	-	-
	sendFtpServerFileAs()	-	-
	sendTextMail()	-	-
	trasmitTextDataOverIP	-	-
	setDelayedTransmissionData	-	-
Operational control functions			
	reloadActiveDocument()	Yes	Yes
	getNPT()	Yes	Yes
	getProgramRelativeTime()	Yes	Yes
	isBeingBroadcast()	Yes	Yes
	lockExecution()	-	-
	unlockExecution()	-	-
	lockModuleOnMemory()	Yes	Yes
	unlockModuleOnMemory()	Yes	Yes
	setCachePriority()	Yes	Yes
	getTuningLinkageSource()	Yes (Note 3)	Yes (Notes 3 and 6)
	getTuningLinkageType()	Yes (Note 3)	Yes (Notes 3 and 6)
	getLinkSourceServiceStr()	-	
	getLinkSourceEventStr()	-	
	getIRDID()	Yes	Yes
	getBrowserVersion()	Yes (Notes 5 and 9)	Yes (Notes 5, 6, and 9)
	getProgramID()	Yes	Yes
	getActiveDocument()	Yes	Yes
	lockScreen()	Yes	Yes
	unlockScreen()	Yes	Yes
	getBrowserSupport()	Yes	Yes
	launchDocument()	Yes	Yes
	launchDocumentRestricted()	-	-
	quitDocument()	-	-
	launchExApp()	Yes (Note 4)	Yes (Notes 4 and 6)
	getFreeContentsMemory()	Yes (Note 8)	Yes (Notes 8 and 6)

	Function	CS Basic Function Operation	BS Level 2 Operation
	isSupportedMedia()	Yes (Note 1)	Yes (Notes 1 and 6)
	detectComponent()	-	-
	lockModuleOnMemoryEx()	-	-
	unlockModuleOnMemoryEx()	-	-
	unlockAllModulesOnMemory ()	-	-
	getLockedModuleInfo()	-	-
Receiver sound control			
	playRomSound()	Yes	Yes
Timer functions			
	sleep()	Yes	Yes
	setTimeout()	-	-
	setInterval()	Yes	Yes
	clearTimer()	Yes	Yes
	pauseTimer()	Yes	Yes
	resumeTimer()	Yes	Yes
	setCurrentDateMode()	Yes	Yes
External character Functions			
	loadDRCS()	Yes	Yes
	unloadDRCS()	-	-
Other functions			
	random()	Yes	Yes
	subDate()	Yes	Yes
	addDate()	Yes	Yes
	formatNumber()	Yes	Yes
Subtitle display control functions			
	setCCStreamReference()	-	-
	getCCStreamReference()	-	-
	setCCDisplayStatus()	Yes	Yes
	getCCDisplayStatus()	Yes	Yes
	getCCLanguageStatus()	Yes	Yes
Bookmark control functions			
	writeBookmarkArray()	Yes (Note 5)	Yes (Notes 5 and 6)
	readBookmarkArray()	Yes (Note 5)	Yes (Notes 5 and 6)
	deleteBookmark()	Yes (Note 5)	Yes (Notes 5 and 6)
	lockBookmark()	Yes (Note 5)	Yes (Notes 5 and 6)
	unlockBookmark()	Yes (Note 5)	Yes (Notes 5 and 6)
	getBookmarkInfo()	Yes (Note 5)	Yes (Notes 5 and 6)
Greg pseudo object properties			
	Greg[]	Yes (Note 5)	Yes (Notes 5 and 6)

Note 1) This API is used to check the media available for selection by a receiver and to specify the range of NVRAM supported by a receiver (in consideration of use for bookmarks, etc.).

Note 2) For details, see Section 8.10.

Note 3) A function used for channel selection using a link descriptor defined in ARIB STD-B10. For details, see 8.12.2.

Note 4) When using this function, inquire whether it is supported using getBrowserSupport(). For details of operation, see ARIB STD-B24, Volume 2, Appendix 1.

Note 5) For details of operation, see ARIB STD-B24, Volume 2, Appendix 1.

Note 6) In BS Level 2 Operation, a BS content should be a shared content that can be received even by an existing receiver.

For a shared content, use getBrowserSupport() to know if a new function is supported and determine in advance whether it can be used. Even in this case, the content is broadcast with a BML version of 1.0. In other words, this operation is treated as BML1.0 extension in BS.

Note 7) When using this function, inquire whether it is supported using getBrowserSupport(). For details of operation, see Part 2, Volume 6.

Note 8) When using this function, inquire whether it is supported using getBrowserSupport(). For details of operation, see 8.12.2.

Note 9) Aray[0] of this function returns a MakerID assigned to each vendor as a two-digit hexadecimal string. A MakerID is a value assigned for software download.

8.12.2 Operation details for extended functions for broadcasting

- Operation of getTuningLinkageSource()

  getTuningLinkageSource() obtains a link source service at the time of channel selection using a link descriptor. In broadband CS digital broadcasting and BS Level 2 operation, only a link descriptor with a link type of 0x03 (CA alternative service) is used. If, at the time of channel selection using a link descriptor, the link destination service is an independent data program or TV program with additional data, getTuningLinkageSource() is called in a BML document belonging to the link destination service to obtain information on the link source service. The details of return values of getTuningLinkageSource() are shown below.

  - If the return value is a string identifying a service

    This value is returned when getTuningLinkageSource() is successful and represents a URI string that shows the link source service.

  - If the return value is a null string

    This value is returned when getTuningLinkageSource() fails. A null string is returned when getTuningLinkageSource() is called in a BML document of a service selected using a means other than channel selection using a link descriptor (such as direct or EPG-based channel selection) or when the function fails to obtain a URI string indicating a link source service.

  At the time of channel selection using a link descriptor, the link source service information stored on a receiver is valid only in the content group of the link destination service.

  For details of operation of CA alternative service, see Volume 5.

- Operation of getTuningLinkageType()

  getTuningLinkageType() obtains a link type at the time of channel selection using a link descriptor. In broadband CS digital broadcasting and BS Level 2 operation, only a link descriptor with a link type of 0x03 (CA alternative service) is used. If, at the time of channel selection using a link descriptor, the link destination service is an independent data program or TV program with additional data, getTuningLinkageType() is called in a BML document belonging to the link destination service. The details of return values of getTuningLinkageType() are shown below.

- If the return value is 0x03

  This value is returned when getTuningLinkageType() is successful and represents a service selected using a link descriptor with a link type of 0x03 (CA alternative service) specified. In other words, this means a service selected by a CA alternative service.

- If the return value is -1

  This value is returned when getTuningLinkageType() fails. A value of -1 is returned when getTuningLinkageType() is called in a BML document of a service selected using a means other than channel selection using a link descriptor (such as direct or EPG-based channel selection) or when the function fails to obtain the link type of a link descriptor.

- If the return value is other than the above

  In broadband CS digital broadcasting and BS Level 2 operation, only a link descriptor with a link type of 0x03 (CA alternative service) is used, and other value than 0x03 or -1 is never returned.

At the time of channel selection using a link descriptor, the link type information stored on a receiver is valid only in the content group of the link destination service.

For details of operation of CA alternative service, see Volume 5.

- Operation of getFreeContentsMemory()

  This function is assumed to be used in combination with lockModuleOnMemory(). Before executing lockModuleOnMemory, this function is used to acquire the free space size of contents memory of a receiver unit to find out whether or not the module that is about to be locked can be stored. However, in accordance with the operation described in Section 8.5, the 1MB area reserved for carousel acquisition is not included during the calculation of getFreeContentMemory() on a receiver.

  The number_of_resource argument should be set to a number of module resources that are read by lockModuleOnMemory() to be executed after the processing of the concerned API. The upper limit of values that can be set in number_of_resource is 256 in accordance with Section 8.7. The value in number_of_resource should be used as hint information for calculating the free space size of the content memory of a receiver. This argument may be ignored depending on the design of a receiver. Although the maximum data size of a module is defined to be 1MB in Section 5.3, the return value conforms to the free space size of the above content memory regardless of this restriction.

  When a compressed module is transmitted, both the compressed and decompressed modules are accumulated in the content memory. Therefore, when a compressed module is received, the return value indicating the free space size of the content memory is smaller than the difference between the total size of the content memory and the carousel size. When transmitting compressed modules, the total size of compressed and decompressed modules must not exceed the maximum module size in accordance with the specifications in Section 5.3.3.

  Furthermore, the return value indicating the free space size of the content memory may change

according to the processing status of the BML browser, depending on whether getFreeContentsMemory() or lockModuleOnMemory() is executed. The amount of change in the free space size of the content memory is receiver-dependent at this time. Therefore, the return value acquired by this API should be used as a reference value to check whether the target module can be locked or not. Likewise, when this function is called before the lock of a module is completed, there is no guarantee that the same value is returned as when there is no lock request. A content should be designed in consideration of a possible failure of module lock even if the return value indicates sufficient free space.

8.13 Operation of Encrypted Communications in Interaction Channel Functions

The functions for encrypted communications in interaction channel functions (startCASEncryption(), endCASEncryption(), and transmitWithCASEncryption()) are not used.

9 Operation of Data Broadcasting Services Requiring Accumulation Function

Same as Part 1.

10 High-Functional Type 1 Operation (Optional)

10.1 Environment and Scope of High-Functional Type 1 Operation

High-functional type 1 operation basically consists of the basic function operation and supports bidirectional communication function based on IP connection and accumulation-only data services for mass accumulation media. The IP communication function and the mass accumulation media support enable media mix services in which broadcasting contents, communication contents, and accumulation contents are linked to each other. Figure 10-1 shows a model of the high-functional type 1 operation environment.

This chapter specifies the high-functional type 1 operation mainly in terms of differences from the basic function operation. The scope of specification includes the following items (1) through (6).

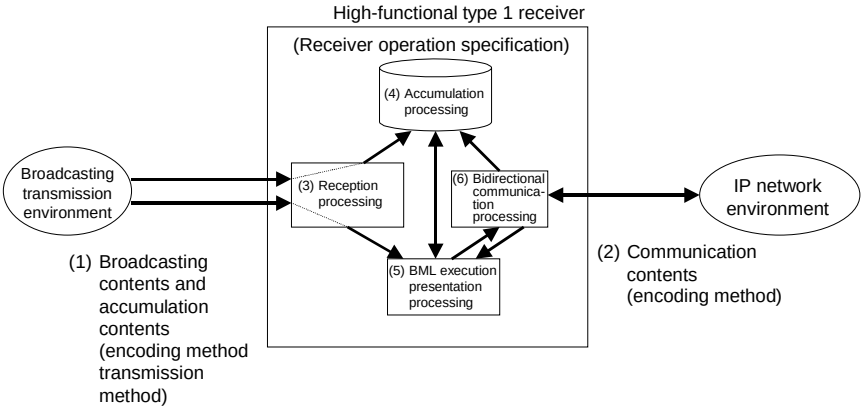


Figure 10-1 High-functional type 1 operation environment.

(1) Broadcasting contents and accumulation contents (encoding and transmission methods)

Contents to be broadcast in the high-functional type 1 operation environment consist of two types: Broadcasting contents for TV programs with additional data and data programs which presupposes ordinary realtime viewing and accumulation contents (see Note) for accumulation-only data service which disables realtime viewing. The transmission method for the former is the same as for the basic function operation and therefore is not defined in this chapter. The data transmission method for the latter is defined in this chapter as supplementary operational guidelines for ARIB STD-B24, Volume 3. The encoding method is basically defined in ARIB STD-B24, Volume 2 and is further defined in this chapter as references to the former standard and supplementary operational guidelines.

Note: This does not apply to "link-type data programs for preliminary accumulation" and "independent data programs for preliminary accumulation" defined in Chapter 9, "Operation of Data Broadcasting Service Requiring Accumulation Function."

(2) Communication contents (encoding method)

The communication contents in the high-functional type 1 operation environment are the above-mentioned broadcasting contents and the BML documents on an IP network linked from the accumulation contents that are accumulated by the accumulation-only data service. The encoding method to be used is defined in ARIB STD-B24, Volume 2 but is further defined in this chapter as supplementary operational guidelines.

(3) Reception processing

For services that presuppose ordinary realtime viewing, the reception processing for the transmission method of the broadcasting contents is the same as for a basic-function receiver and therefore is not defined in this chapter in particular. For accumulation-only data services, the receiver operation including the accumulation processing described in Item (4) is defined in this chapter.

(4) Accumulation processing

For accumulation-only data services, the receiver operation including the reception processing described in Item (3) is defined in this chapter. Also for services that presuppose ordinary realtime viewing, a BML document currently playing back realtime may cause to accumulate the data carousel that is broadcast at the same time.

(5) BML execution and presentation processing

Execution and presentation processing of BML documents of the above-mentioned broadcasting

contents, accumulation contents, and communication contents. This method is basically defined in ARIB STD-B24, Volume 2 and is further defined in this chapter as references to the former standard and supplementary operational guidelines.

(6) Bidirectional communication processing

The BML execution processing block performs communication processing based on IP connection according to the call of extended functions for broadcasting related to bidirectional communications or the execution of anchor elements of communication contents. This is defined in Volume 6, Part 2 of this standard.

10.2 Operation of Data Transmission System in Data Service Exclusively for Accumulation

10.2.1 Overview of Data Service Exclusively for Accumulation

Each data in the data service exclusively for accumulation is managed by being mapped on the directory tree, which is located under the root directory of the name reserved per contracted broadcasting company in advance. As a data type, there are BML document and various mono-media to name a few. Figure 10-2 shows an image of directory tree for data in the data service exclusively for accumulation.

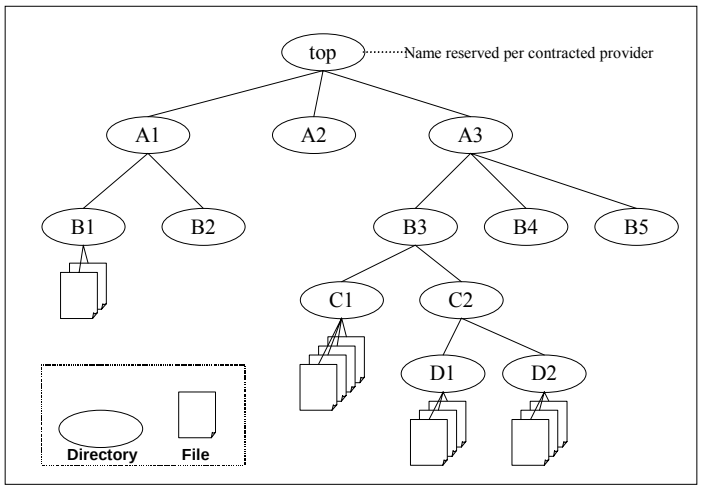


Figure 10-2 Directory Tree Example for Data Service Exclusively for Accumulation

In the operation rules of the data service exclusively for accumulation, directory tree of the producer will be restructured on the receiver HDD as described above. In this case, the range under the specific directory will be transmitted as a single unit in consideration of the transmission efficiency and complexity of data management in the receiver HDD.

10.2.2 PSI/SI Operation

10.2.2.1 Operation of Service and Component

- Service type of the data service exclusively for accumulation is “0xA9” for transmission,
- Components that make up the service should be the component of data carousel system only.
- All data that constitute the data service exclusively for accumulation will be transmitted using this component.
- Each component may be scrambled for transmission.
- The maximum number of components in a service is 1.

10.2.2.2 Operation of PMT Data Coding System Descriptor

- Operation of the data coding system descriptor is intended to identify the coding type of each component.
- Make sure to place this descriptor with the component that transmits carousel data in PMT.

The send operation rules of each field are defined in Table 10-1.

Table 10-1 Send Operation Rules for Data Coding System Descriptor

Send operation rules of each field	
descriptor_tag	Describe “0xFD”.
descriptor_length	Describe the length of data coding system descriptor.
data_component_id	Describe the value for XML base coding system, which is 0x000B.
Operation of additional_arib_bxml_info()	
transmission_format	Fixed as 01 (data carousel transmission system (data service exclusively for accumulation))
entry_point_flag	Fixed as 1 (transmit the BML document to be activated).
auto_start_flag	Fixed as 0 (immediate activation disabled for the BML document to be activated).
document_resolution	0000 (BML document of more than one resolution / aspect ratio is included).
use_xml	Fixed as 0 (disable transmission of XML using application-dependent tag).
default_version_flag	Fixed at 0 (default value is not valid as version number).
independent_flag	Fixed as 1 (independent viewing enabled).
style_for_tv_flag	Fixed as 1 (tv is available as a style and enable layout of all data by receiver).
bml_major_version	Conform to the operation method of multi-media coding to be used as accumulation contents. See Table 10-9.
bml_minor_version	0
bxml_major_version	Will not be used.
bxml_minor_version	Will not be used.
additional_arib_carousel_info()	Will not be used.
ondemand_retrieval_flag	Will not be used.
File_storable_flag	Will not be used.

10.2.2.3 Receiver Basic Operation during Reception of PMT Data Coding System Descriptor

- Concerning PMT, it does not allow a reception of carousel data when their component does not contain a data coding system descriptor.

The receiver processing rules / standards of each field are listed in Table 10-2.

Table 10-2 Receiver Processing Rules / Standards for Data Coding System Descriptor

Receiver Processing Rules / Standards of Each Field	
descriptor_tag	If the value is "0xFD", it means that the descriptor is a data coding system descriptor.
descriptor_length	It indicates the length of descriptor.
data_component_id	If the value is 0x000B indicating the XML base coding system, the additional identification data (additional_data_component_info) is additional_arib_bxml_info(). Other than the value above, reception of such component is not allowed.
Operation of additional_arib_bxml_info()	
transmission_format	When the value is not 01 (data carousel transmission system (data service exclusively for accumulation)), reception of such component is not allowed.
entry_point_flag	If the value is not 1 (enable transmission of BML document to be activated), reception of such component is not allowed.
auto_start_flag	No reference.
document_resolution	No reference. Control of resolution and aspect should follow document_resolution specified by BML document.
use_xml	No reference.
default_version_flag	If the value is not 0 (default value is not valid as a version number), reception of such component is not allowed.
independent_flag	No reference.
style_for_tv_flag	No reference.
bml_major_version	When this is not the major version defined by the operation method of multi-media coding to be used as accumulation contents (see Table 10-9), reception of such component is not allowed.
bml_minor_version	
bxml_major_version	No reference.
bxml_minor_version	No reference.
additional_arib_carousel_info()	No reference.
ondand_retrieval_flag	No reference.
file_storable_flag	No reference.

10.2.2.4 Operation of EIT Data Contents Descriptor

- Data contents descriptor is used to identify the component to be received, to determine if carousel data can be accumulated, and to diagnose if a reception of event succeeded or failed.
- Event should contain a data contents descriptor.
- Describe the component that transmits carousel data in entry_component field (fixed value).

Table 10-3 shows the send operation rules for each field of data contents descriptor.

Table 10-3 Send Operation Rules for Data Contents Descriptor

Send operation rules of each field	
descriptor_tag	Describe “0xC7”.
descriptor_length	Describe the length of data contents descriptor.
data_component_id	Describe the value for XML base coding system, which is 0x000B.
entry_component	Fixed as 0x40.
selector_length	Describe the length of selector_byte (arib_bxml_info()).
num_of_component_ref	Fixed as 0.
component_ref	Will not be used.
ISO_639_language_code	Fixed as jpn (Japanese).
text_length	Fixed as 0.
text_char	Will not be used.
Operation of arib_bxml_info()	
transmission_format	Fixed as 01 (data carousel transmission system (data service exclusively for accumulation)).
auto_start_flag	Fixed as 0 (immediate activation disabled for the BML document to be activated).
document_resolution	Fixed as 0000 (BML document of more than one resolution / aspect ratio is included).
use_xml	Fixed as 0 (disable transmission of XML using application-dependent tag).
default_version_flag	Fixed at 0 (default value is not valid as version number).
independent_flag	Fixed as 1 (independent viewing enabled).
content_id_flag	Fixed as 0 (contents identification and contents version are not included).
associated_contents_flag	Fixed as 0 (associated contents are not included in this content. Or it is not the additional data service).
style_for_tv_flag	Fixed as 1 (tv is available as a style and enable layout of all contents by receiver).
update_flag	Fixed as 0 (delivery of deviation is not conducted for this BML contents).
ISO_639_language_code	Fixed as jpn (Japanese).
content_id	Will not be used.
content_version	Will not be used.
bml_major_version	Conform to the operation method of multi-media coding to be used as accumulation contents. See Table 10-9.
bml_minor_version	0
bxml_major_version	Will not be used.
bxml_minor_version	Will not be used.
arib_carousel_info()	Will not be used.
ondemand_retrieval_flag	Will not be used.
file_storable_flag	Will not be used.
Operation of arib_stored_carousel_info()	
num_of_carousels	Fixed as 1.
component_tag	Fixed as 0x40.
num_dataEvent_flag	To describe in EIT[p/f]: Fixed as 1 (coding enabled). To describe in EIT[schedule]: 0 (coding disabled) might be set.
num_modules_flag	Fixed as 0 (coding disabled).
num_resources_flag	Fixed as 0 (coding disabled).
compressed_component_size_flag	Fixed as 0 (coding disabled).
component_size_flag	Fixed as 0 (coding disabled).
default_transaction_id_flag	Fixed as 0 (coding disabled).

default_timeout_DII_flag	Fixed as 0 (coding disabled).
default_leak_rate_flag	Fixed as 0 (coding disabled).
num_dataEvent	Describe the number of data events (excluding data events that transmit empty carousel) to be transmitted in the corresponding event. There are some instances that the coding is disabled in EIT[schedule].
num_modules	Will not be used.
num_resources	Will not be used.
compressed_component_size	Will not be used.
component_size	Will not be used.
transaction_id	Will not be used.
timeout_value_DII	Will not be used.
leak_rate	Will not be used.

10.2.2.5 Basic Operation of Receiver During Reception of EIT Data Contents Descriptor

- Receive the carousel data transmitted by the component described at entry_component field.
- If the number of data events successfully received (excluding data events that transmit empty carousel where StoreRoot descriptor is not placed) matches with the number described at num_dataEvent of data contents descriptor placed in EIT[p/f actual], it indicates that reception of such event has succeeded.

Table 10-4 shows the receive processing rules/standards for each field of data contents descriptor.

Table 10-4 Receive Processing Rules/Standards for Data Contents Descriptor

Receive Processing Rules / Standards of Each Field	
descriptor_tag	If the value is "0xC7", it means that the descriptor is a data contents descriptor.
descriptor_length	It indicates the length of descriptor.
data_component_id	If the value is 0x000B indicating the XML base coding system, it indicates that selector_byte is arib_bxml_info(). Other than the value above, it indicates that such event is not valid for receiving.
entry_component	It indicates a component that transmits the carousel data of corresponding event.
selector_length	It indicates the length of selector_byte (arib_bxml_info()).
num_of_component_ref	No reference.
component_ref	No reference.
ISO_639_language_code	No reference.
text_length	No reference.
text_char	No reference.
Operation of arib_bxml_info()	
transmission_format	When the value is not 01 (data carousel transmission system (data service exclusively for accumulation)), reception of such event is not allowed.
auto_start_flag	No reference.
document_resolution	No reference.Control of resolution and aspect should follow document_resolution specified by BML document.
use_xml	No reference.
default_version_flag	If the value is not 0 (default value is not valid as a version number), reception of such event is not allowed.
independent_flag	No reference.

content_id_flag	No reference.
associated_contents_flag	No reference.
style_for_tv_flag	No reference.
update_flag	No reference.
ISO_639_language_code	No reference.
content_id	No reference.
content_version	No reference.
bml_major_version bml_minor_version	When this is not the major version defined by the operation method of multi-media coding to be used as accumulation contents (see Table 10-9), reception of such component is not allowed.
bxml_major_version	No reference.
bxml_minor_version	No reference.
arib_carousel_info()	No reference.
ondemand_retrieval_flag	No reference.
File_storable_flag	No reference.
Operation of arib_stored_carousel_info()	
num_of_carousels	No reference.
component_tag	It can be used to specify the component to be received.
num_dataEvent_flag	No reference.
num_modules_flag	No reference.
num_resources_flag	No reference.
compressed_component_size_flag	No reference.
component_size_flag	No reference.
default_transaction_id_flag	No reference.
default_timeout_DII_flag	No reference.
default_leak_rate_flag	No reference.
num_dataEvent	Description in EIT[p/f actual]: It indicates the number of data events (excluding the data events that transmit empty carousel) to be transmitted in the corresponding event. It can be used to verify if reception has been succeeded or failed in the unit of event. Description in EIT[schedule]: No reference.
num_modules	No reference.
num_resources	No reference.
compressed_component_size	No reference.
component_size	No reference.
transaction_id	No reference.
timeout_value_DII	No reference.
leak_rate	No reference.

10.2.3 Data Carousel Transmission Method

10.2.3.1 Operation of Data Event within Event

In the data service exclusively for accumulation, more than one data event can be allowed within an event.

- Disable the data events to be sent out striding across the start and finish time of an event. However, utilize the empty carousel for the start and finish time of an event.

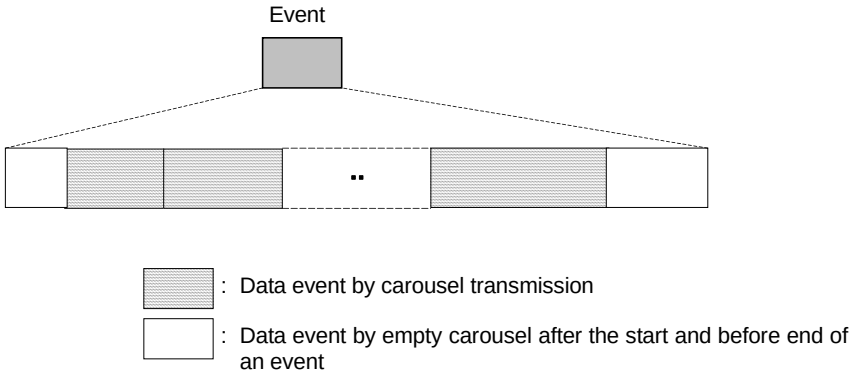


Figure 10-3 Relation between Event and Data Event

10.2.3.2 Carousel Operation in Data Event

- In the data service exclusively for accumulation, data is transmitted by data carousel method. All data under one directory will be transmitted with one carousel. This directory is defined as **carousel root**.
- Path of carousel root must be described at private_data_byte field inside of the carousel DII, using StoreRoot descriptor as well as SubDirectory descriptor. For StoreRoot descriptor, describe root directory and the directory located immediately below. If the number of hierarchy from root directory to carousel root is greater than or equal to 3, for SubDirectory descriptor, describe the path through carousel root followed by StoreRoot descriptor.

  Example: When the carousel path is "/AAA/BBB/Data1", describe "AAA/BBB" for StoreRoot descriptor and "Data1" for Subdirectory descriptor.

Operation of carousel should conform to the following rules.

- Only one carousel is allowed for simultaneous transmission within a single data event. However, due to the condition of delivery equipment, there is an instance where a DDB of the carousel that was transmitted in the previous data event might flow out immediately after the data event swap.
- Carousel needs to be transmitted at least once within a data event.
- The maximum number of hierarchies from root directory to carousel root is 4.
- Up to 254.125 MB (4066 x 2^{16} byte) of data can be assigned under a single carousel root when it is modularized as entity.

In order to insert a space between the carousels that belong to events placed next to each other, transmit an empty carousel at the start and end timing of an event. Note that an empty carousel may be transmitted at other than the start or end time of an event.

Operation of empty carousel should conform to the following rules.

- In the empty carousel, do not place StoreRoot descriptor or SubDirectory descriptor from

private_data_byte field of DII.

10.2.3.3 Module Operation inside of Carousel

The area under one directory immediately beneath the carousel root will be transmitted as a single module under the prevision of entity forms given in ARIB STD-B24. This directory is defined as **module root**.
Relative path between carousel root and module root must be described in the moduleInfoByte field of DII in a carousel, using Name descriptor.

Example: When the path of carousel root is "/AAA/BBB/Data1", and the path of module root is "/AAA/BBB/Data1/DATA", applicable description for Name descriptor is "DATA".

Operation of module should conform to the following rules.

- When the transmission of a single module finishes, the next module can be transmitted (only one module can be transmitted at any time).
- Transmit the DDB section in ascending order of blockNumber within a module.
- Modules should be transmitted one by one in ascending order of moduleID.
- Do not implement a direct mapping to the resource of modules.
- Up to 254.125 MB (4066 x 2^{16} byte) of data can be assigned for a single module when it is modularized as entity.
- All the BML data as well as mono-media data to be referenced (excluding data in TS format with time stamp) are stored in one module in a single carousel. Likewise, all data in TS format with time stamp in a single carousel are stored into one module.
- Operation of the accumulation-type resource list defined in ARIB STD-B24 is intended to describe information concerning the resources inside of a module. Store the accumulation-type resource list in the area within 1MB from the head of a module for transmission.

The relation between data event and module to be transmitted is shown in Figure 10-4.

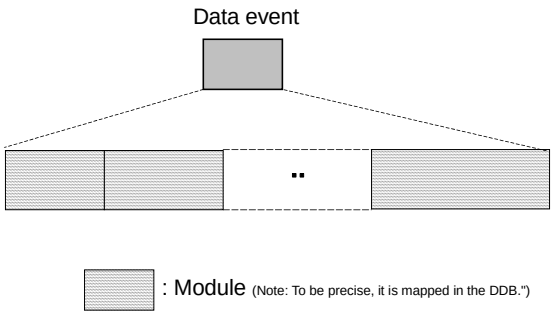


Figure 10-4 Relation between Data Event and Module To Be Transmitted

Table 10-6 is an example` of layout in carousel and module for the data to be transmitted.

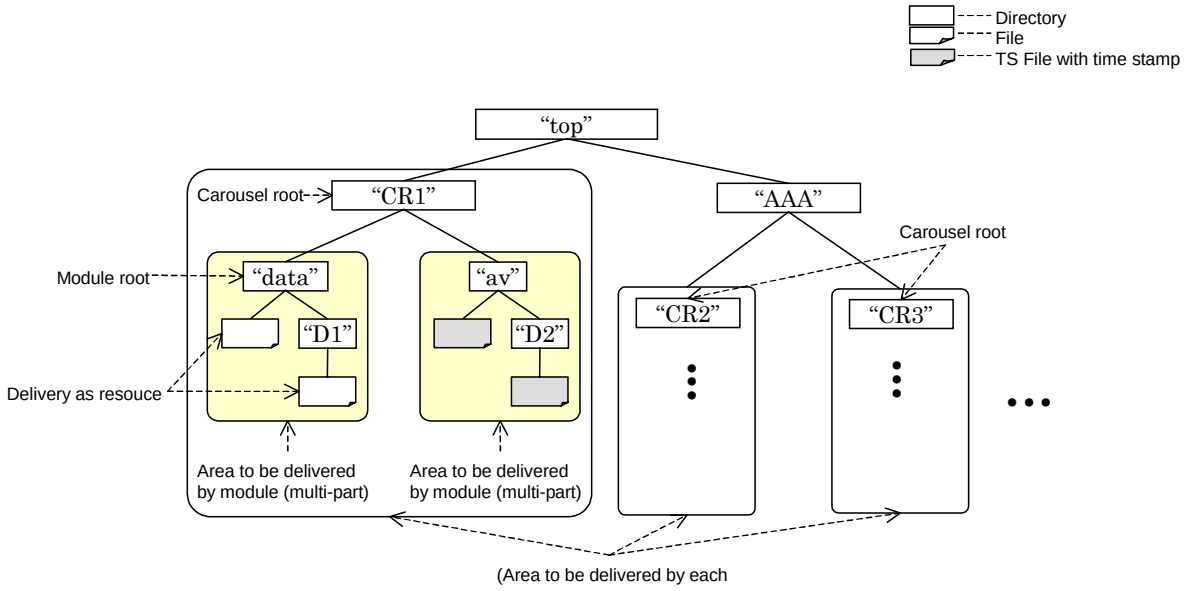


Table 10-5 Example of Transmission Data Placement in Carousel and Module

10.2.3.4 Basic Operation of Receiver on Carousel Reception

Receiver stores the data by creating a directory according to the information described in DII of the carousel received.

- Store the data in a format where resource can be referenced by StoreRoot descriptor, SubDirectory descriptor, Name descriptor, and by the path name described in resource list.
- Example: If "AAA/BBB" is assigned for StoreRoot descriptor, "DATA1" is assigned for Subdirectory descriptor, "DATA11" is assigned for Name descriptor respectively, store the data in the format where the resource can be referenced as a name of /AAA/BBB/DATA1/DATA11/index.bml for the resource "index.bml" in the module "DATA11".
- In the case where no data exists in the concerned path and that a new directory is required between the root directory and the concerned path, create the new directory for data storage.
- Immediately after the swap of data events, there is an instance where DDB section of the last data event has been transmitted. If the receiver received this, it should ignore this normally.
- If the value of TypeValue as well as SubtypeValue of resourceTypeValue(), which is the first resource to appear in the resource list, is application/X-arib-mpeg2-tts, it is appropriate to consider that the all resources in this module are TS data with time stamp. If this value is set to other than application/X-arib-mpeg2-tts, it is appropriate to consider that TS data with time stamp is not included in the module.

10.2.3.5 Operation of DownloadInfoIndication (DII)

Operation of DSMCC_section that transmits DII conforms to the standard.

The module information is stored in the DII message in the ascending order for the moduleID.

Table 10-5 shows the operations of userNetworkMessage().

Table 10-5 Operations of DII:userNetworkMessage()

Field	Operation	Remarks
dsmccMessageHeader()		
protocolDiscriminator	Operation conforms to the standard.	0x11
dsmccType	Operation conforms to the standard.	0x03
messageId	Operation conforms to the standard.	0x1002
transaction_id	Operation conforms to the standard. Transaction number (the lowest 30 bits of transaction_id) is refreshed in the swap timing of data events.	
dsmccAdaptionHeader()	Will not be used.	
downloaded	Operation conforms to the standard. Refreshed at the swap timing of data events. bit31-28 data_event_id bit27-0 all 1	Utilize data_event_id to identify the swap timing of carousels.
blockSize	Operate as fixed value (4066).	4066
windowSize	Operation conforms to the standard.	0
ackPeriod	Operation conforms to the standard.	0
tCDownloadWindow	Operation conforms to the standard.	0
tCDownloadScenario	Set all bits to 1.	It will not reference receiver.
compatibilityDescriptor()	The operation without contents conforms to the standard.	compatibilityDescriptorLength=2 descriptorCount=0
numberOfModules	See 10.2.3.3 for the maximum value of module count to be transmitted in 1 data carousel. To indicate an empty carousel, numberOfModules=0 may be used.	
moduleId	Operation conforms to the standard.	
moduleVersion	Operate as fixed value (0).	
moduleSize	The maximum value of module size is 254.125 MB (4066 x 2^{16} byte).	
moduleInfoByte	The following descriptors will be stored in moduleInfoByte. Name descriptor Expire descriptor	
Private data area	The following descriptors will be stored in the private data area. StoreRoot descriptor SubDirectory descriptor ProviderPrivate descriptor	

Table 10-6 shows operations of descriptors.

Table 10-6 Operation of Descriptors

Descriptor	Operation	Remarks
StoreRoot descriptor	StoreRoot descriptor is used to specify the upper two hierarchies of directory (carousel root) path for the data transmitted by carousel is stored. Place it in the privateDataByte area of DII. The character "/" that distinguishes directory hierarchy should not be added in the front or the end of store_root_path.	It is only placed in the carousel that intends to accumulate the data. Placement is mandatory.
SubDirectory descriptor	SubDirectory descriptor as well as StoreRoot descriptor is used to specify the third hierarchy or below of the directory (carousel root) path where the data transmitted by carousel is stored. Store the data transmitted by carousel in the directory specified by StoreRoot/SubDirectory. Place it in the private data area of DII as needed. The character "/" that distinguishes directory hierarchy should not be added in the front or the end of subdirectory_path. NULL should not be assigned as the value of subdirectory_path.	It is only placed in the carousel that intends to accumulate the data. Do not place this descriptor if the path between root directory of provider area and carousel root is two-tiered. Placement is mandatory for the three-tiered or more.
Title descriptor	Will not be used.	
Name descriptor	Name descriptor is used to specify a directory (module root) name when the module is referenced under the directory specified by StoreRoot/SubDirectory. - Up to 16 bytes can be entered as text_char.	It is only placed in the carousel that intends to accumulate the data. Placement is mandatory.
ProviderPrivate descriptor	It is used to describe the supplemental information specific to a provider.	It is only placed in the carousel that intends to accumulate the data. Placement is arbitrary.
Info descriptor	Will not be used.	
Module_Link descriptor	Will not be used.	
CRC descriptor	Will not be used.	
Download estimated time descriptor	Will not be used.	
Expire descriptor	Expire descriptor is used to specify the effective period of such module. Value to be assigned to time_mode is 0x01 (MJD_JST_time) only. If current time has passed the effective period of the module in a receiver, this module will not be presented.	It is only placed in the carousel that intends to accumulate the data. Placement is arbitrary.
ActivationTime descriptor	Will not be used.	
CompressionType descriptor	Will not be used.	Module must not be compressed.
Control descriptor	Will not be used.	
DataEncoding descriptor	Will not be used.	
TS descriptor with time stamp	Will not be used.	

10.2.3.6 Operation of DownloadDataBlock (DDB) Message

- Operation of DSMCC_section for transmitting DDB message conforms to the standard.
- The maximum size of module to be transmitted by DDB message is 254 MB. To be more precise, the maximum value of DSMCC_section that transmits DDB is 2^{16}. (The maximum module size is 4066 x 2^{16} = 266469376 bytes).
- Operation of DDB (downloadDataMessage()) is listed in Table 10-7.

Table 10-7 DDB: Operation of downloadDataMessage()

Field	Operation	Remarks
dsmccDownloadDataHeader()		
protocolDiscriminator	Operation conforms to the standard.	0x11
DsmcType	Operation conforms to the standard.	0x03
MessageId	Operation conforms to the standard.	0x1003
Downloaded	Operation conforms to the standard.	Store the same value assigned at downloadId.
adaptationLength	Do not use dsmccAdaptationHeader().	0
ModuleId	No special rules are set for the value of moduleId.	
moduleVersion	Operate as fixed value (0).	
BlockNumber	Operation conforms to the standard.	Value returned from moduleSize/blockSize.

10.2.3.7 Operation of Directory Name

This section defines the rules of directory operation that uses StoreRoot descriptor, SubDirectory descriptor, Name descriptor, and resource name.

- Available characters to be used as a directory name and a file name are described in ARIB STD-B24 Volume 2, 9.2.15.1.
- The upper-case and lower-case of alphabet letters will not be distinguished.
- Character "/" is used to distinguish the hierarchy of directory.
- The maximum string length including the character "/" is 255 characters, which covers the characters from root directory to the file name to be described at storedFileInfo in X-arib-storedResourceList.

10.2.3.8 Operation of Accumulation Resource List

The resource list is used as information related to the resource included in the module in multi-part format.

- Resource list structure (X-arib-storedresourceList) is used for the data service exclusively for accumulation as a resource list structure.

Table 10-8 shows the operation of descriptors to be used in the resource list.

Table 10-8 Operation of Descriptors to Be Used in Resource List

Descriptor	Operation	Remarks
Info descriptor	Will not be used.	
Expire descriptor	Will not be used.	
ActivationTime descriptor	Will not be used.	
CompressionType descriptor	Will not be used.	
Control descriptor	Will not be used.	
ProviderPrivate descriptor	It is used to describe the supplemental information specific to a provider.	Placement in additionalDirectoryInfo is arbitrary. Placement in additionalFileInfo is arbitrary.
Title descriptor	Will not be used.	
DataEncoding descriptor	It indicates the data encoding system of data in unique format included as a resource.	Do not place in additionalDirectoryInfo. Placement in additionalFileInfo is arbitrary.
TS descriptor with time stamp	It indicates supplemental file information of the MPEG image and audio by TS format with time stamp with carousel transmissions.	Do not place in additionalDirectoryInfo. If the Content-Type is application/ X-arib-mpeg2-tts, be sure to place this descriptor in AdditionalFileInfo. If the Content-Type is other than application/X-arib mpeg2-tts, do not place this descriptor.

10.3 Operation of Multi-Media Coding in High-Functional Type 1 Operation

10.3.1 Two Operation Methods of Multimedia Coding

In the operation of high-functional type 1, the following two types of operational methods are defined as a means of multimedia coding: BML-A operation that focuses on the compatibility with the operation concerning the BS receiver as well as CS basic function receiver, and BML-B operation that focuses on the consistency with internet. Each provider can determine which one of the operation types can be used between BML-A operation and BML-B operation as broadcasting contents, communication contents, and accumulation contents assumed in the operation of high-functional type 1.

As a common prerequisite of the two operational methods, see the corresponding main sections in ARIB STD-B24, Volume 2 and Appendix 1.

See the following descriptions for the parts to be referenced in the standard as each prerequisite of the two operational methods.

10.3.1.1 BML-A Operation

BML-A operation is defined as an operation concerning the CS basic function receiver in addition to the operation concerning IP connection as interactive communication function as well as the operation concerning storage function. Therefore, the fundamental operation conforms to Appendix 2 of the ARIB

STD-B24, Volume 2, except the parts concerning interactive functions are to be referenced from Appendix 3. The specific parts to be referenced are listed below. Considering the consistency with the shared specifications of terrestrial digital, BML-A operation is scheduled to comply with the specifications once the terrestrial digital operation is established.

- Operation concerning the encoding of BML document

  See Appendix 2, 4.1 ~ 4.8. For the section 4.5.4 Operation of Browser Quasi-Object, see section 10.3.4 in this guide.

- Guideline concerning the browser behavior

  See Appendix 2, 5.1 ~ 5.6.

  See Appendix 3, 5.6.5 ~ 5.6.7 Interactive Communication Function by IP Connection

  5.6.10 Operation Concerning Storage Function

  5.9 Operation Concerning Cookies

- Guideline concerning a transmission of contents and namespace

  See Appendix 3, 6.1 ~ 6.5. However, the description concerning the form element will not be referenced.

10.3.1.2 BML-B Operation

BML-B operation, of which specifications focus on the high consistency with Internet, conforms to Appendix 3 of ARIB STD-B24. For the section 4.7.4 Operation of Browser Pseudo Objects, see section 10.3.4 in this guide.

10.3.2 Operation of BML Version

The following list shows the value of BML major version in the high-functional type 1 operation (BML-A operation and BML-B operation).

Table 10-9 Operation of BML Major Version

Operation Type	BML major version
CS Basic Function Operation (Reference)	2
CS High-functional Type 1 Operation BML-A Operation	2
CS High-functional Type 1 Operation BML-B Operation	10

10.3.3 Security Class of Communication Contents

- In the operation of high-functional type 1, data-broadcasting contents are delivered by broadcasting or communication lines. To prevent the loss of profits from receivers or viewers caused by the accidental contents, the security class of contents based on each acquisition route is set as follows.

Table 10-10 Security Class of Contents

Acquisition Route	Security Class
Broadcasting	Class A
Communication Line	Class B

- The content acquired from broadcasting is class A, which possesses the equivalent representation as the basic service.
- In reference to the restrictions associated with the security class, see ARIB STD-B24 Version 3.2 and each section of this provision.
- Receiver needs to restrict the execution of extended function for broadcasting based on the security class of contents. When a function with impermissible execution is called, the receiver does not execute the function and the behavior after that will depend on the implementation.

10.3.4 Operation of Procedural Descriptive Language

Table 10-11 shows the operational scope of extended function for broadcasting in the operation of high-functional type 1.

Table 10-11 Operation of Extended Functions for Broadcasting in High-Functional Type 1 Operation

	Function	Class A Operation (Broadcasting)	Class B Operation (Communication)	Remarks
Ureg Related Function				
	Ureg[]	Yes	-	
Greg Related Function				
	Greg[]	Yes	Yes	
EPG Related Function				
	epgGetEventStartTime()	Yes	Yes	
	epgGetEventDuration()	Yes	Yes	
	epgTune()	Yes	Yes	Note 3)
	epgTuneToComponent()	Yes	Yes	Note 3)
	epgTuneToDocument()	-	-	
	epgIsReserved()	Yes	Yes	
	epgReserve()	Yes	Yes	
	epgCancelReservation()	Yes	Yes	
	epgRecIsReserved()	Yes	Yes	
	epgRecReserve()	Yes	Yes	Note 5)
	epgRecCancelReservation()	Yes	Yes	Note 5)
Program Group Index Related Function				
	grpIsReserved()	-	-	
	grpReserve()	-	-	
	grpCancelReservation()	-	-	
	grpRecIsReserved()	-	-	
	grpRecReserve()	-	-	
	grpRecCancelReservation()	-	-	
	grpGetNodeEventList()	-	-	
	grpGetERTNodeName()	-	-	
	grpGetERTNodeDescription()	-	-	
	epgXTune()	-	-	
Series Reserve Function				

	Function	Class A Operation (Broadcasting)	Class B Operation (Communication)	Remarks
	seriesIsReserved()	Yes	Yes	Note 4)
	seriesReserve()	Yes	Yes	Note 4)
	seriesCancelReservation()	Yes	Yes	Note 4)
	seriesRecIsReserved()	Yes	Yes	Note 4)
	seriesRecReserve()	Yes	Yes	Note 4) Note 5)
	seriesRecCancelReservation()	Yes	Yes	Note 4) Note 5)
Persistent Memory Function				
	readPersistentString()	-	-	
	readPersistentNumber()	-	-	
	readPersistentArray()	Yes	-	Note 6)
	writePersistentString()	-	-	
	writePersistentNumber()	-	-	
	writePersistentArray()	Yes	-	Note 6)
	copyPersistent()	-	-	
	getPersistentInfoList()	-	-	
	deletePersistent()	-	-	
	getFreeSpace()	-	-	
Control of Persistent Memory Area with Access Control				
	isSupportedPersistentType()	-	-	
	setAccessInfoOfPersistentArray()	-	-	
	checkAccessInfoOfPersistentArray()	Yes	-	Note 2)
	writePersistentArrayWithAccessCheck()	Yes	-	Note 2)
	readPersistentArrayWithAccessCheck()	Yes	-	Note 2)
	X_CSP_setAccessInfoToProviderArea()	Yes	-	Note 2)
Interactive Function				
Interactive Function – Delayed Call				
	registerTransmission()	-	-	
	registerTransmissionStatus()	-	-	
	getTransmissionStatus()	-	-	
	setDelayTransmissionDataOverBASIC()	Yes	-	Note 4)
Interactive Function – BASIC Procedure				
	connect()	Yes	-	
	disconnect()	Yes	-	
	sendBinaryData()	-	-	
	receiveBinaryData()	-	-	
	sendTextData()	Yes	-	
	receiveTextData()	Yes	-	
Interactive Function – TCP/IP				
	setISPParams()	Yes	-	Note 4)
	getISPParams()	Yes	-	Note 4)
	connectPPP()	Yes	-	Note 4)
	connectPPPWithISPParams()	Yes	-	Note 4)
	disconnectPPP()	Yes	-	Note 4)
	getConnectionType()	Yes	Yes	Note 4)
	isIPConnected()	Yes	Yes	
	saveHttpServerFileAs()	Yes	-	Note 4)
	saveHttpServerFile()	Yes	Yes	
	sendHttpServerFileAs()	-	-	
	saveFtpServerFileAs()	-	-	
	saveFtpServerFile()	-	-	
	sendFtpServerFileAs()	-	-	
	sendTextMail()	-	-	
	transmitTextDataOverIP()	Yes	-	Note 4)
	setDelayedTransmissionData()	Yes	-	Note 4)
Interactive Function – Acquisition Function of Delayed Call Status Common to BASIC Type Procedure and IP Connection				

	Function	Class A Operation (Broadcasting)	Class B Operation (Communication)	Remarks
	getDelayedTransmissionStatus()	Yes	-	Note 4)
	getDelayedTransmissionResult()	Yes	-	Note 4)
Interactive Function – Function for Obtaining Line Connection Status				
	getPrefixNumber()	Yes	-	Note 4)
Interactive Function – Mass Calls Acceptance Service				
	vote()	Yes	-	
Interactive Function – Encrypted Communication Using CAS				
	startCASEncryption()	Yes	-	
	transmitWithCASEncryption()	Yes	-	
	endCASEncryption()	Yes	-	
Interactive Function – Communication by Private-Key Cryptography without Using CAS				
	getEncryptionKey()	-	-	
	beginEncryption()	-	-	
	endEncryption()	-	-	
Behavior Control Function				
	reloadActiveDocument()	Yes	Yes	
	getNPT()	Yes	Yes	
	getProgramRelativeTime()	Yes	Yes	
	isBeingBroadcast()	Yes	Yes	
	lockExecution()	-	-	
	unlockExecution()	-	-	
	lockModuleOnMemory()	Yes	-	
	unlockModulesOnMemory()	Yes	-	
	setCachePriority()	Yes	Yes	
	getTuningLinkageSource()	-	-	
	getTuningLinkageType()	-	-	
	getLinkSourceServiceStr()	-	-	
	getLinkSourceEventStr()	-	-	
	getIRDID()	Yes	-	
	getBrowserVersion()	Yes	Yes	
	getProgramID()	Yes	Yes	
	getActiveDocument()	Yes	-	
	lockScreen()	Yes	Yes	
	unlockScreen()	Yes	Yes	
	getBrowserSupport()	Yes	Yes	
	launchDocument()	Yes	Yes	
	launchDocumentRestricted()	Yes	-	Note 4)
	quitDocument()	Yes	Yes	Note 4)
	launchExApp()	Yes	Yes	Note 4)
	getFreeContentsMemory()	Yes	Yes	Note 4)
	isSupportedMedia()	Yes	Yes	Note 1)
	detectComponent()	-	-	
	lockModuleOnMemoryEx()	-	-	
	unlockModuleOnMemoryEx()	-	-	
	unlockAllModulesOnMemorys()	-	-	
	getLockedModuleInfo()	-	-	
Receiver Sound Control				
	playRomSound()	Yes	Yes	
Timer Function				
	sleep()	Yes	Yes	
	setTimeout()	-	-	
	setInterval()	Yes	Yes	
	clearTimer()	Yes	Yes	
	pauseTimer()	Yes	Yes	
	resumeTimer()	Yes	Yes	
	setCurrentDataMode()	Yes	Yes	
External Character Function				

	Function	Class A Operation (Broadcasting)	Class B Operation (Communication)	Remarks
	loadDRCS()	Yes	Yes	
	unloadDRCS()	-	-	
External Equipment Control Function				
	enumPeripherals()	-	-	
	passXMLDocToPeripheral()	-	-	
Other Functions				
	random()	Yes	Yes	
	subDate()	Yes	Yes	
	addDate()	Yes	Yes	
	formatNumber()	Yes	Yes	
Subtitle Display Control Function				
	setCCStreamReference()	-	-	
	getCCStreamReference()	-	-	
	setCCDisplayStatus()	Yes	-	
	getCCDisplayStatus()	Yes	-	
	getCCLanguageStatus()	Yes	-	
Directory Handling Function				
	saveDir()	Yes	-	Note 4)
	saveDirAs()	Yes	-	Note 4)
	createDir()	-	-	
	getParentDirName()	Yes	-	Note 4)
	getDirNames()	Yes	Yes	Note 4)
	isDirExisting()	Yes	Yes	
File Handling Function				
	saveFile()	Yes	-	Note 4)
	saveFileAs()	Yes	-	Note 4)
	getFileNames()	Yes	Yes	Note 4)
	isFileExisting()	Yes	Yes	
File I/O Function				
	writeArray()	-	-	
	readArray()	-	-	
Inquiry Function				
	getDirInfo()	-	-	
	getFileInfo()	-	-	
	getCarouseInfo()	-	-	
	getModuleInfo()	-	-	
	getContentSource()	-	-	
	getStorageInfo()	Yes	-	
Data Carousel Accumulation Function				
	saveCarouselAs()	-	-	
	saveCarousel()	-	-	
	saveModuleAs()	Yes	-	Note 4)
	saveModule()	Yes	-	
	getResourceAs()	Yes	-	Note 4)
	saveResource()	Yes	-	
Bookmark Control Function				
	writeBookmarkArray()	Yes	-	
	readBookmarkArray()	Yes	Yes	
	deleteBookmark()	Yes	-	
	lockBookmark()	Yes	-	
	unlockBookmark()	Yes	-	
	getBookmarkInfo()	Yes	Yes	

Note 1) In addition to checking the media available for selection by the receiver, this API is used to specify the range of NVRAM supported by the receiver (with an assumption to be used for a bookmark).

Note 2) For details, see section 8.10.

Note 3) For details of operation, see ARIB STD-B24, Volume 2, Appendix 1, section 8.5.

Note 4) In reference to the use of this function, inquire the availability of support.

Note 5) Class B operation conforms to the guideline of recording and storage operation described in Appendix 1 of ARIB STD-B24, Volume 2.

Note 6) It is available only for the real-time broadcasting contents or the contents stored from the broadcasting.

11 Operation Rules for Terrestrial / BS / Broadband CS Digital-Broadcasting Tri-Purpose Receivers

11.1 Introduction

This chapter stipulates “Operation of Terrestrial / BS / Broadband CS Multi-Purpose Digital Receiver” (hereinafter referred to as operation of multi-purpose receiver) to extend and apply these functions in the broadband CS digital broadcasting with the view towards the operation of data broadcasting by the terrestrial digital television broadcasting. Basically, the operation of multi-purpose receiver applies to the BS digital / broadband CS digital / terrestrial digital multi-purpose receiver defined at Part 5, Volume 3 of TR-B14. Additionally, this chapter clarifies the details of broadband CS digital receiving function of the terrestrial / BS / broadband CS multi-purpose digital receiver (hereinafter referred to as terrestrial digital multi-purpose receiver).

11.2 Operation Level and BML Version Concept

Table 11-1 shows the presentable BML version and operation level in the broadband CS digital data broadcasting.

Table 11-1 Operation Level and BML Version

Operation Level	Target Receiver	BML2.0	BML3.0
Basic Function Operation	BS and Broadband CS Digital-Broadcasting Dual-Purpose Receiver	Yes	No
Operation Supported by Dual-Purpose Receiver	Terrestrial, BS and Broadband CS Digital-Broadcasting Tri-Purpose Receivers	Yes - Upon verifying the implementation of extended function for broadcasting prescribed for terrestrial, common contents with the basic functions available	Yes (See 11.5.1 Assessment of Terrestrial Digital Multi-Purpose Receiver) - Contents exclusively for the multi-purpose receiver, of which new functions and extended functions for broadcasting defined for terrestrial are available for use in the same condition as terrestrial - Arrangement needs to be made so that it will not be displayed with the BS / Broadband CS dual-purpose receiver.

BML2.0 is a shared content that supports the basic function and optional function for multi-purpose receiver with an assumption that the BS / Broadband CS dual-purpose receiver (hereinafter referred to as BS/CS dual-purpose receiver) is capable of receiving the dedicated contents without problems. In reference to the extended function for broadcasting associated with the operation of dual-purpose receiver, its use is permitted only when it is not disrupting for the viewers, which can be prevented by checking the function using getBrowserSupport() before execution.

On the other hand, BML3.0 transmitted by the broadband CS digital broadcasting, which is written by using the new features defined for the terrestrial digital television broadcasting, is the contents specially designed for the terrestrial digital multi-purpose receiver and cannot be displayed (unable to maintain compatibility) with the BS/CS dual-purpose receiver. These contents need to be arranged by being separated along the way within the range of BML2.0, such as a menu screen, so that they will not be displayed with BS/CS dual-purpose receiver, Provided that the receiver is determined as the terrestrial digital multi-purpose receiver in the previous step, within the BML3.0 contents, the indispensable functions defined in TR-B14 Volume 3 can be utilized without verifying if they are implemented while the optional features can be utilized once they are confirmed to be implemented.

11.3 Functions Required for Terrestrial Digital Multi-Purpose Receiver

It is necessary for the terrestrial digital multi-purpose receiver to equip the functions at least, which are described in TR-B14 and Part 2 of TR-B15 for the media that the receiver is capable of receiving.

11.3.1 RAM

Greg should be shared by all media available for reception. The value of Greg should be maintained even when the communication content that does not support Greg is presented. It is desirable that the value of Greg is maintained even when the other media that does not support Greg is presented.

In case that the value of Greg cannot be maintained while other media is presented, the receiver initializes the value of Greg when it presents the media that supports Greg right after.

11.3.2 NVRAM

Bookmark area, registered call request area, and general root certificate area are to be shared by each media. See the following description regarding the NVRAM area for each media in terms of its capacity and availability of access from other media.

RW: Read and write capable

R: Read only

x : No read or write capability

(*) It is an optional feature since it was set-up after the launch of operation. Both read and write functions are available only when they are permitted by the access authority information configured by the BS provider service. For details, see section 8.2.3.

Table 11-2 Availability of Access from NVRAM of Dual-Purpose Receiver and Each Media

Media	Area Name	Access from BS	Access from Broadband CS	Access from Terrestrial
BS	provider common area	RW	No	R
	provider specific area	RW	RW (*)	No
	Provider specific common area for broadcasting and communication	RW (BML3.0 only)	No	No
Broadband CS	provider common area	No	RW	No
	Provider specific area	No	RW	No
	Provider specific common area for broadcasting and communication	No	RW (BML3.0 only)	No
Terrestrial	Provider common area	R (BML3.0 only)	No	RW
	Provider specific area	No	No	RW

Media	Area Name	Access from BS	Access from Broadband CS	Access from Terrestrial
	Affiliation specific area	RW (BML3.0 only) (Access enabled for the BS broadcast providers who are defined to be in the same affiliations by terrestrial extended broadcaster descriptor.)	No	RW
	Provider specific common area for broadcasting and communication	No	No	RW
Common	General root certificate area	RW (BML3.0 only)	RW (BML3.0 only)	RW
	Registered call request area	RW (BML3.0 only)	RW (BML3.0 only)	RW
	Bookmark Area	RW	RW	RW

Capacity of the common area dedicated to broadband CS providers to be added in the terrestrial digital multi-purpose receiver is as follows:

- 1 kilobyte per 1 provider and available for 18 providers (64 byte * 16 blocks)

11.3.3 Difference in Operation between BS/CS Dual-Purpose Receiver and Terrestrial Digital Multi-Purpose Receiver

The terrestrial digital multi-purpose receiver should operate as specified in TR-B14 regardless of the presence of BML2.0 or BML3.0 unless otherwise stated.

For the terrestrial digital multi-purpose receiver, some of the operations are different from the BS/CS dual-purpose receiver. Functions that generate different behaviors are listed in Table 11-3.

Table 11.3 Difference in Operation between BS/CS Dual-Purpose Receiver and Terrestrial Digital Multi-Purpose Receiver

Function	BS /CS Dual Purpose Receiver	Terrestrial Digital Multi-Purpose Receiver	Reference Section in TR-B14, Volume 3, Part 2 / Remarks
Display resolution when the invisible attribute of body element is set to invisible	No specification	Resolution of graphic image	1.2.2, Appendix 10
Display from data event change to the interpretation of next document	Discard the document immediately. However, there is no description about the display resolution after discarding the document. (Most implementations are designed to keep the same resolution of the previous contents for the display resolution)	Display resolution should be kept at the same level as the previous contents during the time between contents are unloaded after the data event change and the next document is presented.	5.12.1, Appendix 10

Function	BS /CS Dual Purpose Receiver	Terrestrial Digital Multi-Purpose Receiver	Reference Section in TR-B14, Volume 3, Part 2 / Remarks
Action that corresponds with a change of PID being viewed or PID of the entry component.	No specification	Action equivalent to re-selection of channel	2.1.10.3
Action that corresponds with the change of auto_start_flag	When an entry component emerges, it is desirable to execute the operation 4 or later described at 5.1.12.2 "Receiver Basic Operation on Channel Selection".	If data broadcast engine is not activated when the value changes from 0 → 1, it is desirable to execute the operation 6 or later described at 5.1.12.2 "Receiver Basic Operation on Channel Selection".	2.1.10.3
DII to be monitored	DII of the component that includes the module being viewed and DII of the entry component.	In addition to the component described in the left, it monitors the following components. 1. DII of the component that transmits the module specified by lockModuleOnMemoryEx() (Tag value 0x40, 0x50, 0x60) 2. DII of the component transmitting the module that subscribes an interrupt event of ModuleUpdated or ModuleLocked	2.3.1.7
Component of the event message to be monitored (the number of ES can be subscribed simultaneously)	1ES	2ES	2.3.4.3 2ES subscription is supported by BML3.0 only.

11.3.4 Assessment of Media Being Received

BML version declares a scope of browser function used in the contents, but a scope of NVRAM access capability is determined by the media type being received and irrelevant to BML version. Since media-specific description, such as access to NVRAM dedicated to the BS / broadband CS digital broadcasting, may be included in the BML3.0 contents, it is important to pay attention to these factors in implementing the receiver.

11.4 Transmission

11.4.1 Operation of DownloadInfoIndication(DII) Message

In the operation of dual-purpose receiver, BML2.0 and 3.0 contents co-exist according to the setting of 11.5.2 BML3.0 Contents Layout, but do not place Control descriptor of DII.Version will be retrieved from version information of the BML document.

11.4.2 Refresh Interval of DSMCC_section for General Event Message

While the refresh interval of general event message is 100 ms or greater for the terrestrial digital television broadcasting as defined in TR-B14 Volume 3, Part 2, section 2.3.4.3; the refresh interval of general event

message is set to 200 ms or greater for the broadband CS digital broadcasting as shown in section 5.3.4.3.

11.4.3 Event Message That Does Not Depend on Data Event ID

In the operation of multi-purpose receivers, it is possible to transmit the event message of event_msg_group_id=1 to refer from BML3.0 contents. For details, see TR-B14 Volume 3, Part 2, section 2.3.4.3. In this case, note that the contents creator cannot specify event_msg_group_id from BML2.0 contents.

11.4.4 NPT Reference Message

In the operation of multi-purpose receiver as in the operation of basic functions, if STC revolves 0 time while NPT reference message is being sent out, be sure to notify the receiver that the NPT is in the unstable state, using the STCmax reference message. For details, see 5.3.4.4.

11.4.5 Transmission of Root Certificates

In the operation of multi-purpose receiver, the broadcasting companies, who provide interactive service using TLS or SSL, always need to send the root certificate by the module set as module_id=0xFFFF in the entry component of data broadcasting service. For details, see TR-B14 Volume 3, section 2.3.1.8.

11.5 Operation Guideline of Contents

In the operation of multi-purpose receiver, CS digital broadcasting can utilize the contents that use the function prescribed for terrestrial digital television broadcasting. The guidelines are listed below.

11.5.1 Assessment of Terrestrial Digital Multi-Purpose Receiver

When BMLversion is assigned at functionname and “3.0” is assigned at additionalInfo of getBrowserSupport(), it indicates that BML2.0 contents are compatible with BML3.0. To specify namespace for the other media, check the compatibility with the target media using isSupportedMedia(). Compatibility with BML3.0 does not conclude that it is a terrestrial digital dual-purpose receiver. Assessment to verify the compatibility with BML3.0 and terrestrial digital multi-purpose receiver should be conducted separately.

11.5.2 BML3.0 Contents Layout

- Since the BS / CS dual-purpose receiver needs to support the contents to be received immediately after channel selection, at least the start-up document of entry component and the start-up document to be activated directly from EPG should be written in BML2.0.
- bml_version to be included in PMT and EIT must be 2.0.
- BML 2.0 must be the start-up document to be activated by the component of broadband CS digital

broadcasting specified by epgTuneToComponent() from other media.

- Concerning the BS/CS dual-purpose receiver, recording a bookmark for the BML 3.0 contents is not allowed.

11.5.3 Operation Scope of New Functions

Table 11-4 shows the operational scope of BML2.0 and 3.0 contents for the terrestrial digital dual-purpose receiver.

Meanings of "operation" field are described as follows:

"Yes" Available

"Yes(*)" Available as option

"-" Not available

Table 11-4 Operational Scope of Various New Functions for Terrestrial Digital Dual-Purpose Receiver

Function	BML2.0 Contents	BML3.0 Contents	Reference Section in TR-B14, Volume 3, Part 2 / Remarks
Contents that use tilde "~" in the own ES	Yes	Yes	B24 version 1.1 or later
Contents that the HD data is added to the video other than HD or MPEG2-I	-	Yes	1.2.3, Appendix 4
Contents that use 112/128 scaling of HD and SD video	-	Yes	1.2.3, Appendix 4
Contents that remain partial JPEG	-	Yes	5.11
Clipping of X-coordinate of video	-	Yes	1.2.1, Appendix 3
Contents that the range of provider setting color of PNG and MNG is extended to the 207 colors of index 17 to 223	-	Yes	1.2.1
MNG of which refresh cycle is more than 100 milliseconds and less than 200 milliseconds	-	Yes	3.2.3.2
Contents based on the resident text input application	-	Yes	1.6
Contents that use Kana-Kanji conversion function	-	Yes(*)	1.6.3. Will be used after checking the function with identification function for receiver application described at 5.9.6.2
Contents with an assumption that the size of BContents is more than 5MByte.	-	Yes	1.4.1
Contents based on the upper limit of resource count within the BContents is 768	-	Yes	5.13.3
AAC-LC sound of 32kHz sample	-	Yes	1.2.4
Contents based on the maximum file length is 512 KByte	-	Yes	1.4.1
Contents used for the stop control of AAC file	-	Yes	3.3.1.3
Reference of the component for partial reception	-	Yes	2.1.2.3
Contents that subscribe the event message of more than 9 up to 16 simultaneously	Yes	Yes	2.3.4.3
Contents that subscribe event messages to be transmitted by two different ES simultaneously	-	Yes	2.3.4.3

Function	BML2.0 Contents	BML3.0 Contents	Reference Section in TR-B14, Volume 3, Part 2 / Remarks
Contents that subscribe the event message of event_msg_group_id=1	-	Yes	2.3.4.3
Function for extracting the ECMAScript and CSS as separate files for reference.	-	Yes	5.6, 5.7.2, 5.7.3
Contents based on the increase of various constants in ECMAScript operation environment	-	Yes	5.12.4, B24 Volume 2, Appendix 3
Contents based on the increase of various constants in BinaryTable	-	Yes	5.12.5, B24 Volume 2, Appendix 3
Contents that use URI starting with arib://-1.-1.-1/ or arib-dc://-1.-1.-1/	-	Yes	5.12.6.3 5.13.3 5.14.10.4
Contents that use lockModuleOnMemoryEx()	-	Yes	5.12.6.9 (6)
Contents to refer and display the module that has been locked in the above operation	-	Yes	5.13.3
TCP/IP Communication Function Connect/Disconnect by function in broadcast contents	Yes(*)	Yes	5.14
TCP/IP Communication Function Use of transmitTextDataOverIP() in broadcast contents	Yes(*)	Yes	5.14
TCP/IP Communication Function Transition from broadcast contents to communication contents	Yes(*)	Yes	5.14
Communication Contents	-	Yes	5.14 Manage the communication contents by 3.0 only.
Secure communication by TLS	Yes(*)	Yes	5.14.14 2.3.1.8 Place the root certificate at the module 0xFFFF of entry ES. Be sure to allocate the root certificate descriptor in DII. BML1.0 is used only with the utilization of the site starting with https:// or transition to the site starting with https:// for secure communication using transmitTextDataOverIP() from the broadcasting contents.
Read/write of broadcasting and communication common area for NVRAM provider of broadband CS digital broadcasting	Yes(*)	Yes	
Read/write in Bookmark area	Yes(*)	Yes	5.2
Record in NVRAM for recorded call request	Yes(*)	Yes	5.16
Call request timer function compatible with NVRAM for recorded call request	Yes(*)	Yes(*)	5.16.5 Will be used after checking the function with identification function for receiver application described at 5.9.6.2
Call resident bookmark list function	Yes(*)	Yes(*)	5.15.4 Will be used after checking the function with identification function for receiver application described at 5.9.6.2
Print function	Yes(*)	Yes(*)	5.9.6.1 Will be used after checking the function with identification function for receiver application described at 5.9.6.2

Function	BML2.0 Contents	BML3.0 Contents	Reference Section in TR-B14, Volume 3, Part 2 / Remarks
Mail send function	Yes(*)	Yes(*)	5.9.4 Will be used after checking the function with identification function for receiver application described at 5.9.6.2
HTML browser call function	Yes(*)	Yes(*)	BML1.0: Will be used after checking launchExApp() function with getBrowserSupport() BML3.0: 6.1 Will be used after checking the function with identification function for receiver application described at 5.9.6.2

11.5.4 Operational Scope of Browser Pseudo Objects

Table 11-5 indicates the operational scope of basic function and dual-purpose receiver supported function for the browser pseudo objects in the broadband CS digital broadcasting.

Meanings of "operation" field are described as follows:

"Yes" It indicates a basic function in this provision. This function can be used without checking if the receiver supports the concerned processing using getBrowserSupport() function.

"Yes(*1)" These functions are optional in the provision of terrestrial operation. In order to use these functions in contents, check if the receiver has ability to process these functions by specifying APIGroup as functionname and by assigning the value defined at Appendix 1 of STD-B24, Volume 2, at additionalinfo using the getBrowserSupport() function. Only when the processing turns out to be feasible, such function can be called.

"Yes(*2)" These functions are mandatory functions newly defined in the provision of terrestrial operation, but they are not implemented in the BS/CS dual-purpose receivers. Thus, in order to use these functions in contents, check if the receiver has ability to process these functions by specifying APIGroup as functionname and by assigning the value defined at Appendix 1 of B24, Volume 2, at additionalinfo using the getBrowserSupport() function. Only when the processing turns out to be feasible, such function can be called. These functions can be examined by specifying BMLversion for functionname and "3.0" for additionalinfo as well.

"Yes(*3)" These functions are operable only in the broadband CS digital broadcasting.

"Yes(*4)" These functions are optional features defined after the launch of operation. Thus, in order to use these functions in contents, check if the receiver has ability to process these functions by specifying "BPA" as sProvider, "APIGroup" as functionname, and "Persistent.Media.Support.Ext" as additionalinfo. Only when the processing turns out to be feasible, such function can be called. Details of operation

are defined at section 8.2.3.

"-" It is not regarded as neither a basic function nor an optional function in this provision.

Table 11-5 Operational Scope of Browser Pseudo Objects in Multi-Purpose Receiver

	Function	Basic Function Operation	Operation Supported by Dual-Purpose Receiver	Remarks
Ureg Related Function				
	Ureg[]	Yes	Yes	
Greg Related Function				
	Greg[]	Yes	Yes	
EPG Related Function				
	epgGetEventStartTime()	Yes	Yes	
	epgGetEventDuration()	Yes	Yes	
	epgTune()	Yes	Yes	
	epgTuneToComponent()	Yes	Yes	
	epgTuneToDocument()	-	-	
	epgIsReserved()	Yes	Yes	
	epgReserve()	Yes	Yes	
	epgCancelReservation()	Yes	Yes	
	epgRecIsReserved()	Yes	Yes	
	epgRecReserve()	Yes	Yes	
	epgRecCancelReservation()	Yes	Yes	
Program Group Index Function				
	grpIsReserved()	-	-	
	grpReserve()	-	-	
	grpCancelReservation()	-	-	
	grpRecIsReserved()	-	-	
	grpRecReserve()	-	-	
	grpRecCancelReservation()	-	-	
	grpGetNodeEventList()	-	-	
	grpGetERTNodeName()	-	-	
	grpGetERTNodeDescription()	-	-	
	epgXTune()	-	-	
Series Reservation Function				
	seriesIsReserved()	Yes(*1)	Yes(*1)	(Note 1)
	seriesReserve()	Yes(*1)	Yes(*1)	(Note 1)
	seriesCancelReservation()	Yes(*1)	Yes(*1)	(Note 1)
	seriesRecIsReserved()	Yes(*1)	Yes(*1)	(Note 1)
	seriesRecReserve()	Yes(*1)	Yes(*1)	(Note 1)
	seriesRecCancelReservation()	Yes(*1)	Yes(*1)	(Note 1)
Persistent Memory Function				
	readPersistentString()	-	-	
	readPersistentNumber()	-	-	
	readPersistentArray()	Yes	Yes	
	writePersistentString()	-	-	
	writePersistentNumber()	-	-	
	writePersistentArray()	Yes	Yes	
	copyPersistent()	-	-	
	getPersistentInfoList()	-	-	
	deletePersistent()	-	-	
	getFreeSpace()	-	-	
Control of Persistent Memory Area with Access Control				
	setAccessInfoOfPersistentArray()	-	-	
	checkAccessInfoOfPersistentArray()	Yes(*3)	Yes(*3)	
	writePersistentArrayWithAccessCheck()	Yes(*3)	Yes(*3)	

	Function	Basic Function Operation	Operation Supported by Dual-Purpose Receiver	Remarks
	readPersistentArrayWithAccessCheck()	Yes(*3)	Yes(*3)	
	X_CSP_setAccessInfoToProviderArea()	Yes(*3)	Yes(*3)	
	X_BPA_setAccessInfoOfPersistentArrayForAnotherProvider()	Yes(*4)	Yes(*4)	
	X_BPA_checkAccessInfoOfPersistentArrayForAnotherProvider()	-	-	
	X_BPA_writePersistentArrayForAnotherProviderWithAccessCheck()	-	-	
	X_BPA_readPersistentArrayForAnotherProviderWithAccessCheck()	-	-	
Interaction Channel Function				
Interaction Channel Function – Delayed Call				
	registerTransmission()	-	-	
	registerTransmissionStatus()	-	-	
	getTransmissionStatus()	-	-	
	setDelayedTransmissionDataOverBASIC()	-	-	
Interaction Channel Function – BASIC Procedure				
	connect()	Yes	Yes(*1)	(Note 2)
	disconnect()	Yes	Yes(*1)	(Note 2)
	sendBinaryData()	-	-	
	receiveBinaryData()	-	-	
	sendTextData()	Yes	Yes(*1)	(Note 2)
	receiveTextData()	Yes	Yes(*1)	(Note 2)
Interaction Channel Function – TCP/IP				
	setISPParams()	Yes(*2)	Yes	
	getISPParams()	Yes(*2)	Yes	
	connectPPP()	Yes(*2)	Yes	
	connectPPPWithISPParams()	Yes(*2)	Yes	
	disconnectPPP()	Yes(*2)	Yes	
	getConnectionType()	Yes(*2)	Yes	
	isIPConnected()	Yes(*2)	Yes	
	saveHttpServerFileAs()	-		
	saveHttpServerFile()	-		
	sendHttpServerFileAs()	-		
	saveFtpServerFileAs()	-		
	saveFtpServerFile()	-		
	sendFtpServerFileAs()	-		
	sendTextMail()	Yes(*1)	Yes(*1)	
	sendMIMEMail()	Yes(*1)	Yes(*1)	
	transmitTextDataOverIP()	Yes(*2)	Yes	
	setDelayedTransmissionData()	-	-	
	setCacheResourceOverIP()	-	Yes(*1)	(Note 3)
Interaction Channel Function – Status Look-up Function for Delayed Call Function Applicable to BASIC Procedure and IP Connection				
	getDelayedTransmissionStatus()	-	-	
	getDelayedTransmissionResult()	-	-	
Interaction Channel Function – Function for Obtaining Line Connection State				
	getPrefixNumber()	Yes	Yes	
Interaction Channel Function – Mass Calls Acceptance Service				
	vote()	Yes	Yes(*1)	(Note 2)
Interaction Channel Function – Encrypted Communication Using CAS				

	Function	Basic Function Operation	Operation Supported by Dual-Purpose Receiver	Remarks
	startCASEncryption()	-	-	(Note 4)
	transmitWithCASEncryption()	-	-	(Note 4)
	endCASEncryption()	-	-	(Note 4)
Interaction Channel Function - Communication by Private-Key Cryptography without Using CAS				
	getEncryptionKey()	-	-	
	beginEncryption()	-	-	
	endEncryption()	-	-	
Operational Control Function				
	reloadActiveDocument()	Yes	Yes	
	getNPT()	Yes	Yes	
	getProgramRelativeTime()	Yes	Yes	
	isBeingBroadcast()	Yes	Yes	
	lockExecution()	-	-	
	unlockExecution()	-	-	
	lockModuleOnMemory()	Yes	Yes	
	unlockModuleOnMemory()	Yes	Yes	
	setCachePriority()	Yes	Yes	(Note 5)
	getTuningLinkageSource()	Yes(*1)	Yes(*1)	(Note 6)
	getTuningLinkageType()	Yes(*1)	Yes(*1)	(Note 6)
	getLinkSourceServiceStr()	-	-	
	getLinkSourceEventStr()	-	-	
	getIRDID()	Yes	Yes	
	getBrowserVersion()	Yes	Yes	
	getProgramID()	Yes	Yes	
	getActiveDocument()	Yes	Yes	
	lockScreen()	Yes	Yes	
	unlockScreen()	Yes	Yes	
	getBrowserSupport()	Yes	Yes	
	launchDocument()	Yes	Yes	
	launchDocumentRestricted()	Yes(*2)	Yes	
	quitDocument()	Yes(*2)	Yes	
	launchExApp()	Yes(*1)	Yes(*1)	(Note 7)
	getFreeContentsMemory()	Yes(*3)	Yes	
	isSupportedMedia()	Yes(*3)	Yes	
	detectComponent()	Yes(*2)	Yes	
	lockModuleOnMemoryEx()	-	Yes	
	unlockModuleOnMemoryEx()	-	Yes	
	unlockAllModulesOnMemory()	Yes(*2)	Yes	
	getLockedModuleInfo()	Yes(*2)	Yes	(Note 8)
	getBrowserStatus()	Yes(*2)	Yes	
	getResidentAppVersion()	Yes(*2)	Yes	
	isRootCertificateExisting()	Yes(*2)	Yes	
	getRootCertificateInfo()	Yes(*2)	Yes	
	startResidentApp()	Yes(*1)	Yes(*1)	
Receiver Sound Control				
	playRomSound()	Yes	Yes	
Timer Function				
	sleep()	Yes	Yes	
	setTimeout()	-	-	
	setInterval()	Yes	Yes	
	clearTimer()	Yes	Yes	
	pauseTimer()	Yes	Yes	
	resumeTimer()	Yes	Yes	
	setCurrentDataMode()	Yes	Yes	
External Character Functon				

	Function	Basic Function Operation	Operation Supported by Dual-Purpose Receiver	Remarks
	loadDRCS()	Yes	Yes	
	unloadDRCS()	-	-	
External Equipment Control Function				
	enumPeripherals()	-	-	
	passXMLDocToPeripheral()	-	-	
Other Functions				
	random()	Yes	Yes	
	subDate()	Yes	Yes	
	addDate()	Yes	Yes	
	formatNumber()	Yes	Yes	
Subtitle Display Control Function				
	setCCStreamReference()	-	-	
	getCCStreamReference()	-	-	
	setCCDisplayStatus()	Yes	Yes	
	getCCDisplayStatus()	Yes	Yes	
	getCCLanguageStatus()	Yes	Yes	
Printing Related Function API – Print Basic Function				
	getPrinterSatus()	Yes(*1)	Yes(*1)	
	printFile()	Yes(*1)	Yes(*1)	
	printTemplate()	Yes(*1)	Yes(*1)	
	printUri()	Yes(*1)	Yes(*1)	
	printStaticScreen()	Yes(*1)	Yes(*1)	
Printing Related Function API – Memory Card Related				
	saveImageToMemoryCard()	Yes(*1)	Yes(*1)	
	saveHttpServerImageToMemoryCard()	Yes(*1)	Yes(*1)	
	saveStaticScreenToMemoryCard()	Yes(*1)	Yes(*1)	
Directory Handling Function				
	saveDir()	-	-	
	saveDirAs()	-	-	
	createDir()	-	-	
	getParentDirName()	-	-	
	getDirNames()	-	-	
	isDirExisting()	-	-	
File Handling Function				
	saveFile()	-	-	
	saveFileAs()	-	-	
	getFileNames()	-	-	
	isFileExisting()	-	-	
File I/O Function				
	writeArray()	-	-	
	readArray()	-	-	
Inquiry Function				
	getDirInfo()	-	-	
	getFileInfo()	-	-	
	getCarouseInfo()	-	-	
	getModuleInfo()	-	-	
	getContentSource()	-	-	
	getStorageInfo()	-	-	
Data Carousel Accumulation Function				
	saveCarouselAs()	-	-	
	saveCarousel()	-	-	
	saveModuleAs()	-	-	
	saveModule()	-	-	

	Function	Basic Function Operation	Operation Supported by Dual-Purpose Receiver	Remarks
	getResourceAs()	-	-	
	saveResource()	-	-	
Bookmark Control Function				
	writeBookmarkArray()	Yes	Yes	
	readBookmarkArray()	Yes	Yes	
	deleteBookmark()	Yes	Yes	
	lockBookmark()	Yes	Yes	
	unlockBookmark()	Yes	Yes	
	getBookmarkInfo()	Yes	Yes	
	getBookmarkInfo2()	Yes(*2)	Yes	
	startResidentBookmarkList()	Yes(*1)	Yes(*1)	

(Note 1) It is desirable to implement this function in the receiver with series reservation function.

(Note 2) In preparation for the receiver without modem in the future, this function is treated as an option in BML3.0.

(Note 3) Since STD-B24 is undefined at this time, see TR-B14 Volume 3.

(Note 4) Since there is no performance in broadband CS digital broadcasting, it will not be operated in the same way as terrestrial digital television broadcasting.

(Note 5) Notice the difference in interpreting the priority level.

(Note 6) It will not be used in the terrestrial digital television broadcasting

(Note 7) The verification method of function implemented will vary between the basic function and multi-purpose receiver function. See Table 11-3.

(Note 8) If there is no modules fixed or in the state of standing request, return the array of which length is 0 as a return value. However, some receivers return NULL as a return value, so consider this factor when using such functions in the contents.

11.5.5 Notes on the operations with multiple BML versions coexisted

When you transit from BML3.0 contents to BML2.0 contents, you should not assume that the functions available in BML3.0 are also available within BML2.0 contents.

- For example, the module locked using lockModuleOnMemoryEx() in BML3.0 contents must not be used in BML2.0.
- You must not transit to BML2.0 contents after specifying partial JPEG as remain.
- You must not specify the event_msg_group_id attribute in a beitem element of BML2.0 contents.

Although the module locked by lockModuleOnMemoryEx() in BML3.0 contents should be unlocked in BML3.0 contents, it will sometimes be forced to transit to the startup document of an entry component in BML2.0, by the event of component lost during presentation or pull flag and so on. For this reason the providers who operate a lockModuleOnMemoryEx() have to bear in mind that unnecessary modules won't be

left in the contents memory by using unlockAllModulesOnMemory() properly in an entry component startup document or in a BML document launched automatically from it.

11.5.6 Communication contents

11.5.6.1 BML versions

Communication contents can be presented only on the receivers capable of multi-purpose receiver operation, and can be presented only on BML3.0 because they would be shared with those used in terrestrial digital television broadcasting in the future. Broadcasting contents transited into communication contents may be in BML2.0.

11.5.6.2 Security

See TR-B14, Volume 3, Part 2, 5.14 for link/unlink status of communication contents and limitations of function use.

11.5.6.3 Browser specific display

Comply also with the TR-B14 Volume 3, 1.8.1 "Browser specific display" when you present communication contents in unlink state using launchDocumentRestricted function after checking if there is the function using getBrowserSupport function from BML2.0 contents.

11.5.6.4 Transmission of root certificates

In BS/Broadband CS digital broadcasting, if you provide interactive services using TLS or SSL, the root certificate must be transmitted. The operation of the root certificate complies with TR-B14 Volume 3, Part 2, 5.14.14 and 2.3.1.8.The general root certificate among the other root certificates must be uniformly managed and operated under the certificate management authority for terrestrial digital data broadcasting.

11.5.6.5 Printing related functions

See TR-B14 Volume 3, Part 2, 5.14.6.16 for operations of printing related functions in communication contents.See TR-B14 Part 4, part 2, Section 5.12.6 for operations of data broadcasting reception status.

11.5.7 Operations of name space

In the multi-purpose receiver operation, you can use following name spaces in addition to those of the basic function operation.

11.5.7.1 Identification of broadband CS digital broadcasting company exclusive broadband/communication common areas

When you perform read/write information on the broadband CS digital broadcasting company exclusive broadband/communication common areas from MM services, execute readPersistentArray( )/writePersistentArray( ) assuming the fixed-length block as a file. Reading/writing information on the broadband CS digital broadcasting company exclusive broadband/communication common areas from MM services must be done by fixed-length blocks. To identify a fixed-length block, use the following URI.

nvram://[<broadcaster_id>;]local_web/<block_number>

The <broadcaster_id> is always omitted and the broadcaster_id of the stream, into which the current contents on playback transmitted, is assumed instead.

There is no access control in the broadband CS digital broadcasting company exclusive broadband/communication common areas unlike in the provider exclusive areas. Contents creators must always take special care to specify the appropriate block number at read/write operations. The broadcasting companies must be responsible so as not to destroy the data for the important information for the viewer (personal information or points provided by programs) or not to read them by mistake.

11.5.7.2 Identification of the registered call request areas

See TR-B14 Volume 3, Part 2, 5.16.2.

11.5.7.3 Identification when selecting your own station with epgTune( ) and epgTuneToComponent( )

When selecting your own station with epgTune( ) and your own component with epgTuneToComponent( ), specify "arib://-1.-1.-1" and "arib-dc://-1.-1.-1" each as the URIs. See TR-B14 Volume 3, Part 2, 5.12.6.3 for details.

11.5.7.4 Broadcasting stream mono-media referenced from communication contents

When you reference a broadcasting contents stream from a communication contents, specify absolute URI beginning with "arib://-1.-1.-1." When you reference a broadcasting contents mono-media (rather than a stream), always specify absolute URI beginning with "arib-dc://-1.-1.-1."

See TR-B14 Volume 3, Part 2, 5.14.10.4 for details.

11.5.8 Selecting the terrestrial digital television broadcasting services

When selecting a terrestrial digital television broadcasting service from BS/broadband CS digital broadcasting using epgTune() and epgTuneToComponent(), you need to change the destination by each area

in the contents. On the receiver which has no area information settings or in the case in which the viewer's area cannot be identified, the BML element responsible for transiting to the terrestrial digital television broadcasting should not be presented.

11.5.9 Recording/viewing reservation of terrestrial digital television broadcasting services

When the receiver supports terrestrial digital broadcasting media, you can perform recording/viewing reservation features (epgIsReserved(), epgReserve(), epgCancelReservation(), epgRecIsReserved(), epgRecReserve(), epgRecCancelReservation()) for the terrestrial digital television broadcasting services. There is, however, no guarantee that the SI information of the terrestrial digital television broadcasting services has been retrieved, and if it cannot have been retrieved the reservation will fail.

Also the contents creator needs to change the BLM contents which controls the reservation function so that the expression gives no discomfort feeling to the viewer’s area, considering that the broadcasting company might be different in each area.

11.6 Operations of New Functions of Subtitle

11.6.1 Subtitle roll-up mode

This mode is an option in the terrestrial operation rules and because the compatibility with the BS and CS dual-purpose receivers is taken into account, it is also operable with the BS/CS dual-purpose receivers in broadband CS digital broadcasting. See TR-B14 Volume 3, Part 2, 4.10 for details.

11.6.2 Out-screen display functions

Out-screen display function is an option rule only for the receivers independent of the subtitle sending operations. It is desirable to operate on the BS and CS dual-purpose receivers equipped with out-screen displaying function. See TR-B14 Volume 3, Part 2, 4.11 for details.

11.7 Print Functions

This is an optional function in the terrestrial operation rules. In BS, it is also operable as an optional function for terrestrial multi-purpose receiver operations in BML1.0 and BML3.0.

Functions and rules related to the print function comply with the ARIB STD-B24 Volume 2 , "7.6.17 Printing related functions" and Volume 2, Appendix 1 "Guidelines for the print functions."

11.7.1 Extended API groups

For the print function is an option for the receiver implementation, in order to use those functions in contents, you should check if the receiver has an ability to process those functions by specifying the APIGroup in

functionname and the value specified in Volume 2, Appendix 1 in additionalinfo in the getBrowserSupport() function, and only if it has the ability, you can call this function.

Print related functions are divided into following two groups.

A) The function group for printing:

- getPrinterSatus()
- printFile()
- printTemplate()
- printUri()
- printStaticScreen()

B) The function group for storing print data in memory card:

- saveImageToMemoryCard()
- saveHttpServerImageToMemoryCard()
- saveStaticScreenToMemoryCard()

The receiver supporting the print functions can process A) and/or B) above mentioned.

11.7.2 Print data format

See TR-B14 Volume 3, Part 2, 6.2.2 for details.

11.7.3 Supplementary information on print related APIs

About data broadcasting resolution rules at the execution of printStaticScreen() and saveStaticScreenToMemoryCard()

This function can be used at the data broadcasting resolution of 960x540 and 720x480. At the data broadcasting resolution of 720x480, however, there would be distortion of aspect ratio at print time, so pay attention to the operation. Alpha composition between planes is not mandatory. Video planes won't combine.

See TR-B14 Volume 3, Part 2, 6.2.3 for details on any other rules.

11.7.4 Presentation with the receiver

See TR-B14 Volume 3, Part 2, 6.2.4 for details.

Appendix 1 CLUT Common Fixed Color

Same as Part 1.

Appendix 2 Module Compression Format

Same as Part 1.

Appendix 3 BS Level 2 Operation Description

(1) What is BS level 2 operation

- The receiver shared with the BS broadcast is assumed to be the receiver for the broadband CS broadcast. Therefore, it is possible to use extended new functions in the CS broadcast in the BS broadcast as well. This is called "BS level 2 operation", and described in conjunction with this document.
- Interoperability is assumed for the BS level 2 operation, which allows existing receivers or existing BS operations to continue to be used without having any change made. Thus, this shall be positioned as an option in the shared receiver as well.

(2) Ensuring basic operation and interoperability

- For the data broadcasting contents sent for the common receiver, the new function equivalent for BML2.0 can also be used in BS. In this case, however, the contents should be "shared contents" which can be presented in any receivers with no support for BS level 2 operation, regardless of a conventional BS only receiver or a common receiver.
- The shared contents use getBrowserSupport() to know if the new function exists or not and can use the BML2.0 equivalent function if it finds it available. In this case, however, the BML version 1.0 will be broadcasted. That is, this operation will be treated as BML1.0 extension in BS.
- Any other functions and constants should not be changed in principle, considering the interoperability with the existing receivers.
- Table-appendix 3 shows the functions in CS and BS.

Table-Appendix 3 CS and BS Function Comparisons

Function	Operation in CS	Basic Operation in BS	BS Level 2 Operation	Remarks for BS Level 2 Operation
BML Version	2.0 only	1.0 only	1.0 only	
Function of new function general	Required and option	None	Option	Use it after checking with getBrowserSupport().
Bookmark function	Required (Resident function is an option.)	none	Option	Use it after checking with getBrowserSupport().

Provider common NVRAM	64 byte *32*2 networks	64 byte *16	64 byte *16	
Provider specific NVRAM	64 byte *47 (18 providers)	64 byte *16 (64 providers or less)	64 byte *16 (20 providers or less)	Less than those in the BS only receiver.
NVRAM with access control	Required	None	No operation	
Bcontents	More than or equal to 4MB	More than or equal to 2MB	More than or equal to 2MB	Virtually more than or equal to 4MB
Bookmark keys	Option	None	Option	
General event massages	Concurrently 16 or less. 200ms or more interval time	Concurrently 8 or less. 100ms or more interval time	Concurrently 8 or less. 100ms or more interval time	
Reference to auto_start_flag	When selecting channel and when detected an entry component after PMT update.	Only when selecting channel	When selecting channel and when detected an entry component after PMT update.	BS and CS have the same operation in the common receiver.
The range of epgTune()	The range of isSupportedMedia()	Only within BS	The range of isSupportedMedia()	The operation without CS antenna or with no service contract depends on the receiver.
The range of epgTuneToComponent()	The range of isSupportedMedia().	None	The range of isSupportedMedia().	The same as above
New service type	0xA5: Promotion image 0xA6: Promotion voice 0xA7:Promotion data 0xAA: Bookmark list		0xAA: Bookmark list (TBD)	

Appendix 4 Notes on NVRAM Access

- About the life span of NVRAM

  It is expected that NVRAM be implemented using a semiconductor storage device called a flash memory.This device has a limit in the number of write access times and that is the life span for the device. This write access upper limit is around 100,000 as of the year 2000.

  It is desirable to use global variables and Ureg when you want to accumulate the information over the time during the contents presentation. It is recommended to use the Greg function, when supported, when you use temporary data storage for passing data between multiple services. It is not recommended to use NVRAM as a data temporary storage.

Appendix 5　Use of BOOKMARK/Bookmark Logo and Trademark

The following describes the use of “BOOKMARK” and “Bookmark” logos and trademarks. Any operator can use these logos if he/she complies with the provisions given in this Appendix. For the use of “BOOKMARK” and “Bookmark” trademarks, the trademark right of general-purpose electronic appliances belongs to Sony Corporation (Trademark No. 3281163 registered in Japan), and the operator needs to follow the licensing procedure given in Section 5 below.

1. Design of Bookmark logo

- Logo design

  The logo design is shown below. When the operator (or the manufacturer) actually prints the logo on a product such as a remote controller or when actually use it as the contents data, the operator (manufacturer) must request MU-HA Company for its electronic data and use it.

- Alteration of logo

  As a general rule, any alteration of the logo is not permitted. However, if the logo is printed in a limited space of the remote controller or other devices and if the space between the vertical line of character B and the curve of this character is lost, the width of this space can be adjusted.

2. Use of Bookmark logo

(1) When the logo is displayed on a data screen

- Use of Bookmark logo

  If the Bookmark functions are implemented in the data broadcasting contents or in the receiver units, the Bookmark logo can be used. However, the following rules must be complied.

- Coloring of Bookmark logo

  The Bookmark logo is recommended to be in the following blue color. If the blue color cannot be used, the black and white colors can be used instead.

- Setup of RGB colors

  R15 G33 B139

- Size of Bookmark logo

  - 960 * 540

    Width: 26 pixels; height: 30 pixels;

  - 720 *480 (16:9)

Width: 21 pixels; height: 28 pixels;

- 720 * 480 (4:3)

Width: 29 pixels; height: 28 pixels;

- Position of Bookmark logo

It is recommended to display the Bookmark logo in the following position (upper right of the screen) on the HD/SD data plane. If there is no space, the logo can be displayed at upper left position.

- 960 * 540

Left: 845 pixels; top: 77 pixels;

- 720 * 480 (16:9)

Left: 634 pixels; top: 67 pixels;

- 720 * 480 (4:3)

Left: 635 pixels; top: 62 pixels;

- Background color

No background color is specified. However, to improve the visibility, it is recommended to display a background image, having the position and size shown below, under the Bookmark logo. The background image is recommended to be translucent and white of □=128 (50%).

- 960 * 540

Left: 840 pixels; top: 75 pixels; width: 34 pixels; height: 35 pixels;

- 720 * 480 (16:9)

Left: 630 pixels; top: 65 pixels; width: 27 pixels; height: 33 pixels;

- 720 * 480 (4:3)

Left: 630 pixels; top: 65 pixels; width: 27 pixels; height: 33 pixels;

(2) When the logo is printed

- Use of Bookmark logo

The Bookmark logo can be printed on a remote controller or any printed material (on a voluntary basis). However, the following rules must be complied.

- Coloring of Bookmark logo

It is recommended to print the logo in blue as specified below. If the blue color cannot be used, the black or white color can be used.

- Printing

DIC P-755 (C100 M80 Y0 K0)

- Size of Bookmark logo when printed

No logo size is specified.

- Background color

  No background color is specified. However, it is desirable to consider the better visibility to users.
- Space around the Bookmark logo

  A space around the logo is not specified on the data screen. However, it is desirable to consider the better visibility to users.
- If the Bookmark logo is printed on a key of remote controller or around its key (*)
  - If the remote controller has a special Bookmark recording button, the Bookmark logo can be printed on (or around) this button. In this case, the logo needs not be printed around the blue button.
  - If the remote controller does not have the special Bookmark recording button, the Bookmark logo can be printed around the blue button.
  - If the Bookmark logo is printed on (or around) the Bookmark List button, an appropriate design needs to be considered so that the audience does not take it for the Bookmark recording button.

* A special Bookmark recording button or a special blue button is expected to be used for execution of Bookmark recording of the contents.

3. Intended use of Bookmark logo
   - The Bookmark logo is limited to use for the following purposes under the provisions given in Annex 1 of ARIB STD-B24 and Volume 3 of TR-B15 Fascicle 4.

   1) The Bookmark logo is displayed on the data screen during the time when bookmark data can be recorded from the bookmark recording contents that are operated under the Bookmark standard defined in Annex 1 of ARIB STD-B24.
   2) Similarly, the Bookmark logo is displayed on the data screen of the Bookmark list contents and prelist.
   3) The Bookmark logo is used for the Bookmark recording button and its related button of the receiver's remote controller.
   4) The Bookmark logo is used on the briefing papers and explanatory materials of the receiver.
   5) The Bookmark logo is used for explanation of the bookmark on the TV broadcasting screen.

4. Owner of the Bookmark logo and its copyright management system
   - Whereabouts and licensing of the copyright
     - The copyright of the Bookmark logo belongs to MU-HA Company.
     - However, the Bookmark logo can be used without license from MU-HA Company if these provisions are complied.

- MU-HA Company does not request for any value in use of the Bookmark logo.

- Distribution of the Bookmark logo electronic data
  - MU-HA Company distributes electronic data of the Bookmark logo when requested by a broadcasting company or a receiver manufacturer.
  - The data is distributed as a Windows ".psd" or ".bmp" file. The reproduction proof (or repro) is not provided.
  - Two types of bitmap data (color and monochrome data) are provided. A single size logo is provided. The requesting party shall resize the logo. It is desirable to use anti-alias processing to resize the logo.

5. Use of “BOOKMARK/Bookmark” trademark

   For the general-purpose electronic appliances, the right of "BOOKMARK/Bookmark" trademark (Trademark No. 3281163 registered in Japan) belongs to Sony Corporation. MU-HA Company is totally licensed from Sony Corporation under certain conditions and re-licenses nonexclusively and indiscriminately to the parties who comply these regulations under certain conditions. For the licensing details, contact MU-HA Company.

Appendix 6 Guideline for Information Operation on Data Broadcasting NVRAM

1. Basic concept to handle the data broadcasting NVRAM

   The NVRAM used for broadcasting has the following basic concept.

   - The manufacturer guarantees the physical functions and performance of the NVRAM.
   - The user has the ownership of the personal information written in the NVRAM.
   - The broadcasting company manages the information and licenses to the user.

2. Definition of personal information on the NVRAM

   This guideline describes the personal information stored in the NVRAM as the information that has been defined by "The Compliance Program Requirements for Personal Information Protection" of JIS Q 15001 Standard.

   The personal information means an information about individuals, and this is the information that can identify an individual with the name, date of birth or other description, a number, symbol or code assigned to each individual, an image and/or a voice that are included in this information. (It also includes an information that cannot identify an individual but that can easily identify an individual by collation with another information.)

   Also, the "points" and other data that can be used for exchange of values of a prize, game or free gift needs to be handled carefully to protect the interests of viewer. Such data is also considered to be the personal information that is controlled by this guideline.

3. Identification of viewer

   It is assumed that each viewer is identified or agreed with the display of personal information, deletion of data, recovery and others of data broadcasting contents. The identification of each viewer can be as follows:

   - Identification of an individual by his/her secret number,
   - Identification of a receiver by its B-CAS card ID, or
   - Identification of a family unit by its telephone caller ID.

4. Guideline to provide the personal information handling convention for data broadcasting contents

   - It is desirable to show the following information in the "Membership rules", "FAQ", "Help" or others.
     (1) The registered information has been stored in the receiver.
     (2) Each service user (or each member) needs to manage the personal information stored in the

receiver on his/her own responsibility, and each user needs to delete this information by himself or herself when the receiver is assigned or transferred to another person or discarded.

(3) A provider of this service must manage the registered information, maintain its confidentiality, and clarify its usage.

(4) A provider that uses B-CAS card IDs for user authentication must clarify the procedure of NVRAM data inheritance (recovery) during B-CAS card replacement and others.

(5) When a member is registered, the disclaimer for missing of points and other data must be declared to the user, and it must be agreed.

- The contents are desirable to have the function that displays the NVRAM data (personal information and others) being stored in the receiver.

(1) The "Member registration" and other menus must have the "Confirmation of memory data" option.

(2) The personal authentication by secret number, for example, must be used to display the NVRAM data.

It is desirable to display all of the NVRAM data (personal information and others).

However, the highly critical information such as the secret number and credit card number must be displayed as asterisks (****) or an "Already stored" message, rather than the actual (numerical) data.

5. Guideline for NVRAM data deletion function of data broadcasting contents

If the service that stores personal information in the NVRAM of the receiver during data broadcasting is provided, each provider (or program supplier) is desired to have the following deletion function for the data broadcasting contents.

- Areas to be deleted: Part of NVRAM provider's areas that is occupied by this provider
- User interface: It is desirable to implement the following user interfaces to improve the operability of viewer and to prevent incorrect operations by viewer. (See the operation screen examples.)
  - The "Member registration" and other menus must have the "Delete memory contents" option.
  - A step of confirmation by viewer is required before the deletion of actual NVRAM provider’s areas.
  - A possibility of an illegal access to the NVRAM that is not defined for the data broadcasting and receiver must be considered, and the "0x00", "0x20" or other values must be written in the entire area that is deleted.

Note that the deletion function contents may not be displayed all the time, and this function may be executed only when a viewer withdraws from the membership.

● Indication example of personal information handling convention

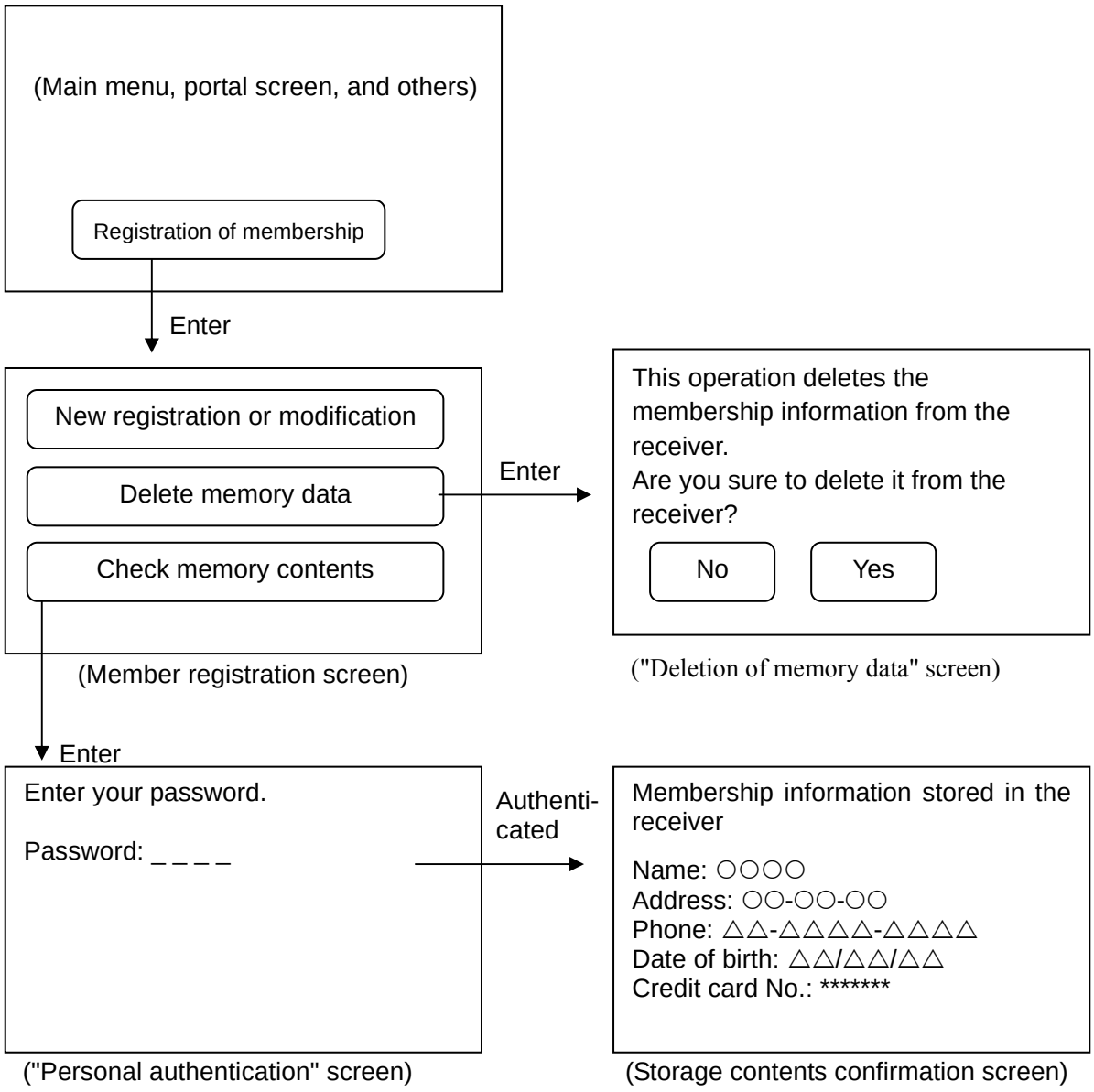
We are responsible to the management of personal information such as membership numbers, addresses, names, and credit card numbers.

We do not expose the membership information to third parties without agreement of the member.

We secure the membership privacy protection.

(When data is sent on the uplink,) only the data represented by XX (for example, the name, address, phone number, and credit card number) is only sent among the information just entered and the information already registered. We use this data for this service (an example of TV shopping) only.

● Screen example to delete the NVRAM data



Volume 4

Broadband CS Digital Broadcasting

PSI/SI Operation Rules

Contents

(This page is intentionally left blank.)

Overview of Operation

1 Introduction

1.1 Preface

The Electronic Program Guide (EPG) service in the Broadband CS digital broadcasting is provided according to the Ministry of Internal Affairs and Communications ordinance and announcements and the rule of the "Service Information for Digital Broadcasting System" (ARIB STD-B10) defined by Association of Radio Industries and Businesses (hereinafter, referred to as ARIB). However, this document, "Broadband CS Digital Broadcasting PSI/SI Operation Rules", has been drawn out because it is necessary to separately define detailed operations for the wider use of this standard.

The transmission standard for transmission control information specified here assumes that it will ensure flexibility in program organization in each consigned broadcasters and expandability for the future broadcasting services.

PSI/SI transmission from consigned broadband CS digital broadcasters shall follow this standard document.

In the receiver shared by the BS and broadband CS digital broadcast, it is desirable that due considerations are given so that transmitted signals can be received according to this rule and singnals that are not defined will not cause any improper operation.

1.2 Purpose

This document defines the transmission standards for the broadband CS digital broadcast conforming to the "Service Information for Digital Broadcasting System", STD-B10, defined by ARIB.

1.3 Scope

This standard document is applied to the operation and transmission standards for the structure, signal types, basic data structure, and identifiers of PSI and SI, which are used for the broadband CS digital broadcasting.

Forces of this standard document are described below.

[Receiving side]

This standard document only defines the specification of transmission operation of PSI/SI in the broadband CS digital broadcasting. This document does not enforce the implementation supporting this operation in the receiver. However, conversely, when the receiver requests any operation other than that which is defined in the standard document, there is no guarantee that consigned broadcasters support that operation.

[Sending side]

Basically, this document does not impose any absolute force on the sending side, either. However, when transmission operation is not performed in accordance with this standard document, normal operation in the receiver is not guaranteed.

2 Applied documents

Based on the STD-B10, “Service Information for Digital Broadcasting System” defined by ARIB, this document specifies detailed operation rules in the broadband CS digital broadcasting.

Related documents are listed as follows:

MPEG standard

- ISO/IEC 13818-1 MPEG-2 Systems standard

ARIB standard

- ARIB STD-B5, “Data Multiplex Broadcasting System for The Conventional Television Using The Vertical Blanking Interval”
- ARIB STD-B10, “Service Information for Digital Broadcasting System”
- ARIB STD-B20, “Transmission System for Digital Satellite Broadcasting”
- ARIB STD-B24, “Data Coding and Transmission Specification for Digital Broadcasting”
- ARIB STD-B25, “Conditional Access System Specifications for Digital Broadcasting”

3 Definition of terms

Terms other than those described in the table below are defined as the same terms as in Part 1.

Table 3-1 shows the descriptions of terms.

Table 3-1 Term description

BAT (Bouquet Association Table)	Information, such as bouquet names and included organization channels, is described. The BS/ broadband CS digital broadcasting will not implement this operation for a while.
LDT (Linked Description Table)	Descriptions which are referenced by other tables are consolidated and transmitted. In the broadband CS digital broadcasting, a descriptor for each station SI are used so that EIT [sch basic] can reference it.
NBIT (Network Board Information_Table)	Bulletin board information and reference information to retrieve the bulletin board information are transmitted.
network_id	Network identification value. One network id is assigned to the BS4 successor for a while. Initially, two network_ids are assigned to the broadband CS digital broadcasting.
RST (Running Status Table)	Progress stage table. This indicates the stage of progress of programs at the current time. The BS/ broadband CS digital broadcasting will not implement this operation.
SI prime TS	TS with a special transmission form in connection with SI. Operation in a short cycle and transmission of NBIT [msg] are executed based on SI prime.
TDT (Time and Date Table)	Date and time table. This indicates the current date and time. This is not transmitted in the BS/ broadband CS digital broadcasting.
TOT (Time Offset Table)	This indicates the current date and time. This also specifies difference in time between actual time and time displayed for people under the system of daylight-saving time. (In the BS/ broadband CS digital broadcasting, only TOT is transmitted. TDT is not transmitted.)

4 Encoding of text strings

All items other than the items described in 4.5 below are defined as the same as in Part 1.

4.1 Character set

The same as in Part 1.

4.2 Control code

The same as in Part 1.

4.3 Initialization

The same as in Part 1.

4.4 Operation of external characters

The same as in Part 1.

4.5 Maximum length of text strings

Table 4-7 shows the maximum length of each text string field in the SI.

Table 4-7 Maximum length of each text string field in the SI

Field name	Descriptor	Maximum length
Network name	Network descriptor	No more than 10 em characters and no more than 20 bytes.
Broadcaster name	Broadcaster name descriptor	No more than 10 em characters and no more than 20 bytes.
Company name	Service descriptor	No more than 10 em characters and no more than 20 bytes.
Organization channel name	Service descriptor	No more than 10 em characters and no more than 20 bytes.
Charge name	CA contract information descriptor	No more than 10 em characters and no more than 20 bytes.
Program name Note 1)	Short event descriptor	No more than 40 em characters and no more than 80 bytes.
Program description	Short event descriptor	No more than 80 em characters and no more than 160 bytes.
Graphic image component description	Component descriptor	No more than 8 em characters and no more than 16 bytes.
Audio component description	Audio component descriptor	- No more than 8 em characters and no more than 16 bytes for each type of voice. - When two types of voice exist for one ES, 1 byte line feed code is inserted between voice type names. Total length should be no more than 33 bytes (for character length of each voice type, 8 em characters).
Content description	Data content descriptor	Maximum length is set in conformity with Volume 3, the data broadcasting operation rules.
Series name	Series descriptor	No more than 20 em characters and no more than 40 bytes.
Component group name	Component group descriptor	No more than 8 em characters and no more than 16 bytes.
Item name	Extended event descriptor	No more than 8 em characters and no more than 16 bytes.
Item description	Extended event descriptor	For each descriptor, maximum length should be no more than 100 em characters and no more than 200 bytes. For one item name, a maximum of two descriptors can be allocated.
Movement confirmation message	Linkage descriptor	No more than 80 em characters and no more than 160 bytes.
Board information title	Board information descriptor	No more than 20 em characters and no more than 40 bytes.
Board information content description	Board information descriptor	For each descriptor, maximum length should be no more than 200 bytes. When it exceeds 200 bytes, a descriptor can be divided to describe the information up to the length of 200 em characters and 400 bytes.

(Note 1) The program name consists of "program title and program sub-title." In regards to long time programs, displaying in 40 characters is strongly desired. However, considering the case in which the program name is omitted at the point of 20 characters due to limitation in displaying, the transmitting side implements some operations, such as notation which is arranged in a preferential order. In addition, as a rule, the length for programs with a duration of 30 minutes or less should be no more than 20 characters.

5 Definition of table/descriptor

The same as in Part 1.

5.1 Type and identification of tables

In the broadband CS digital broadcasting, the following tables are used for the Program Specific Information (PSI) and Service Information (SI).

For the PSI, the following tables, which are defined in the ministry ordinance, are used. These are also described in Section 4.1 of Part 1 of the ARIB STD-B10. This is shown in Table 5-1.

Table 5-1 PSI tables to be used

Table name	Overview of the function
Program association Table PAT (Program Association Table)	To specify the PID of TS packet which transmits PMT related to broadcasted programs.
Conditional access table CAT (Conditional Access Table)	To specify the PID of TS packet which transmits information related to broadcast with limited access.
Program map table PMT (Program Map Table)	To specify the PID of TS packet which transmits each encoding signal which configures broadcasted programs.
Network information table NIT (Network Information Table)	To transmit information which associates transmission channel information, such as modulation frequency, with broadcasted programs.

Tables for SI are described in Section 4.1 of Part 1 of the ARIB STD-B10. Out of these tables, the following tables are used. This is shown in Table 5-2.

Table 5-2 SI tables to be used (Tables defined in the ARIB STD-B10)

Table name	Overview of the function
Service description table SDT (Service Description Table)	To transmit information related to organization channels, such as organization channel name and consigned broadcaster name.
Event information table EIT (Event Information Table)	To indicate information related to programs, such as program name, broadcasting date and time, and content description.

Broadcaster information table BIT (Broadcaster Information Table)	To specify SI transmission parameters and other information which are defined for each company in the SI and each company (broadcaster).
Network board information table NBIT (Network Board Information_Table)	To transmit bulletin board information and reference information to retrieve the bulletin board information.
Linked description table LDT (Linked Description Table)	Descriptions which are referenced by other tables are consolidated and transmitted.
Time offset table TOT (Time Offset Table)	This indicates the current date and time. This also specifies difference in time between actual time and time displayed for people under the system of daylight-saving time.
Stuffing table ST （Stuffing Table）	To disable tables.

* In the broadband CS digital broadcasting, TDT and RST are not transmitted.
* In regards to BAT, LIT, ERT, ITT, and PCAT, when a possibility that they might be implemented is generated, BAT, LIT, ERT, ITT, and PCAT shall be revised in the related rule document.

In the broadband CS digital broadcasting, in addition to the SI tables, tables which are defined in the ARIB STD-B10 are used. This is shown in Table 5-3.

Table 5-3　Table to be used (Table other than for the SI tables)

Table name	Overview of the function
Software download trigger table SDTT (Software Download Trigger Table)	To specify announcement information, such as download service ID, schedule information, and receiver model type to be updated. For details, see Volume 1.

In addition, table 5-5 shows the PID values of the transport stream packet which transmits the PSI/SI section.

Table 5-5　Allocation of the PID to the PSI/SI

PID	Table
0x0000	PAT
Indirect specification using the PAT	PMT
0x0001	CAT
0x0010	NIT, ST
0x0011	SDT, ST
0x0012	EIT, ST
0x0014	TOT, ST
0x0023	SDTT
0x0024	BIT
0x0025	NBIT, LDT

Values (table_id) are assigned to identify tables for the PSI and SI which are used in the broadband CS digital broadcasting. Out of the values defined in Section 5.2 of Part 1 of the ARIB STD-B10, the following values are used. This is shown in Table 5-6.

Table 5-6 Allocation of table_id

table_id	Table
0x00	PAT
0x01	CAT
0x02	PMT
0x40	NIT[actual]
0x41	NIT[other]
0x42	SDT[actual]
0x46	SDT[other]
0x4E	EIT[p/f actual]
0x4F	EIT[p/f other]
0x50-0x57	EIT[schedule actual basic]
0x58-0x5F	EIT[schedule actual extended]
0x60-0x67	EIT[schedule other basic]
0x68-0x6F	EIT[schedule other extended]
0x72	ST
0x73	TOT
0xC3	SDTT
0xC4	BIT
0xC5	NBIT[msg] (Bulletin board information)
0xC6	NBIT[ref] (Reference information to retrieve bulletin board information)
0xC7	LDT

* For the detailed types of EIT[schedule], see Chapter 10 and 13.

5.2 Type and identification of descriptors

For descriptors used for the PSI and SI, out of rules based on announcement and rules defined in Section 4.2 of Part 1 of the ARIB STD-B10, the following descriptors are used. This is shown in Table 5-7.

Table 5-7 Descriptors to be used (Descriptors defined in the ARIB STD-B10)

Descriptor name	Overview of the function
Conditional access descriptor (Conditional Access Descriptor)	To describe the PID which transmits the conditional access method and its ECM and EMM (When it is allocated in the CAT, it indicates EMM information. When it is allocated in the PMT, it indicates ECM information).
Network name descriptor (Network Name Descriptor)	To describe the network name
Service list descriptor (Service List Descriptor)	To describe the organization channel and the list of its identifications.
Stuffing descriptor (Stuffing Descriptor)	To secure descriptor spaces and disable descriptors.
Satellite delivery system descriptor (Satellite Delivery System Descriptor)	To describe physical conditions of satellite transmission channels.
Service descriptor	To describe the organization channel name and its

(Service Descriptor)	broadcaster.
Linkage descriptor (linkage Descriptor)	To describe the linkage with other organization channels.
Short event descriptor (Short Event Descriptor)	To describe simple explanation of the program name and program.
Extended event descriptor (Extended Event Descriptor)	To describe detailed information related to programs.
Component descriptor (Component Descriptor)	To describe types and descriptions related to graphic image components.
Stream Identifier Descriptor (Stream Identifier Descriptor)	To describe individual component identifiers.
Content descriptor (Content Descriptor)	To describe program genres.
Parental rate descriptor (Parental Rate Descriptor)	To describe age limitation on access to programs.
Local time offset descriptor (Local Time Offset Descriptor)	To describe difference in time between actual time (UTC + 9 hours) and time displayed to people under the system of daylight-saving time.
Hierarchical transmission descriptor (Hierarchical Transmission Descriptor)	To describe the relationship of hierarchical streams in the hierarchical transmission.
Digital copy control description (Digital Copy Control Descriptor)	To describe the information which controls copy generations in digital recording equipment and the maximum transmission rate.
Audio component descriptor (Audio Component Descriptor)	To describe parameters related to audio components.
Hyper link descriptor (Hyper Link Descriptor)	To describe the links to other programs, internal programs, and program related information.
Target area descriptor (Target Area Descriptor)	To describe target areas.
Data contents descriptor (Data Contents Descriptor)	To describe detailed information related to data contents.
Video decode control descriptor (Video Decode Control Descriptor)	This is used to identify whether static images are being transmitted to control video decoding when the vide coding system is switched in the same service_id.
CA EMM TS descriptor (CA EMM TS Descriptor)	To indicate the specified TS when EMM is transmitted based on the specified TS method.
CA contract information descriptor (CA Contract Info Descriptor)	To describe the types of conditional access of planned broadcast programs (tier/ flat/ PPV) and whether watching/ recording reservation is allowed or not.
CA service descriptor (CA Service Descriptor)	To describe broadcasters which provide services to display automatic displayed messages.
Series descriptor (Series Descriptor)	To describe series information covering multiple events.
Event group descriptor (Event Group Descriptor)	To describe grouping information for multiple events.
SI parameter descriptor (SI Parameter Descriptor)	To describe SI transmission parameters (cycle group or resending cycle)
Broadcaster name descriptor (Broadcaster Name Descriptor)	To describe broadcaster names.
Component group descriptor (Component Group Descriptor)	To describe grouping information for multiple components.
SI prime TS descriptor (SI Prime TS Descriptor)	To describe identification information for SI prime TS and transmission parameters.
Board information descriptor (Board Information Descriptor)	To describe the title of board information and main body.
LDT linkage descriptor (LDT linkage Descriptor)	Descriptions which are referenced by other tables are consolidated and transmitted.

Emergency information descriptor (Emergency Information Descriptor)	To describe information and functions necessary as an emergency alert signal.
Data coding system descriptor (Data Component Descriptor)	To identify data coding systems.
Download content descriptor (Download Content Descriptor)	To describe download property information, such as the type and size of downloaded contents and download ID. This descriptor is defined in the ARIB STD-B21.
System management descriptor (System Management Descriptor)	To identify whether it is broadcasted or not broadcasted.
Content availability descriptor (Content Availability Descriptor)	To describe control information related to accumulation and output.

* Out of descriptors defined in the ARIB STD-B10, the following descriptors are not used: copyright descriptor, bouquet name descriptor, country enabled access descriptor, NVOD standard service descriptor, time shift service descriptor, time shift event descriptor, mosaic descriptor, CA identifier descriptor, partial transport stream descriptor, network identifier descriptor, partial transport stream time descriptor, basic local event descriptor, reference descriptor, node relational descriptor, short node information descriptor, STC reference descriptor, partial reception descriptor.

* In regards to the descriptors other than those which are defined in table 5-7, when a possibility that they might be implemented is generated, they shall be revised in the related rule document.

For the tag values which are assigned to descriptors (descriptor_tag), the definition in Section 5.3 of Part 1 of the ARIB STD-B10 is followed. This is shown in Table 5-8.

Table 5-8 Assignment of descriptor tag values

Tag value	Descriptor name
0x09	Conditional access descriptor
0x40	Network name descriptor
0x41	Service list descriptor
0x42	Stuffing descriptor
0x43	Satellite delivery system descriptor
0x48	Service descriptor
0x4A	Linkage descriptor
0x4D	Short event descriptor
0x4E	Extended event descriptor
0x50	Component descriptor
0x52	Stream identifier Descriptor
0x54	Content descriptor
0x55	Parental rate descriptor
0x58	Local time offset descriptor
0xC0	Hierarchical transmission descriptor
0xC1	Digital copy control description
0xC4	Audio component descriptor
0xC5	Hyper link descriptor
0xC6	Target area descriptor
0xC7	Data contents descriptor
0xC8	Video decode control descriptor
0xC9	Download content descriptor [Note 1]

0xCA	CA EMM TS descriptor
0xCB	CA contract information descriptor
0xCC	CA service descriptor
0xD5	Series descriptor
0xD6	Event group descriptor
0xD7	SI parameter descriptor
0xD8	Broadcaster name descriptor
0xD9	Component group descriptor
0xDA	SI prime TS descriptor
0xDB	Board information descriptor
0xDC	LDT linkage descriptor
0xDE	Content availability descriptor
0xFC	Emergency information descriptor
0xFD	Data coding system descriptor
0xFE	System management descriptor

Note 1: This descriptor is defined in the ARIB STD-B21.

5.3 Operation of identifiers

Table 5-9 shows the assignment of each identifier (uniqueness).

Table 5-9 Operation of identifiers

Identifier	Operation (uniqueness)
network_id	In the BS digital broadcasting, one network_id is assigned to the BS4 successor for a while. In the broadband CS digital broadcasting, one network_id is assigned to each of the two platform companies. This id is unique in Japan.
transport_stream_id	This is assigned to each TS. This is unique in network.
service_id (=program_number)	This is assigned to each organization channel. This is unique in network in the BS digital broadcasting. In the broadband CS digital broadcasting, this is unique in the entire network. For the uniqueness in assigning based on time, see Section 29.1.
event_id	This is assigned to each event. This is unique in a service. For the uniqueness in assigning based on time, see Section 8.2.1.
broadcaster_id	This is assigned to broadcasters. This is unique in the original network.
series_idseries_id	This is assigned to a series of programs. This is unique in a service group which belongs to the same media type in a broadcaster.
component_tagcomponent_tag	This is assigned to each ES (component).This is unique in a service. For the operation of component_tag, see Chapter 14.
PID	This is assigned in the TS in a unique manner. However, for the PSI/SI other than PMT, see the fixed PID value assignment (table 5-5).

6 Operation of the Items Commonly Shared among Tables

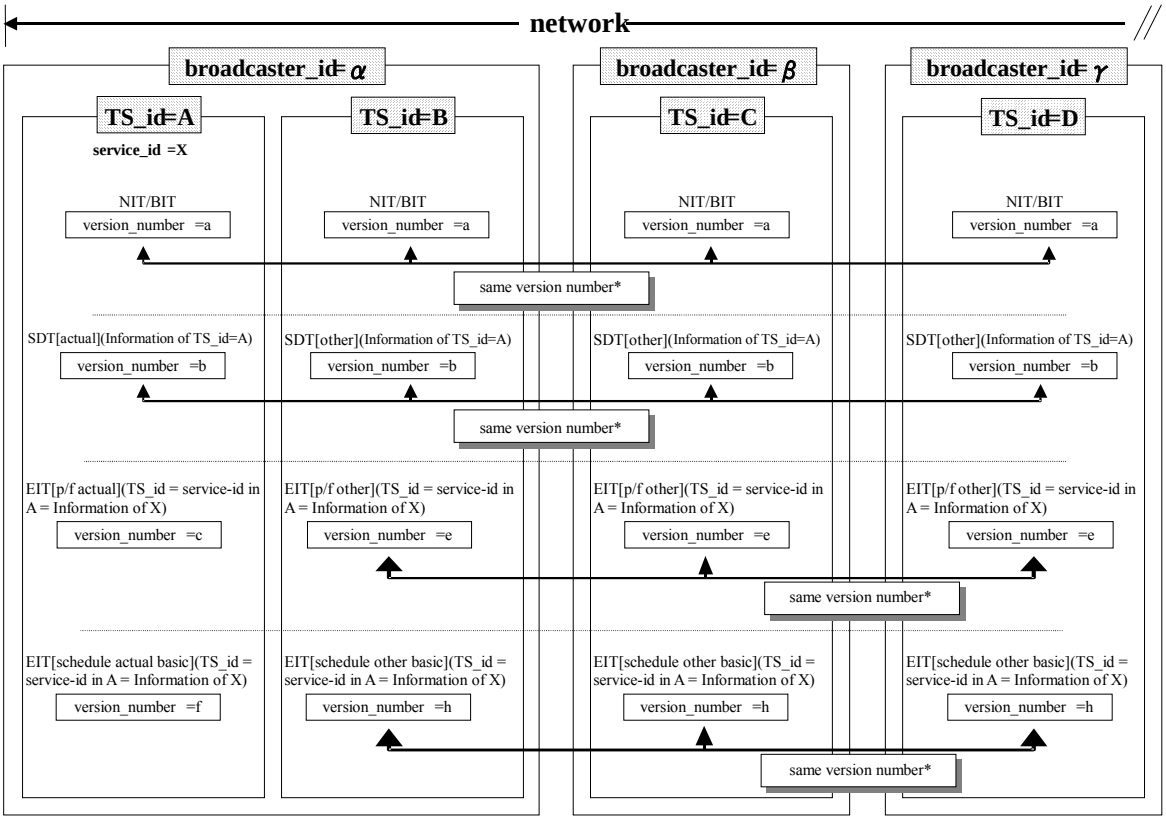
6.1 Operation of version_number

6.1.1 Granting of version_number and ensuring of the transmission of the same version_id

An independent version_number is granted for each sub table.

When table_id and table_id_extension are the same, NIT[actual/other], BIT, SDT, EIT[p/f other], EIT[schedule other], and NBIT[ref] table which are transmitted by each TS are transmitted with the same

version_number in all TSs.



* There might be slight discrepancies in timing of updating version_number in each TS.

Figure 6-1　Contents of version_number among TSs which are transmitted simultaneously

6.1.2 Timing of change

In the broadband CS digital broadcasting, the updating of other tables which are transmitted by the other TSs is not always updated after the updating of the actual table which the original TS transmits.

However, in the BS digital broadcasting, the updating of other tables which are transmitted by the other TSs might be updated after the updating of the actual table which the TS itself transmits. (This depends on collecting/distributing transaction time of SI information and SI transmission processing time in each contracted broadcasting companies: approximately one minute is assumed at present.)

○ When SDT is updated

SDT[other] is always updated after the updating of SDT[actual].

○ When EIT is updated

Normally, EIT[actual] and EIT[other] are updated simultaneously. However, when described contents are changed, such as due to flexible program organization, the change of EIT[other] follows the change of EIT[actual].

6.1.3 Version change

Same as Part 1.

6.1.4 Version control of sections

Same as Part 1.

6.2 Operation of current_next_indicator

Same as Part 1.

6.3 Operation of running_status

Same as Part 1.

6.4 Operation of reserved and Items of reserved_future_use

Same as Part 1.

6.5 Scramble

Same as Part 1.

7 SI Information Change

Same as Part 1.

8 Definition of Service Events

8.1 Definition of Services and Service Types

Same as Part 1. However, the following five lines are not applied to the definition of services and service types.

“In addition, it is possible to transmit programs for which any service is defined in the NIT. This means that programs which are not defined in the NIT are entered in the PAT. Channels for this program are not selected. For examples, programs for which services are not defined in the NIT refer to test broadcasting and services whose channels are selected only through the link from the selected service. This means that direct channel select operation, such as inputting a channel number, is not allowed.”

The following two services are added to service_type to be used.

○ Promotion (video, audio, and data) service

This service is used to publish and advertise the contents of programs and services.

○ Accumulation only data service

This service is one of the services which are available after data is accumulated in the receiver. This special service is used while data is retained in the specified directory in the accumulating media.

8.2 Definition of Events

Same as Part 1. However, for the items which are related to basic concept of event settings, it is necessary to change the document as follows:

"○ The BS digital broadcasting is different from the CS digital broadcasting in the point that its event schedule is frequently changed due to abrupt incidents or accidents (see Chapter 19 Event Schedule Change). In other words, flexible program organization is assumed for the BS digital broadcasting. The contents of change are changes in start_time and duration of events, indetermination of events, and other changes. Determination of program organization should be reflected to the EIT as soon as possible. However, depending on conditions, there is a possibility that event schedule might remain undetermined for a long time."to the following sentences:

"○ When event schedule is changed due to abrupt incidents or accidents, flexible program organization is assumed. The contents of change are changes in start_time and duration of events, indetermination of events, and other changes. Determination of program organization should be reflected to the EIT as soon as possible. However, depending on conditions, there is a possibility that event schedule might remain undetermined for a long time."

8.2.1 Reuse of event_id (uniqueness of time)

Same as Part 1.

9 Transmission Model of the Broadband CS Digital Broadcasting and Broadcasters

9.1 Network Architecture

Figure 9-1 shows the example of the TS architecture in the broadband CS digital broadcasting network.

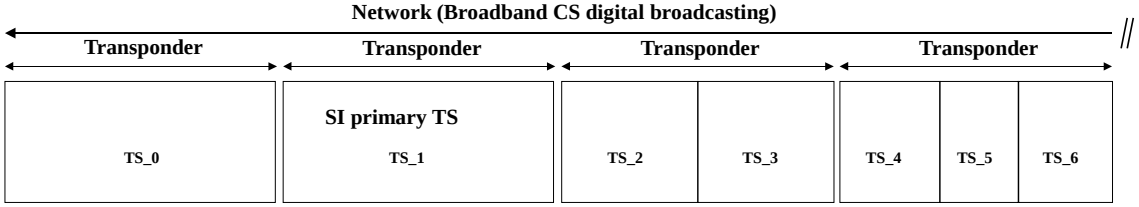


Figure 9-1 Example of TS assignment in the network

Based on the ARIB STD-B10, network is defined for a set of multiple MPEG-2 TSs, which is specified for one distribution system. Network is identified according to network_id, which is granted to the broadband CS digital broadcasting (initial value for the broadband CS is 2). In addition to the case in which multiple transport streams (TS) are transmitted in a similar manner to the BS digital broadcasting network, transponder used in the broadband CS digital broadcasting might be transmitted only to one transport stream (TS) in order to enhance efficiency in transmission bandwidth in operation. Additionally, for the modulation system, the QPSK, FEC3/4 is planned for immediate operation. In that case, the maximum bit rate per TS will be approximately 40Mbps.

Furthermore, in the broadband CS digital broadcasting network, the operation of SI prime TS is allowed. In this case, the operation of one SI prime TS per network is enabled. Figure 9-1 shows an example in which one TS is used as an SI prime TS when one network consists of multiple transponders and the operation of single TS and that of multiple TSs are used at the same time.

Looking at one TS, the TS is called “original TS" (actual_TS). The other TSs in the network is called “other TS” (other_TS). In SI transmission, SDT and EIT, which are described later, have distinct table_id for table in which actual_TS information is described and that in which other_TS information is described. Therefore, SDT and EIT are transmitted using tables with distinct table_id depending on whether the information is related to the TS to be transmitted or not.

9.2 Media Type

Same as Part 1 except for table 9-1.

Table 9-1 Correspondence between media type and service_type

Media type		Corresponding service_type	
Value	Meaning	Value	Meaning
1	TV type	0x01	Digital TV service
		0xA1	Provisional image service
		0xA5	Promotion image service
2	Audio type	0x02	Digital audio service
		0xA2	Provisional audio service
		0xA6	Promotion audio service
3	Data type	0xC0	Data service
		0xA3	Provisional data service
		0xA7	Promotion data service
		0xA8	Preliminary accumulation data service
		0xA9	Accumulation only data service
		0xAA	Bookmark list data service

9.3 Operation of Broadcasters

Same as Part 1.

9.4 Identification of Transmission Systems

In order to identify the BS digital broadcasting and broadband CS digital broadcasting network with distinct transmission systems, the system management descriptor, which is transmitted through the NIT, is referenced.

10 All-station SI and Individual-station SI

10.1 Concept of all-station SI and individual-station SI

[All-station SI]

Transmission operation of PSI/SI in the broadband CS digital broadcasting basically conforms to ARIB STD-B10 (hereafter referred to as “B10”) Part 2 Section 5.1.3.

When only SI is transmitted in each TS while transmission of SI is specified as mandatory in B10, service information transmitted in each TS includes only those information that are used within TS and information on the current and next events that are transmitted within the service.

Because the receiver cannot obtain information other than TS which is being received, every service should receive the transmitted TS to obtain all the service information used in the network. To do this, user’s viewing must be stopped to receive all TS in the network respectively. For the receiver to obtain SI of all the services in the network without interrupting program viewing by the viewer, SI of other TS within the network should be sent to each TS.

For this reason, the broadband CS digital broadcasting allows information on all the services transmitted by each TS within the network to be sent in order to constantly provide viewers with information on services and events that are transmitted by each TS. This scheme is defined as all-station SI.

Information of all-station SI should carry the identical contents to avoid that information obtained differs in volume or types, depending on the originating TS, except for some tables (NBIT, LDT). (SI target service may be used in the TS that transmits SI or may be used in another TS. In either case, contents of the service are the same while table_id of the table in which the contents are written differs from the other.)

SI is transmitted in the same table transmission cycle in all TS in the network to allow stable acquisition of information regardless of the TS from which information is obtained. However, the shorter table transmission cycle may be used in a particular TS than in other TS.

The receiver can obtain information of all the services operated in the network regardless of the TS from which it receive information. In addition, it can obtain information of all-station SI without interrupting user's program viewing.

Programs that shall be transmitted in order to present the viewer event schedule information for the program view reservation and program record reservation during the period separately specified shall be the target programs of all-station SI. Carriers that provide broadband CS digital broadcasting service should transmit all-station SI after determining the contents of information on the target programs.
SI operation in the independent data broadcasting service shall conform to the following specifications for the time being.

- ○ SI operation in the independent data broadcasting service should be handled as the all-station SI. The carriers shall participate in at their own option.
- ○ EIT_present_following_flag and EIT_schedule_flag of SDT should be correctly added according to the actual operation ("1" if the service is provided, "0" if the service is not provided.)
- ○ SI can be operated in units of services.

[Individual-station SI]

The program information for all-station SI should be transmitted in all TS in the network. Therefore amount of information is limited, resulting in minimum information required. In contrast, each contracted broadcasting company can deliver information on operating services by using SI within the available bandwidth range. This scheme is defined as individual-station SI.
<The subsequent descriptions are the same as in Part 1>

10.2 Tables and descriptors used in all-station SI

Figure 10-1 shows tables used in the all-station SI in the broadband CS digital broadcasting services.

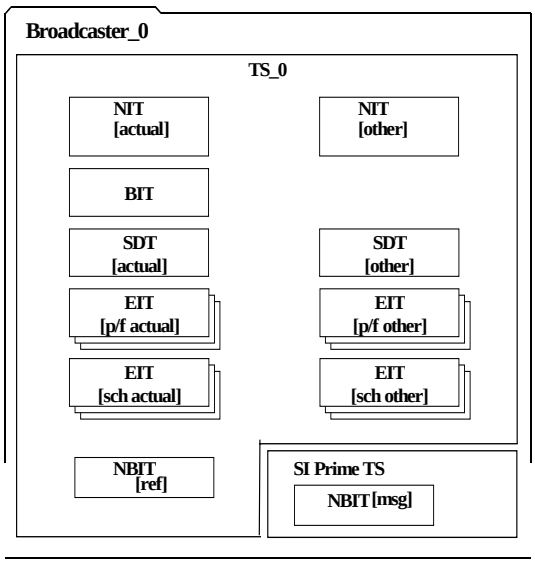


Figure 10-1 Tables used in all-station SI

When the broadcaster operates multiple TS, it must transmit all-station SI in units of TS, respectively. An example is shown in Figure 10-2.

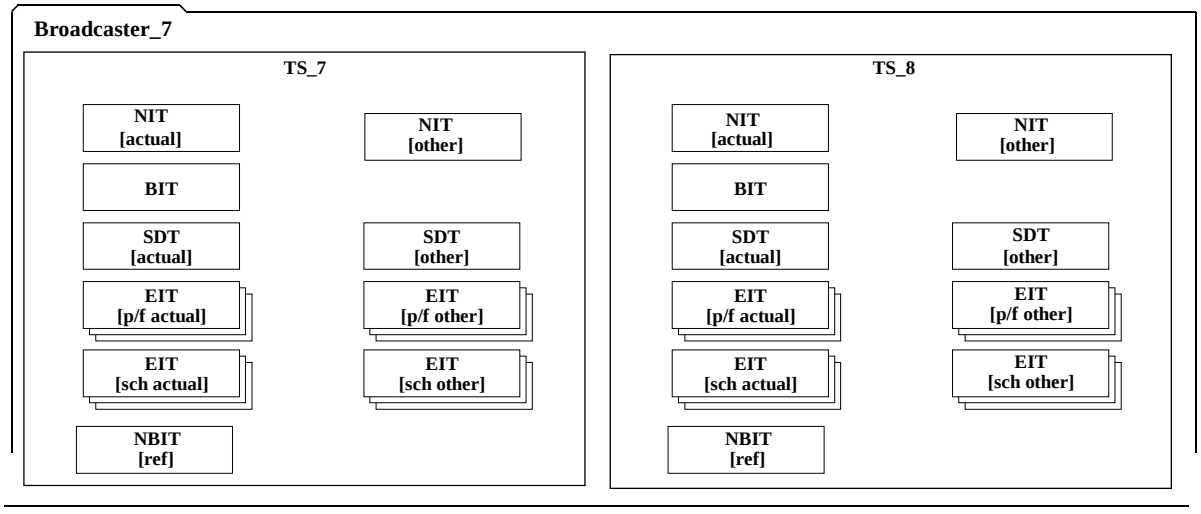


Figure 10-2 Tables used in all-station SI (when the broadcaster operates multiple TS)

For all-station SI, the same information on the target service and event is transmitted with different table_id, depending on the TS from which it is transmitted. However, the contents of SI are the same, allowing the receiver to obtain the identical all-station SI irrespective of the TS.

Table 10-1 shows tables transmitted with PSI and all-station SI. Table 10-2 shows descriptors that are placed

on tables transmitted with PSI and all-station SI.

Tables that are transmitted with all-station SI are NIT, BIT, SDT, EIT, and NBIT.
Only one NIT is described for a network. The NITs transmitted in each TS in the network are identical. The NIT used for the broadband CS digital broadcasting service consists of NIT[actual] and NIT[other]. NIT[actual] contains information that associates transmission path information such as the network frequency currently receiving and the service channels. NIT[other] contains other network information on broadband CS digital broadcasting services as well as network information for downloading from the BS engineering slot. The NIT[actual] and NIT[other] shall have different talbe_id and contents according to the respective networks.

BIT describes broadcasters operated in the broadband CS digitals broadcasting service. One BIT is made for a network of the broadband CS digital broadcasting service. As with NIT, the same BITs are transmitted in each TS in the network.

SDT describes services operated in the network. The same number of SDTs as that of TS are made. The SDT consists of SDT[actual] containing information on services operated in the TS to transmit and SDT[other] containing information on other services. The SDT[actual] and SDT[other] shall have different table_id and contents according to the respective services.

EIT describes events included in the services in the network. The same number of EITs as the services are made. As with SDT, EIT consists of EIT[actual] containing event information operated in the TS to transmit and EIT[other] containing information on other events. EIT[actual] and EIT[other] have different table_id .Descriptions of respective services shall be the same irrespective of TS to transmit.

The EIT[p/f] describing the current or next event and EIT[schedule] describing the events to be transmitted in a certain period have different table_id.

It is assumed that the period of the target events of EIT[schedule] may vary depending on the media type. However, for the same media type, the target events in each TS are the same.

NBIT describes bulletin information in the network such as navigation or announcement. Two types of tables, one that describes body contents of bulletin information and the other that describes information required to obtain the body contents, have different table_id. The table that describes the body contents should be transmitted only by SI prime TS.

Table 10-1　Tables that are transmitted in PSI and all-station SI

Table_id	Table	Transmission level
0x00	PAT	◉
0x01	CAT	○
0x02	PMT	◉
0x40	NIT[actual]	◉
0x41	NIT[other]	◉(Note 1)
0x42	SDT[actual]	◉
0x46	SDT[other]	◉
0x90	BIT	◉
0x4E	EIT[p/f actual]	◉
0x4F	EIT[p/f other]	◉
0x50 - 0x57	EIT[schedule actual basic]	◉(Note 2)
0x58 - 0x5F	EIT[schedule actual extended]	×
0x60 - 0x67	EIT[schedule other basic]	◉(Note 2)
0x68 - 0x6F	EIT[schedule other extended]	×
0x73	TOT	◉
0xC5	NBIT[msg]	○(Note 3)
0xC6	NBIT[ref]	○
0xC7	LDT	×

Transmission level:　◉ : Always transmitted
○ : Transmitted as required
× : Not transmitted

(Note 1) In the broadband CS digital broadcasting service, transmission of NIT[other] is mandatory that includes information on some TS about the network other than its own.

(Note 2) The scope of description is specified by media types through the SI transmission parameter descriptor placed in the BIT 1st loop (See Chapter 12, D1 to D3, schedule_range fields of the SI transmission parameter [Section 31.2.2.1]).

(Note 3) Transmitted only in SI prime TS, if applicable.

Table 10-2 Descriptors placed in tables that are transmitted in PSI and all-station SI

Table_id	Table	Descriptor	Transmission level
0x01	CAT	Conditional Access System (CAS) Descriptor	◉(Note 2)
		CA Service Descriptor	○(Note 2)
0x02	PMT (1st_loop)	Conditional Access System (CAS) Descriptor	○(Note 2)
		Digital Copy Control Descriptor	○
		Emergency Warning Signal (EWS) Descriptor	○
		Content Availability Descriptor	○
	PMT (2nd_loop)	Conditional Access System (CAS) Descriptor	○(Note 2)
		Stream ID Descriptor	◉
		Hierarchical transmission descriptor	○(Note 6)
		Digital Copy Control Descriptor	○
		Target area descriptor	○
		Video decode control descriptor	○(Note 1)
		Data Coding System Descriptor	○
0x40	NIT[actual](1st_loop)	Network Name Descriptor	◉
		CA_EMM_TS Descriptor	○(Note 2)
		System Management Descriptor	◉
	NIT[actual](2nd_loop)	Service List Descriptor	◉
		Satellite Delivery System Descriptor	◉
0x41	NIT[other](1st_loop)	Network Name Descriptor	◉
		CA_EMM_TS Descriptor	○
		System Management Descriptor	◉
	NIT[other](2nd_loop)	Service List Descriptor	○(Note 7)
		Satellite Delivery System Descriptor	◉
0x42 0x46	SDT[actual] SDT[other]	Service Descriptor	◉
		Digital Copy Control Descriptor	○
		CA Contract Info Descriptor	○(Note 2)
		Link Descriptors	○
0xC4	BIT (1st_loop)	SI Transmission Parameter Descriptor	○(Note 2)
		SI prime TS Descriptor	○
	BIT(2nd_loop)	Broadcaster Name Descriptor	◉
		Service List Descriptor	◉
		SI Transmission Parameter Descriptor	○(Note 2)
0x4E 0x4F	EIT[p/f actual] EIT[p/f other]	Short Event Descriptor	◉
		Component Descriptor	◉(Note 3)
		Content Descriptor	○
		Parental rate descriptor	○
		Digital Copy Control Descriptor	○
		Audio Component Descriptor	◉(Note 4)
		Data Contents Descriptor	○(Note 2)
		CA Contract Info Descriptor	○(Note 2)
		Event Group Descriptor	○(Note 5)
		Component Group Descriptor	○
		Series Descriptor	○
0x50 - 0x57 0x60 - 0x67	EIT[schedule actual basic] EIT[schedule other basic]	Short Event Descriptor	◉
		Component Descriptor	◉(Note 3)
		Content Descriptor	○
		Parental rate descriptor	○
		Digital Copy Control Descriptor	○
		Audio Component Descriptor	◉(Note 4)
		Data Contents Descriptor	○(Note 2)
		CA Contract Info Descriptor	○(Note 2)
		Event Group Descriptor	○(Note 5)

		Component Group Descriptor	○
		Series Descriptor	○
		LDT Linkage Descriptor	○
0xC6	NBIT[ref]	Board Information Descriptor	○

Note: Stuffing Descriptor is placed as required.

Transmission level: ◉ : Always transmitted
○ : Transmitted as required
× : Not transmitted

(Note 1) Depending on the media type, it may not be placed.
(Note 2) Multiple descriptors can be placed.
(Note 3) For a service of television media type, at least one descriptor must be inserted.
(Note 4) For a service of television or audio media type, at least one descriptor must be inserted.
(Note 5) Multiple descriptors can be placed. However, descriptors having the same group_type value cannot be placed in a single event.
(Note 6) This descriptor is not placed for the broadband CS digital broadcasting.
(Note 7) However, only the engineering service is described for the BS digital broadcasting.

10.3 Tables and descriptors used in individual-station SI

Figure 10-3 shows outlines of tables used in individual-station SI for the broadband CS digital broadcasting.

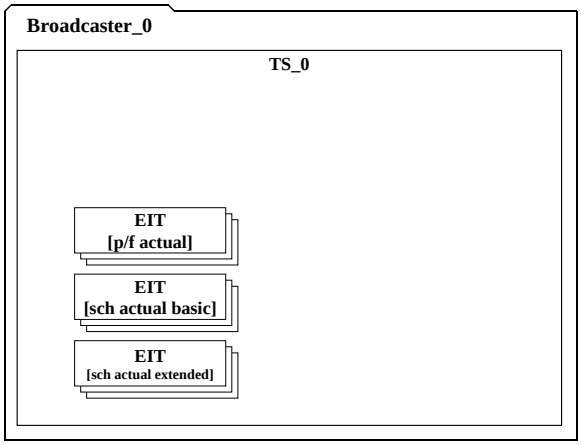


Figure 10-3 Tables used in individual-station SI
(When EIT[sch extended] is used)

If the broadcaster operates multiple TS, information of other TS of this broadcaster (only) can be transmitted. An example is shown in Figure 10-4.

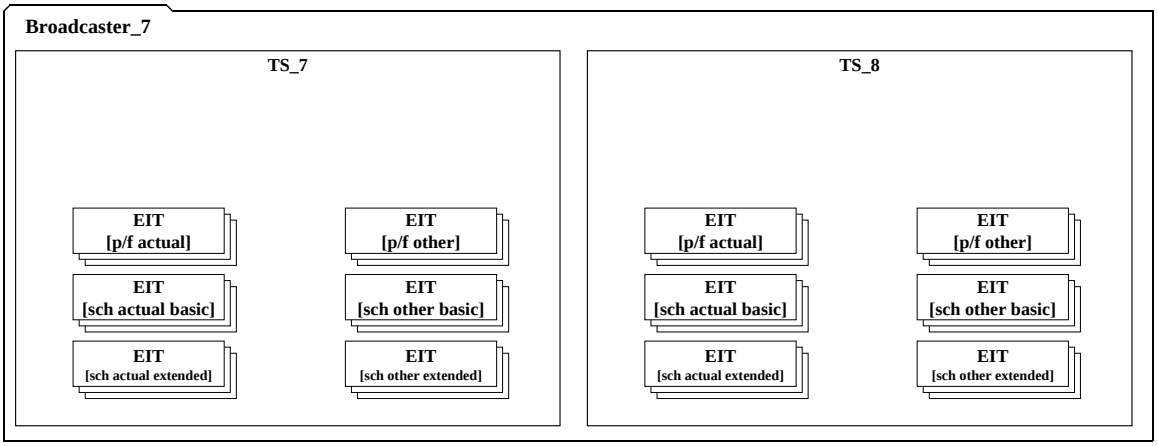


Figure 10-4 Tables used in individual-station SI

(When the broadcaster operates multiple TS, and EIT[schedule extended] is used)

Individual-station SI contains information on services transmitted in the broadcaster.

It can be roughly divided into two categories:

(1) Additional information on events described in the all-station SI

(2) Information on events that are not described in the all-station SI

For information of category (1), descriptions must be consistent with contents of the all-station SI. For information of category (2), description must be consistent with the contents of the all-station SI. Additionally, only the fixed contents should be included so that they will be still consistent with the all-station SI even if such event becomes the target of all-station SI over time. Uncertain information that might be changed with times should not be described.

For services included in the same broadcaster, individual-station SI can be used to describe and transmit information, even when it might be transmitted in different TS.

Table 10-3 shows tables transmitted with individual-station SI. Table 10-4 shows descriptors that are placed on tables transmitted with individual-station SI.

Table 10-3　Tables used in individual-station SI

Table_id	Table	Transmission level
0x4E	EIT[p/f actual]	○(Note 1)
0x4F	EIT[p/f other]	○(Note 2)
0x50 - 0x57	EIT[schedule actual basic]	○(Note 3)
0x58 - 0x5F	EIT[schedule actual extended]	○(Note 3)
0x60 - 0x67	EIT[schedule other basic]	○(Note 2)(Note 3)
0x68 - 0x6F	EIT[schedule other extended]	○(Note 2)(Note 3)
0xC7	LDT	○(Note 4)

Transmission level: ◉ : Always transmitted
○ : Transmitted as required
× : Not transmitted

(Note 1) While tables are always transmitted in all-station SI, descriptors in individual-station SI shall be placed as required.

(Note 2) If the multiple service groups that belong to the same media type in the broadcaster are operated across multiple TS, only EIT for those service groups are transmitted. More precisely, EIT[p/f(schedule) others_TS actual_broadcaster actual_mediatype].

(Note 3) The scope of description is specified by media types through the SI transmission parameter descriptor placed in the BIT 2nd loop (See Chapter 12, D4 to D9, schedule_range fields of the SI transmission parameter [Section 31.2.3.3]).

(Note 4) EIT[schedule extended] shall not be used when LDT is used for operation.

Table 10-4 Descriptors placed in tables that are transmitted in individual-station SI

Table_id	Table	Descriptor	Transmission level
0x4E 0x4F	EIT[p/f actual] EIT[p/f other]	Extended Event Descriptor	○
		Hyper Link Descriptor	○(Note 1)
0x50 - 0x57 0x60 - 0x67	EIT[schedule actual basic] EIT[schedule other basic]	Short Event Descriptor	○
		Component Descriptor	◉(Note 2)
		Content Descriptor	○
		Parental rate descriptor	○
		Digital Copy Control Descriptor	○
		Audio Component Descriptor	◉(Note 3)
		Data Contents Descriptor	○(Note 1)
		CA Contract Info Descriptor	○(Note 1)
		Event Group Descriptor	○(Note 4)
		Component Group Descriptor	○
		Series Descriptor	○
0x58 - 0x5F 0x68 - 0x6F	EIT[schedule actual extended] EIT[schedule other extended]	Extended Event Descriptor	○
		Hyper Link Descriptor	○(Note 1)
0xC7	LDT	Extended Event Descriptor	○
		Short Event Descriptor	×

Note: Stuffing Descriptor is placed as required.

Transmission level: ◉ : Always transmitted
○ : Transmitted as required
× : Not transmitted

(Note 1) Multiple descriptors can be placed.

(Note 2) For a service of television media type, at least one descriptor must be inserted.

(Note 3) For a service of television or audio media type, at least one descriptor must be inserted.

(Note 4) Multiple descriptors can be placed. However, descriptors having the same group_type value cannot be placed in a single event.

10.4 Relationship between the all-station SI and individual-station SI

Same as Part 1.

11 TS Packetization and Transmission Rules

Same as Part 1.

11.1 Detailed Rules for Placement of Sections in TS Packets

Sections should be embedded directly into a transport stream packet. Because the start of the first section in the payload in a transport stream packet is specified in a pointer field, a section does not have to begin from the start of the payload in the transport stream packet. The standard does not allow having spaces between sections in a transport stream packet; thus, the start of a section can be specified by counting the lengths of the first and subsequent sections. Therefore, only one pointer field is allowed in a transport stream packet.
In a transport stream packet with a single PID value, a section should be allowed to start after the previous section ends. Otherwise, the section header to which the data belongs cannot be identified. If a section ends before a transport stream packet does and it is not convenient to start another section, the stuffing function is used to fill the space.
Stuffing is performed by padding the remaining bytes in a transport stream packet with “0xFF.”Therefore, the “0xFF” value should not be used for table identification. If a byte that is immediately after the last byte in a section is “0xFF”, the remaining bytes in the transport stream packet should be padded with “0xFF.” These bytes can be discarded in the decoder. Stuffing can be also performed using the adaptation field function.
For the detailed methods and functions, see ISO/IEC 13818-1 (5), especially Section 2.4.4 and Annex C.

The above description is quoted from ARIB B10 Part 2, Section 5.1.2. The broadband CS digital broadcasting should conform to the above rules. Furthermore, the following rules should be followed.

[Transmission operation rules]

Same as Part 1.

11.1.1 Multi-section transmission:

Same as Part 1.

[Transmission operation rules]: Other than the items described below and the below table, it is same as Part 1.

- Up to 4 KB of sections in the same sub table can be multi-sectionized (can be placed in the TS packet uninterruptedly). For example, linking “present” and “following” in EIT[p/f] or segments in EIT[schedule] is possible. Accordingly, in the broadband CS digital broadcasting, there should not be an interval of 25 ms or more between sections in the same sub table for transmission. See the descriptions in Section 11.2 for details of transmission rules that have been established for the stable

reception processing by receivers.

11.2 Details of TS Packet Transmission

Same as Part 1.

[Transmission operation rules]: Other than the items described below and the below table, it is same as Part 1.

2) In the broadband CS digital broadcasting, a TS packet that carries all SI sections should be transmitted at 3 Mbit or less per any one second. This is a total value of all-station SI and each-station SI in each table that exists in the same transport stream. Here, SI sections mean NIT, BIT, SDT, EIT, and TOT. This rule is not applied to other tables because their operations are not clearly defined for now. When operations of respective tables are established, a decision should be made whether they are included in the scope of this rule or another transmission rule should be made.
3) In the broadband CS digital broadcasting, a TS packet with the same PID that carries all PSI sections should be transmitted at 320 Kbit or less per any one second.
4) When sections are transmitted in the broadband CS digital broadcasting, a TS packet with the same PID should be transmitted in the range of 12 KB ± 100% per 32 ms. This rule of 12 KB per 32 ms is established to define a rule of 3 Mbit per 1 second more specifically. This rule represents a section reception model based on this standard. In other words, a 12 KB reception buffer per PID and the processing speed that enables processing a maximum of 12 KB section data that was received within 32 ms are required. Additionally, 12 KB ± 100% means that a maximum of 24 KB can be transmitted (when considering that the above rule 2) is guaranteed at the same time, it is obvious that this is a temporarily state). Typically, reception processing of multiple PSI and SI data at the same time is required. However, by considering the reception model shown above, it becomes possible to setup reception settings according to the capacity of each receiver.

In the broadband CS digital broadcasting, transmission standard regarding TS packets that carry PSI/SI tables includes only 4 rules described above. Receiver should be designed so that they have no failures (at least, in the reception processing at the TS packet level) as long as TS packets are transmitted according to these 4 rules.

11.3 Continuity Counter

Same as Part 1.

12 Table (Section) Transmission

Same as Part 1.

12.1 Division of Sections

Same as Part 1.

[Transmission operation rules]

Same as Part 1.

12.2 Placement of Descriptors in Sections

Same as Part 1.

[Transmission operation rules]

Same as Part 1 except for the following items.

- When more than one extended event descriptor is placed in the EIT, they should be placed in order of descriptor number. No descriptor number should be missed through to the last descriptor number. Descriptor numbers always start from 0x0 in a descriptor loop of the EIT. This is also applied to the CS digital broadcasting, where more than one extended event descriptor is placed in the LDT.
- For “other” sub tables in all-station SI (NIT[other], SDT[other], EIT[p/f other], EIT[schedule other basic]), placement order of descriptors in the descriptor loop shall be identical among TS. However, the placement order may be changed between different versions (irrespective of whether the contents are changed or not).

12.3 Definition of a Repetition Rate Group and Re-transmission Cycle

A repetition rate group is a collection of information transmitted at the same repetition rate within each PSI/SI table. Usually, a repetition rate group is setup for each PID value and table_id value, but special operation is performed only for the EIT[schedule]. For the concept of repetition rate group setup regarding the EIT[schedule], see the description in Section 13.2.

Repetition rate can be setup for each repetition rate group and multi-section operation is also done for each repetition rate group. (For the relation between multi-section units and repetition rate groups, see Section 11.1.1.)

Re-transmission cycle defined for each repetition rate group is for each whole repetition rate group. On the other hand, a cycle at which individual sections is re-transmitted does not exactly consistent with the re-transmission cycle for the whole repetition rate group. See the descriptions in Section 12.6 for details.

A re-transmission cycle for a repetition rate group can be changed as service configuration changes. However, repetition rate for the PSI tables (PAT, PMT, CAT) are not changed. See the descriptions in Section 12.4 for details.

When the amount of data changes, some adjustments may be made to repetition rate (only when it is unavoidable). See the descriptions in Section 12.5 for details.

Please note that in reception processing, adjustments to repetition rate are different from changes to repetition rate.

In the following sections, operation of repetition rate groups in the broadband CS digital broadcasting is described, for PSI, all-station SI, and each-station SI, respectively.

For the transmission cycle of SDTT, a maximum of fixed 10 minutes of transmission cycle is assumed.

12.3.1 PSI repetition rate group

Same as Part 1.

12.3.2 Repetition rate groups of all-station SI

Same as Part 1 except for the following table items.

Table 12-2 Repetition rate groups of all-station SI

Repetition rate group unit					Parameter (Transmission range)
NIT					
BIT					
SDT	actual				
	other				
EIT	EIT[p/f]	actual			
		other			
	EIT[schedule]	actual	TV type	Basic repetition rate group	D1 (day)
				Extended repetition rate group 1	S1 (segment)
				Extended repetition rate group 2	S2 (segment)
			Audio type	Basic repetition rate group	D2 (day)
				Extended repetition rate group 1	S3 (segment)
			Data type	Basic repetition rate group	D3 (day)
				Extended repetition rate group 1	S4 (segment)
		other	TV type	Basic repetition rate group	D1 (day)
				Extended repetition rate group 1	S1 (segment)
				Extended repetition rate group 2	S2 (segment)
			Audio type	Basic repetition rate group	D2 (day)
			Data type	Basic repetition rate group	D3 (day)
TOT					
SDTT					
NBIT[msg]					
NBIT[ref]					

12.3.3 Repetition rate groups of each-station SI

Same as Part 1.

12.4 Change of Cycles and Default Re-transmission Cycle

Re-transmission cycle for each repetition rate group of all-station SI may be reviewed when the service configuration is significantly changed (though it might rarely happen) such as at the commencement of operation of a new satellite transponder. In addition, each-station SI shall be allowed to change the re-transmission cycle for each broadcaster according to their own transmission bandwidth (very rarely). Assuming such a case, a re-transmission cycle for each repetition rate group is currently transmitted in the form of SI data (SI transmission parameter descriptor in the BIT). (For details, see the descriptions about the SI transmission parameter descriptor in Sections 31.2.2.1 and 31.2.3.3.)

In the sections below, ranges of cycle changes in each repetition rate group for SI and default re-transmission cycle values are described. A range of cycle is assigned to each repetition rate group and can be changed, and transmission within this range for each repetition rate group is mandatory and will be in the future. Additionally, a default re-transmission cycle in all-station SI is one that has been established for now assuming the initial stage of broadband CS digital broadcasting, and which also affects descriptions of SI transmission parameter descriptor in the BIT. (For details, see Section 31.2.2.1.)As the re-transmission cycle for the each-station SI can be freely setup for each broadcaster, its default value may be regarded as the reference value which might be normally set.

Table 12-6 Range of possible repetition rate change and default repetition rate for each repetition rate group in all-station SI

(The value in the upper cell is for BS; the lower cell is for the broadband CS)

Repetition rate group				Parameter	Range of repetition rate change		Default repetition rate (sec)
					Min. (sec.)	Max. (sec.)	
NIT[actual]					5 1	20 5	10 1
NIT[other]					- 5	- 20	- 10
BIT					5 5	20 20	10 10
SDT[actual]					1 1	5 5	3 3
SDT[other]					5 5	20 20	10 10
EIT[p/f actual]					1 1	3 3	3 3
EIT[p/f other]					5 1	20 3	10 3
EIT[schedule]	actual	TV type	Basic repetition rate group	D1	60 60	360 360	180 180
			Extended repetition rate group 1	S1	5 5	20 20	10 5
			Extended repetition rate group 2	S2	10 10	30 30	10 15
		Audio type	Basic repetition rate group	D2	60 60	360 360	180 180
			Extended repetition rate group 1	S3	5 5	20 20	20 20
		Data type	Basic repetition rate group	D3	60 60	360 360	360 360
			Extended repetition rate group 1	S4	5 5	20 20	20 20
	other	TV type	Basic repetition rate group	D1	60 60	360 360	180 180
			Extended repetition rate group 1	S1	5 5	20 20	10 5
			Extended repetition rate group 2	S2	10 10	60 60	20 15
		Audio type	Basic repetition rate group	D2	60 60	360 360	180 180
		Data type	Basic repetition rate group	D3	60 60	360 360	360 360
TOT					5 5	5 5	5 5
SDTT							600 600
NBIT[msg]					- 2	- 10	- 4
NBIT[ref]					- 2	- 10	- 2

Table 12-7 Parameters that show the ranges of repetition rate groups of all-station EIT[schedule]

Parameter	Parameters change range		Default
	Min.	Max.	
D1	8 days	8 days	8 days
D2	2 days	8 days	3 days
D3	2 days	8 days	2 days
S1	3 segments	3 segments	3 segments
S2	0 segment	21 segments	13 segments
S3	0 segment	24 segments	8 segments
S4	0 segment	24 segments	0 segments

(Note) With regard to the TV-based media type, the number of described days “8” and the number of segments “3” in extended repetition rate group 1 are fixed. “3 segments” is used because this can shorten the time to acquire information on programs for at least 9 hours, taking into account the range of information display, such as program listing.

Furthermore, the SI prime TS used in the broadband CS digital broadcasting has the following two applications, and can be used for either or both of them.

- Transmission of NBIT[msg]
- Short-cycle transmission of some SI information

The smaller minimum range of the repetition rate change for the SI prime TS than that of the normal TS is specified, allowing operation at a shorter repetition rate than normally for each table. If the short-cycle operation is used, the relevant table_id and its transmission parameter must be explicitly described within the SI prime TS descriptor in the BIT first loop, and "actual table” and “other table” containing the same transmission parameter values must be placed in pairs.

Table 12-6-2 shows the range of repetition rate change for each repetition rate group at short-cycle transmission of some SI information.

Table 12-6-2 Range of repetition rate change for each repetition rate group of all-station SI (Operation of SI in the SI prime TS)

Repetition rate group				Parameter	Range of repetition rate change	
					Min. (sec.)	Max. (sec.)
SDT[actual]					1	5
SDT[other]					1	5
EIT[schedule]	actual, other	TV type	Basic repetition rate group	D1	4	20
			Extended repetition rate group 1	S1	4	20
			Extended repetition rate group 2	S2	4	20
		Audio type	Basic repetition rate group	D2	4	20
			Extended repetition rate group 1	S3	4	20
		Data type	Basic repetition rate group	D3	4	20
			Extended repetition rate group 1	S4	4	20
NBIT[msg]					2	10
NBIT[ref]					2	10

Table 12-8 Range of possible repetition rate change and default repetition rate for each repetition rate group in each-station SI

Repetition rate group				Parameter	Range of repetition rate change		Default repetition rate (sec)
					Min. (sec.)	Max. (sec.)	
EIT[schedule]	basic	TV type		D4	60	360	180
		Audio type		D5	60	360	180
		Data type		D6	60	360	360
	extended	TV type	Basic repetition rate group	D7	60	360	180
			Extended repetition rate group 1	S5	10	30	20
		Audio type	Basic repetition rate group	D8	60	360	180
			Extended repetition rate group 1	S6	10	30	20
		Data type	Basic repetition rate group	D9	60	360	360
			Extended repetition rate group 1	S7	10	30	20
LDT					60	360	180

Table 12-9 Parameters that show the ranges of repetition rate groups of each-station EIT[schedule] [BS/broadband CS]

Parameter	Parameters change range		Default
	Min.	Max.	
D4 D5 D6	Patterns are prepared for values that can be set up for each-station EIT[schedule basic]. D4 (TV type): 15 days/22 days/32 days D5 (audio type): 8 days/15 days/22 days/32 days D6 (data type): 8 days/15 days/22 days/32 days Selected for each broadcaster. See Sections 31.2.3.3 and 13.2.2.		
D7 D8 D9	Patterns are prepared for values that can be set up for EIT[schedule extended]. It is the same as either the range for all-station EIT[schedule] (D1, D2, D3) or one for each-station EIT[schedule basic] (D4, D5, D6). Selected for each broadcaster. See Sections 31.2.3.3 and 13.2.2.		
S5	0 segment	24 segments	3 segments
S6	0 segment	24 segments	3 segments
S7	0 segment	24 segments	0 segment

(Note) Each-station EIT[schedule] can be operated uniquely for each broadcaster, but some patterns are prepared for the purpose of unification, within which they should be operated. Therefore, values cannot be setup freely for the above parameters. For details, see Section 13.2.2.

The repetition cycle for PSI shall not be changed. The re-transmission cycle for each table of PSI is shown below.

Table 12-10 Re-transmission cycle for PSI

Repetition rate group	Re-transmission cycle (sec.)
PAT	0.1
PMT	0.1
CAT	10

12.5 Cycle Adjustment

Same as Part 1.

12.6 Transmission Cycle for Each Section

Same as Part 1.

12.7 Details of SI Transmission within a Repetition Rate Group

Same as Part 1.

12.8 Rules for Updating Sub Tables

Same as Part 1.

12.9 Update of Tables

Same as Part 1 except for the following table items.

Table 12-11 Update reasons and guidelines for update frequency for each table

Table	Main reasons for updating	Guidelines for update frequency	Other notes and comments
PAT	- Stop and restart of broadcasting service	Irregularly	PIDs of the PMT are rarely changed.
PMT	- Change of a component structure - Change of copy control/conditional access - When an emergency warning system is transmitted (Emergency information descriptor)	Irregularly Frequent updates on an event basis or on a basis of smaller units are possible.	
CAT	- Addition/deletion of a CA system - Change of PID of a stream that carries an EMM/EMM message	Rarely changed.	May be changed because of automatic displayed messages.
NIT	- Addition/deletion/transfer of a service - Change of TS configuration	Irregularly (No frequent changes)	
BIT	- Addition/deletion/transfer of a service	Irregularly (No frequent changes)	No updates of tables, but addition/deletion of sub tables along with addition/deletion of broadcasters may occur. (Very rarely)
SDT	- Addition/deletion/transfer of a service - Change of a service name/service provider name	Irregularly (No frequent changes)	For the SDT, the update frequency may become higher as a provisional service is provided (On/off of the EIT[p/f] flag). The frequency depends on the operation of each provider.
EIT [p/f]	- When an event starts/ends - When event schedule is changed	Updated on an event basis.	
EIT [schedule]	- At 0:00 daily - When event schedule is changed - When other information is changed	Updated daily basically.	It seems that the update frequency becomes higher the nearer it is the current time.
NBIT	- Addition/deletion/transfer of bulletin information	Irregularly (No frequent changes)	
LDT	- When event schedule is changed - When other information is changed	Updated daily basically.	It seems that the update frequency becomes higher the nearer it is the current time.

13 Operation of EIT Transmission

13.1 Basic Operation Model of EIT Transmission

This chapter does not apply to the broadband CS digital broadcasting.

13.1.1 Collection/delivery center related items

This chapter does not apply to the broadband CS digital broadcasting.

13.1.2 Operation of EIT[p/f] transmission

If the service is provided, EIT[p/f] should be always transmitted for each service except for those of the media types of data-based and provisional services.

For the data-based services, some services are transmitted and others not, which matches transmission operation of EIT[schedule basic]. In addition, EIT_present_following_flag in the SDT allows to distinguish them, providing a stable transmission of services that have been specified as to be transmitted. Each table of EIT[p/f] consists of a single section and contains correct description of information on the present/next broadcasting programs, except for emergent cases such as being interrupted by the emergency broadcasting.

If the broadcasting service is inactive, both p/f can be a blank section. A blank section has a 14 bytes of section header followed by CRC32 and has no descriptors. Furthermore, “duration” may be undefined for “present”, and one or more of “start_time” and “duration” may be undefined for “following. "If both “start_time” and “duration” are undefined, the event will become an uncommitted event, which transmit only the EIT[following actual]. (See Section 19.1.1 Uncommitted event.)

Operation of EIT[p/f] that includes inactive service period such as in small hours is described below using Figure 13-1.This figure shows an example in which a program A ends at 1:00 AM and the next program B starts from 2:00 AM. Basically, EIT[f] contains description of the program B and is transmitted during the time zone of program A broadcasting (pattern 1). However, the EIT[f] might be a blank section, depending on the transmission facility (pattern 2). In case of pattern 2, while the EIT[f] during the inactive service has a blank section, the EIT[f] must contain information of program B and should always be transmitted at latest 30 seconds before the start of the program B.

Note that the inactive service period described here does not necessarily mean a suspension of video/audio components.

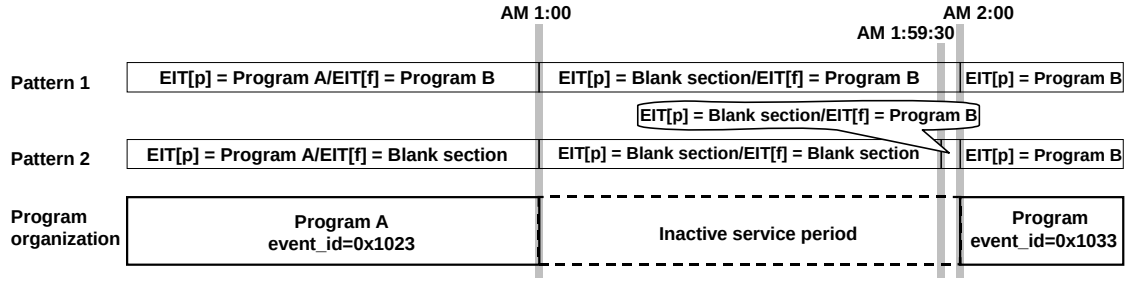


Figure 13-1 Operation of EIT[p/f] transmission including an inactive broadcasting service

The EIT[p/f actual] is a program information of services defined in the TS. Both the descriptors for all-station SI information (reference) and those of each-station SI information (see Table 10-4) shall be set and

generated regarding the events that are broadcasted in the own TS of the broadcaster of itself.
When transmitted, a repetition rate group is formed for transmission irrespective of the media type. The re-transmission cycle at this time is unified across all TS. However, if more than one broadcaster exists in one TS, the repetition rate group differs for each service group that belongs to the respective broadcasters.
The EIT[p/f other] is a program information of services defined in other TS. It can be categorized as for events broadcasted in other TS of the own broadcaster and for events broadcasted by other broadcasters. The former case will happen only when the broadcaster operates multiple TS, where both descriptors for all-station SI (see Table 10-2) and those for each-station SI (see Table 10-4) can be set, as with EIT[p/f actual]. For the EIT[p/f other] for the events by other broadcasters, only descriptors for all-station SI (see Table 10-2) are set.
When transmitted, a repetition rate group is formed for transmission irrespective of the media type. The re-transmission cycle should be unified across all TS.

The running status is always set to “undefined (0x0) for EIT[p/f].

13.1.3 Transmission of the EIT[schedule basic]

13.1.3.1 Transmission of the EIT[schedule basic] common to all-station and each-station

Same as Part 1.

13.1.3.2 Transmission of the EIT[schedule basic] in the range of all-station EIT

The EIT[schedule basic] in the range of all-station EIT should include D1 day (default: 8 days) for the media type of the digital TV service, D2 day (default: 3 days) for the digital audio service, and D3 day (default: 2 days) for the data service, which should be transmitted excluding ones whose media type is data service. For the data-based services, some services are transmitted and others not, which matches transmission operation of EIT[p/f]. In addition, EIT_schedule_flag in the SDT allows to distinguish them, providing a stable transmission of services that have been specified as to be transmitted. For the EITs for the current day, however, only the segment that includes the current time and subsequent segments should be transmitted, and transmission of EITs[schedule basic] of which the specified time passes should be stopped by the segment unit.
If all-station EIT is transmitted in a way other than the default, a parameter should be set in the first loop of the BIT to be transmitted beforehand (see 31.2.2.1 for details).
The re-transmission cycle specified in each repetition rate group should be unified across all TS. The repetition rate group for the EIT[schedule] is described further in detail in Section 13.2.However, if a short-cycle operation is applied for the specified TS, cycles of TS other than one that uses short-cycle shall be unified.

EIT[schedule other basic] of the range of all-station EIT can be categorized as for events broadcasted in other TS of the own broadcaster and for events broadcasted by other broadcasters. The former will happen only when the broadcaster operates multiple TS. For the EIT[schedule other basic] for the events by other broadcasters, only descriptors for all-station SI (see Table 10-2) are set.

13.1.3.3 Transmission of the EIT[schedule basic] in the range of each-station EIT

Same as Part 1.

13.1.4 Transmission of the EIT[schedule extended]

Same as Part 1.

13.2 Repetition Rate Group Setting for the EIT[schedule]

Since the EIT[schedule] is formed as a single program information unit by integrating multiple tables and carries significant amount of data compared to other SI information, its repetition rate group is differently set from normal practices (set by PID, or by table_id). A concept of setting an EIT[schedule] repetition group will be described in detail in the following sections.

Firstly, operation of the EIT[schedule] is completely different for all-station and each-station. The transmission parameter for the all-station EIT[schedule] may be reviewed when the number of services in the whole network is increased. In such a case, a SI transmission parameter descriptor with a new transmission parameter placed in the first descriptor loop of BIT is used. The transmission parameter for the each-station EIT[schedule] is controlled by broadcasters, and it is described with the SI transmission parameter descriptor placed in the second descriptor loop (loop by the broadcaster) of BIT.

There are two types of EIT[schedule] repetition rate groups – one is called basic repetition rate group and the other is called extended repetition rate group.
The EIT[schedule] in the BS digital broadcasting is transmitted at a very long re-transmission cycle based on the assumption that it is stored in fixed receiver before use, and a repetition rate group for which a basic re-transmission cycle is set up based on this assumption is called basic repetition rate group. On the other hand, a repetition rate group with a shorter re-transmission cycle may be set up, for example, in order to enable a certain degree of operation even when information has not been stored such as at the startup of a receiver, and such a repetition rate group is called extended repetition rate group.
In contrast, the EIT[schedule] in the broadband CS digital broadcasting is transmitted at a relatively short re-transmission cycle range by optionally storing it in a receiver for the purpose of enabling a receiver some degree of operations even if it does not store data.

Table 13-1 shows whether the EIT[schedule] is transmitted or not by service_type.

Table 13-1 Transmission of EIT[schedule] by service_type

Media type		Corresponding service_type		
Value	Meaning	Value	Meaning	Transmission of the EIT[schedule]
1	TV type	0x01	Digital TV service	⊙
		0xA1	Provisional image service	×
		0xA5	Promotion image service	⊙
2	Audio type	0x02	Digital audio service	⊙
		0xA2	Provisional audio service	×
		0xA6	Promotion audio service	⊙
3	Data type	0xC0	Data service	○
		0xA3	Provisional data service	×
		0xA7	Promotion data service	⊙
		0xA8	Preliminary accumulation data service	○
		0xA9	Accumulation only data service	○
		0xAA	Bookmark list data service	○

Transmission level: ⊙ : Always transmitted
○ : Transmitted as required
× : Not transmitted

13.2.1 All-station EIT[schedule]

Same as Part 1.

13.2.2 Each-station EIT[schedule]

Same as Part 1.

13.2.2.1 Each-station EIT[schedule basic]

Same as Part 1.

13.2.2.2 Each-station EIT[schedule extended]

Same as Part 1.

13.2.3 Summary of repetition rate group setting for the EIT[schedule]

Same as Part 1.

13.3 Assignment of table_id and section_number in EIT

13.3.1 EIT[p/f]

Same as Part 1.

13.3.2 EIT[schedule basic]

Same as Part 1.

13.3.3 EIT[schedule extended]

Same as Part 1.

13.4 Transmission of the EIT[schedule] along with the Time Pass

Same as Part 1.

13.5 Operation Rule for the Daily Update

Same as Part 1.

14 Use of component_tag

Same as Part 1.

14.1 Concept of component_tag and PID

Same as Part 1.

14.2 Assignment of component_tag Values

As explained above, for continuous display on a receiver, component_tag values should not be changed.

In the broadband CS digital broadcasting, based on the concept explained in Section 14.1, component_tag values are assigned to each component type as shown in Table 14-1, and especially, fixed values are assigned to the default ES.

Table 14-1 Assignment of component_tag values

Component type	component_tag value
Video *1	0x00 to 0x0F Please note that 0x00 is assigned to the default ES.
Audio *1	0x10 to 0x2F Please note that 0x10 is assigned to the default ES.
Others *2	0x30 to 0x7F Please note that 0x40 is assigned to the default ES for data broadcasting. 0x30, 0x31 to 0x37, 0x38, and 0x39 to 0X3F are assigned to subtitle main, subtitle sub, caption main, and caption sub, respectively.
Reserved	0x80 to 0xFF

*1: Video and audio streams defined in the Transmission Standard of the Broadband CS Digital Broadcasting. A video/audio stream to which a component_tag value within this range was assigned can be a target for individual component selection by a receiver.

*2: Video/audio streams other than the above *1 can be included. However, a video/audio stream to which a component_tag value within this range was assigned cannot be a target for individual component selection by a receiver.

When there are no video and audio ES with component_tag values being decoded in the PMT, both video and audio will be switched to default ES.

14.2.1 ES priority

Same as Part 1.

14.3 Assignment of PIDs

Same as Part 1.

15 Definition of Service "On Service"/"Off Service"

Use of PSI/SI with regard to "On service"/"Off service" is as follows.

- ○ When valid PAT and PMT exist, the service is "on service."
- ○ SDT is never used to judge whether a service is "on service" or "off service."
- ○ Handling of PSI/SI in the test broadcasting is the same as for the ordinary programs.
- ○ When PAT is empty, all services within this TS is "off service", regardless of other PSI and SI.
- ○ When the PMT_PID is described in PAT, but that PMT cannot be obtained even if waiting for a second or more, that service should be regarded as "off service."
- ○ "On service" or "Off service" should be in either of the status in Table 15-1.

Table 15-1 Types of "On service" and "Off service"

Status	NIT in TS	Description of NIT in service list	Description of this service into PAT	PMT of this service	Remarks
On service	Yes	Yes	Yes	Yes	Normal broadcasting
Off service	Yes	Yes	No	-	
	Yes	Yes	Yes	No	
No signals	No	No	No	No	RF only

Combinations other than the above are in a transition status and previous status is displayed.

The status that the specified PMT does not exist, even if PMT_PID is described in the PAT should be defined as abnormal in the MPEG systems standard. This status, however, should be regarded as being "off-service" which can be normally happened in the broadband CS broadcasting. The reason of fixed operation of PAT without changing its descriptions as required based on whether the PMT is transmitted or not is explained below.

In the broadband CS digital broadcasting, the program multiplexed (primary multiplexing) TS in several locations are collected to a single point to create TS to be eventually broadcasted with a secondary multiplexing system, and the TS output from that secondary multiplexing system will be then collected to the uplink station to broadcast using frame multiplex transmission.

At this time, the PMT created with the primary multiplexing system might be passed unchanged without being rebuilt in the secondary multiplexing system. As a single PAT is contained in one TS, it is eventually output from the secondary multiplexing system. At this point, fixed transmission of the PAT to which the pre-defined PMT_PID is specified, independent of the "off service" status of the program contained in the TS output from the multiple locations (primary multiplexing), can eliminate complexity of controlling a secondary multiplexing system to allow stable operation. If the PMT does not exist even if it is described in the PAT, it takes some time for the receiver to determine the "off service" status. But we consider this time as within the acceptable range of the viewer and cannot be avoided, giving the PMT transmission cycle of 100 ms, which might not cause to take prolonged time for timeout processing.

Basically, the secondary multiplexing system exists in the broadcasting system of the contracted broadcasting companies that provide digital TV services (excluding some of them). And because those contracted broadcasting companies can provide elaborate control of the secondary multiplexing system from the upstream transmission system, it should be as a rule not to describe the digital TV service in the PAT when this service is "off service."

16 Operation of Time-related Information

Same as Part 1.

16.1 Relation between the TOT and Program Presentation and Delays in Recording

- The TOT should be transmitted so that at the moment it is received by a receiver. Its allowable difference range should be ±500 ms.
- After program source signals are transmitted from a VTR or camera at a broadcasting station until they are presented on a receiver, delays caused by transmission media should be taken into account. Some channels/programs are simultaneously broadcast with the terrestrial broadcasting (analog) programs or BS analog broadcasting programs. Therefore if the same program source is used for simultaneous broadcasting, there will be an approximately 1.3 second difference in the presentation of a terrestrial broadcasting program (analog) and a broadband CS digital broadcasting program.

Table 16-1 Propagation delay and processing delays

Transmission media	Propagation delay	Delay by coding/decoding, multiplexing/separation
Terrestrial broadcasting	≅0	≅0
BS analog broadcasting	300 ms	≅0
Broadband CS Digital Broadcasting	300 ms	Assumed to be approx. 100 ms

- In the broadband CS digital broadcasting, time difference of 1.3 seconds may be caused between the JST and the program start/end time. It might be a time difference of 1.8 seconds when adding a maximum error of TOT and preceding JST.

16.2 Information Related to Dates and Times Coded in SI

Same as Part 1.

16.3 MJD after the Year 2038

The lower 16 bits in MJD (Modified Julian Date) will become all "1" on a day in 2038 and all "0" the next day. If the conversion formula in Appendix C, Part 2 of the ARIB-B10, will be used, the date of all "0" would be calculated to represent a day in the 19th century. For this reason, following operation is used in the broadband CS digital broadcasting.

- The conversion formula defined in Appendix C, Part 2 of the ARIB-B10 will be used after the year 2038 until February 28th, 2100, and lower 16 bits in a converted MJD value will be transmitted.
- Receiver units should memorize dates such as the shipping date of the receiver unit and when information dated obviously later than this date is transmitted, it should be calculated with the 17th bit as "1" and processed accordingly.
- What should be done after the year 2100 has not been decided as of now because a new MJD conversion formula itself should be defined.

Operational Methods

17 Event Common

17.1 About Event Common

Same as Part 1.

17.2 Rules on Event Common

Same as Part 1.

17.3 Description in EITs

Same as Part 1.

17.4 Rules and Examples for Each Table Type

17.4.1 EIT[p/f]

Same as Part 1.

17.4.2 EIT[schedule basic]

Same as Part 1.

17.4.3 EIT[schedule extended]

Same as Part 1.

18 Operation of a Series of Events

Same as Part 1.

18.1 Descriptors to be Used

Same as Part 1.

18.2 Assignment of Values

Same as Part 1.

18.3 End of a Series

Same as Part 1.

18.4 Examples of Operation

18.4.1 Common example

Same as Part 1.

18.4.2 Example of reruns

Same as Part 1.

19 Event Schedule Change

Same as Part 1.

19.1 Undefined Status

Same as Part 1.

19.1.1 Undecided event

Same as Part 1.

19.1.2 Undefined time

Same as Part 1.

19.2 Principles Regarding Change of Programming

Same as Part 1.

19.2.1 Change of contents without change of version number

The contents of the EIT[p/f other] may rarely be changed following the change of event schedule while having the same version number. The cause of this in the BS digital broadcasting is explained below. <snip>

19.3 Basic Rules Regarding Event Progress

Same as Part 1.

19.4 Consistency between EITs

Same as Part 1.

19.4.1 Consistency between EIT[p/f actual] and EIT[p/f other]

Same as Part 1.

19.4.2 Consistency between EIT[p/f] and EIT[schedule]

Same as Part 1.

19.5 Guidelines for Transmission of Change of Programming

Same as Part 1.

19.5.1 Event-extension

Same as Part 1.

19.5.2 Event-shortening (Early ending of an event)

Same as Part 1.

19.5.3 Event-delay

Same as Part 1.

19.5.4 Event interruption

Same as Part 1.

19.5.5 Cut-in of an event

Same as Part 1.

19.6 Examples of Transmission of the Change of Programming

Same as Part 1.

19.6.1 Case of event-extension

Same as Part 1.

19.6.2 Case of an early ending of an event

Same as Part 1.

19.6.3 Case of an event change

Same as Part 1.

19.6.4 Program cut-in (1)

Same as Part 1.

19.6.5 Program cut-in (2)

Same as Part 1.

19.6.6 Program cut-in (3)

Same as Part 1.

20 Conditional Access

Same as Part 1.

20.1 Specification of EMM Streams

With the conditional access broadcasting (pay broadcasting), the EMM streams (EMM or EMM message) should be transmitted. In addition, the EMM streams may be transmitted if the free program with contents protection is broadcasted. If the EMM stream is transmitted, a conditional access system descriptor should be placed in the CAT within the same TS for transmission. This descriptor specifies the EMM streams for the targeted conditional access system. Only one EMM stream can be specified for the single conditional access system within the same TS. For details of transmitting EMM streams when the free program with contents protection is broadcasted, see Volume 5.

In addition to above, the EMM stream transmission format may be specified in the broadband CS digital broadcasting. The EMM stream transmission format is represented as an 8-bit field as shown in Table 20-1. The EMM stream transmission format should be described in the first byte of the "private_data_byte" area of the conditional access system descriptor, which should be placed in the CAT. For details of the EMM stream transmission format, see Volume 5.

Table 20-1 EMM stream transmission formats

Value	Meaning
0x00	Undefined
0x01	Type A
0x02	Type B
0x03 to FF	Reserved for future use

Note that in the case of emergency such as when the secret key has been illegally obtained, though very rarely it might be, the EMM is transmitted in the specified TS to quickly change the keys of all the receivers at once. In this case, CA_EMM_TS descriptor is placed in the first loop of the NIT for a certain period and then transmitted, and power retention period after the power off operation in the transmission TS and receivers should be specified. The CAT is also transmitted in the specified TS to designate the target EMM stream, as with the normal operation. For details of this operation, see Volume 5.

20.2 Setup of chargeable units for programs

Read Table 20-2-1 as shown below for Table 20-1 in Part 1. Same as Part 1 except for the above.

Table 20-2-1 Groups of default ES in conditional access

service_type	Contents	Group of default ES
0x01	Digital TV service	Video, audio
0x02	Digital audio service	Audio
0xC0	Data service	Data
0xA1	Provisional image service	Video, audio
0xA2	Provisional audio service	Audio
0xA3	Provisional data service	Data
0xA5	Promotion image service	Video, audio
0xA6	Promotion audio service	Audio
0xA7	Promotion data service	Data
0xA8	Preliminary accumulation data service	Data
0xA9	Accumulation only data service	Data
0xAA	Bookmark list data service	Data (entry component)

20.2.1 PMT

Same as Part 1.

20.2.2 SDT/EIT

Same as Part 1.

20.3 Setup of Information on Confirmation of Programming for Viewing (Recording)

Same as Part 1.

20.4 Setup of Parental Rate

Same as Part 1.

20.5 Setup of Chargeable Units in the Multi-view Television

Same as Part 1.

20.6 Setup of Display Control in Automatic Display of Message

Same as Part 1.

20.7 Setup of a Link to a CA Substitute Service

In the broadband CS digital broadcasting, when pay program selected by a receiver can not be viewed because it was not subscribed, or when free program with contents protection can not be viewed because Kw for this program is not received, a linkage descriptor may be used to guide the viewer to select another service (CA substitute service). A message may be described in this linkage descriptor to present to the viewer in order to guide them to select another service.

To give a link to a CA substitute service, a linkage descriptor whose “linkage_type” is set to 0x03 should be present in the SDT. The description rules are provided below.

1) The transport_stream_id, original_network_id, and service_id of the linked service should be described for transmission. During a period when a linkage descriptor is present in the SDT, the linked service should be non-scrambled.
2) Follow the following rules when describing the message in the linkage descriptor.
   - ○ A message number should be described in the first 1 byte of “private_data_byte.”A message number is a 8-bit field with a value between 1 and 20. A message number should be unique across multiple networks of the broadband CS. When linkage descriptors in different services have the same message number, a receiver unit will regard that they have the same message contents.
   - ○ A message body should be described in the second byte and later in “private_data_byte.”
   - ○ When specifying the same massage number within a sub table, the massage body can be omitted. However, the first massage body with same massage number being posted cannot be omitted.

For details of operation of CA alternative service, see Volume 5.

20.8 Exceptional Operation before Commencement of Free Program Introduction with Contents Protection

Same as Part 1.

21 Digital Copy Control

Same as Part 1.

21.1 Priority of Copy Control Information

Same as Part 1.

21.2 Default Digital Copy Control Information

Same as Part 1.

21.3 Maximum Bit Rate Information

In the “maximum_bit_rate” field, a rough value worked out by rounding to the nearest 1/4 Mbps for each event is described. Same as Part 1 for the following items.

21.3.1 The maximum bit rate value when the maximum bit rate is not described

Same as Part 1.

21.3.2 How to specify the maximum bit rate in the multi-view television

The maximum bit rate is specified for each event or component using a digital copy control descriptor, but the maximum bit rate in the multi-view television is specified with a component group descriptor. Therefore, in an event where a component group descriptor is present, when “component_group_type” is set to ‘000’ (MVTV), the total bit rate described in the component group descriptor (or the default value, if it is not described) should be given a priority. However, for the maximum bit rate within each ES in the component group, the maximum bit rate by each ES may be referenced. Therefore, if such case is expected (as transmission of ES with different chargeable units or different copy control information within the component group), descriptions according to Section 30.3.3.4 should be added to the component group descriptor to be transmitted.

21.4 Change of Copy Control Information

Same as Part 1.

21.5 Control of Contents Output

Same as Part 1.

21.6 Temporary Accumulation of Contents

Same as Part 1.

22 Operation of PSI/SI at Hierarchical Modulation

In the BS digital broadcasting, multiple (up to four) modulation systems can be used simultaneously for a single carrier. Thus, a single TS can be transmitted in multiple modulation systems, which is called hierarchical modulation. The broadband CS digital broadcasting will not implement hierarchical modulation.
<Same as Part 1 for the following items>

23 Provisional Service

23.1 Definition of a Provisional Service

Same as Part 1.

23.2 Transmission of a Provisional Service

Same as Part 1.

23.3 Assumed Process Performed by a Receiver

Same as Part 1.

24 Event Relay

Same as Part 1.

24.1 Transmission at the Event Relay

Same as Part 1.

24.2 Assumed Process Performed by a Receiver

Same as Part 1.

24.3 Event Relay to the Provisional Service

Same as Part 1.

25 Multi-view Television (MVTV)

25.1 Transmission Operation

Same as Part 1.

25.1.1 MVTV in a free program

Same as Part 1.

25.1.2 MVTV in a pay program

Same as Part 1.

25.1.3 When the common additional chargeable data (D0) exists in the MVTV in a pay program

Same as Part 1.

25.2 Assumed Process Performed by a Receiver

Same as Part 1.

26 Emergency Warning System

26.1 Handling of TMCC Trigger Bit

Same as Part 1.

26.2 Multiplexing Locations of the Emergency Information Descriptor

Same as Part 1.

26.3 Multiplexing Timing and Retention Period of the Emergency Information Descriptor

Same as Part 1.

26.4 Use of Emergency Warning Broadcasting Test Signals

Same as Part 1.

27 Operation of PSI/SI of Programs with Captions

Same as Part 1.

28 Use of Summer Time

28.1 Use of Local Time Offset Descriptor

Same as Part 1.

29 Change of Service/TS Configuration

Same as Part 1.

29.1 Addition/Deletion/Transfer between TS of a Service

Same as Part 1.

29.2 Addition/Deletion of TS

Same as Part 1.

29.3 Transmission of TS over a Transponder

Same as Part 1.

Detailed Table Operation

30 Operation of PSI Table

30.1 PAT (Program Association Table)

30.1.1 Structure and operation of PAT

Same as Part 1.

30.2 CAT (Conditional Access Table)

30.2.1 Structure and operation of CAT

Same as Part 1.

30.2.2 Descriptors inserted into CAT

30.2.2.1 Conditional access system descriptor

Same as Part 1, except for the items and tables described below.

Table 30-8 Transmission operational rules for conditional access system descriptor (CAT)

Transmission operation rules of each field	
descriptor_tag	Write "0x09."
descriptor_length	Describe the length of this descriptor.
CA_system_id	Describe conditional access system ID. Do not use IDs other than the one to be applied to the broadband CS digital broadcasting.
CA_PID	Describe EMM_PID.
private_data_byte	Describe EMM transmission system at the first 1 byte. The second byte or after will not be used at the moment.

Table 30-44 EMM transmission system

Value	**Transmission system**
0x01	Type A
0x02	Type B

[Receiving process standards]

- If the reception of CAT does not succeed while the appropriate descriptor is assigned as specified in the transmission operation rule described above, it indicates that the specified transmission stream for EMM/EMM message is invalid.
- If there are more than two descriptors allocated, only the descriptor with the corresponding CA_system_ID assigned will be read.
- If the EMM transmission system contains an invalid value, the EMM acquisition does not have to be guaranteed.

The receiving process standards of each field are listed in Table 30-9.

Table 30-9 Receiving process standards for conditional access system descriptor (CAT)

Receiving process standards of each field	
descriptor_tag	= “0x09”: Indicates that the corresponding descriptor is a conditional access system descriptor.
descriptor_length	Indicates the length of conditional access descriptor.
CA_system_id	= Broadband CS digital broadcasting ID: Indicates an ID of the corresponding conditional access system descriptor. *1 = Value other than above: Indicates that the corresponding descriptor is invalid.
CA_PID	Indicates EMM_PID.
private_data_byte	The first byte indicates a transmission format of EMM. = ”0x01”: Indicates Type A. = ”0x02”: Indicates Type B. Other than above: Invalid type. Ignore the second byte or after at any given value.

*1 If the value is other than CA_system_ID of the corresponding conditional access system, it indicates that the corresponding conditional access system descriptor is invalid.

[Other notes and comments]

For operational details of conditional access, see Volume 5.

30.2.2.2 CA service descriptor

Same as Part 1.

30.3 PMT (Program Map Table)

30.3.1 PMT structure and operation

Same as Part 1.

30.3.2 Descriptors inserted into the first loop of PMT (program loop)

30.3.2.1 Conditional access system descriptor

Same as Part 1.

30.3.2.2 Digital copy control descriptor

[Usage]

Allocate this descriptor to specify the control information concerning digital copy or analog copy, or to describe the maximum transmission rate for the overall service applicable.

[Structure]

The structure of digital copy control descriptor is shown in Table 30-20.

Table 30-20 Structure of digital copy control descriptor

Data structure	Bits	Identifiers
digital_copy_control_descriptor() {		
descriptor_tag	**8**	**uimsbf**
descriptor_length	**8**	**uimsbf**
digital_recording_control_data	**2**	**bslbf**
maximum_bit_rate_flag	**1**	**bslbf**
component_control_flag	**1**	**bslbf**
copy_control_type	**2**	**bslbf**
if(copy_control_type==01||copy_control_type==11)){		
APS_control_data	**2**	**bslbf**
}		
else{	**2**	**bslbf**
reserved_future_use		
}		
if(maximum_bit_rate_flag == 1){		
maximum_bit_rate	**8**	**uimsbf**
}		
if(component_control_flag ==1){		
component_control_length	**8**	**uimsbf**
for(j=0;j<N;j++){		
component_tag	**8**	**uimsbf**
digital_recording_control_data	**2**	**bslbf**
maximum_bitrate_flag	**1**	**bslbf**
reserved_future_use	**1**	**bslbf**
copy_control_type	**2**	**bslbf**
if(copy_control_type==01||copy_control_type==11) {		
APS_control_data	**2**	**bslbf**
}		
else{		
reserved_future_use	**2**	**bslbf**
}		
if(maximum_bitrate_flag=1){		
maximum_bitrate	**8**	**uimsbf**
}		
}		
}		
}		

[Meanings of each field]

For the meanings of each field, comply with the rules in ARIB STD-B10 part 1, section 6.2, and the definitions in part 2, section 6.2.23 and that in Appendix F.

[Transmission operation rules]

⊙ **This descriptor must always be set if the corresponding service is intended to use digital copy control and analog copy control.**

○ This descriptor must be always set if this services fall outside the range of default maximum bit rate

defined in Table 21-1-1 and Table 21-1-2.

The transmission operation rule of each field is listed in table 30-21.

Table 30-21 Transmission operation rule of digital copy control descriptor (first loop of PMT)

Transmission operation rule of each field	
descriptor_tag	Write “0xC1.”
descriptor_length	Describe the length of digital copy control descriptor.
digital_recording_control_data	This 2-bit field contains the information, which controls the copy generations, and coded according to Table X1-Y1, Table X1-Y2, and Table X1-Y3.
maximum_bit_rate_flag	Write “0” not to specify the maximum transmission rate of the corresponding service. Write “1” to specify the maximum transmission rate of the corresponding service.
component_control_flag	If “0” is set, the digital copy control information is defined for the entire program. The subsequent fields after the component control length do not exist. To transmit this descriptor by PMT, always write '0' to the descriptor.
copy_control_type	This 2-bit field contains the format information, which controls the copy generations, and coded according to Table X1-Y1, Table X1-Y2, and Table X1-Y3.
APS_control_data	This field contains the information on copy control level in analog output. This 2-bit field indicates the level of copy control for analog output when the value set for copy_control_type is ‘01’ or ‘11’ as coded according to Table X1-Y1, Table X1-Y2, and Table X1-Y3.
maximum_bit_rate	Describe the maximum transmission rate.

In addition, details of each bit are described below.

Note that, depending on the service contents, the specification of controlling each output pin varies with the use of digital copy control descriptor.

[Operational notes (applicable to all services)]

Transmission operations in a combination not defined in Table X1-Y1, Table X1-Y2 and Table X1-Y3 are not allowed.

In reference to CGMS-A, if the value of copy_control_type field is set to "01" or "11", digital_recording_control_data as well as APS_control_data will be copied in the area specified by CGMS-A.

If this descriptor contains the copy control information, analog video output, high-speed digital interface output, and digital audio will be output after the appropriate copyright processing being applied in the receive processing. CGMS-A and MACROVISION are applied to the analog video output, 5CDTCP is applied to the high-speed digital interface output, and SCMS is applied to the digital audio output respectively. For details of this processing, see applicable specifications and standards.

When more than one service is output from the high-speed digital interface, the relationship in specifying copy control (including output control) among each service is defined as follows:

- Outputting stream is prohibited when it contains the service unavailable or prohibited.
- Output of a stream that contains the mixed service contents of copy_control_type=01 and copy_control_type=11 is prohibited. However, output is allowed if that contains a service type of copy free without constraints.
- Copy control is considered stricter in the order of copy prohibited (copy prohibited), only the first generation copy permitted (copy once), and copy permitted without constraint condition (copy free).

It is necessary to reflect the accurate information on the category code as well as the copyright display bit of the channel status specified by IEC 60958.

In this case, if a digital copy control descriptor is assigned, the category code is “001_0000L.”

Copy permitted without constraint condition: Set the copyright information bit to 1.

Only the first generation copy permitted: Set the copyright information bit to 1, and set the L bit of category code to 0.

Copy prohibited: Set the copyright information bit to 0, and set the L bit of category code to 1.

Note that, if no descriptor is assigned, it will be treated as copy free.

Table X1-Y1　Operations of descriptors for TV-based media type services

<table>
<tr><th rowspan="2">Digital copy control</th><th rowspan="2">Analog copy control *3</th><th colspan="3">Operation of each descriptor</th></tr>
<tr><th>copy_control_type</th><th>digital_recording_control_data</th><th>APS_control_data</th></tr>
<tr><td>Copy permitted without constraint condition</td><td>Copy permitted without constraint condition</td><td rowspan="5">01</td><td>00</td><td>Not Applicable</td></tr>
<tr><td rowspan="2">Copy prohibited *1</td><td>Copy prohibited, but no Macrovision protection added. Therefore, copy is permitted only for the conventional analog input and analog recording devices.</td><td rowspan="2">11</td><td>00</td></tr>
<tr><td>Copy prohibited *4</td><td>Other than 00</td></tr>
<tr><td rowspan="2">Only one-generation copy permitted *2</td><td>Only one-generation copy is permitted, but no Macrovision protection added. Therefore, the copy is permitted for the conventional analog recording devices.</td><td rowspan="2">10</td><td>00</td></tr>
<tr><td>Copy prohibited after one-generation copy is made *4</td><td>Other than 00</td></tr>
</table>

★ *1: The “copy never” process of “source function” defined in 5CDTCP is executed for the high-speed digital interface output. However, if only the audio stream is output in the IEC60958 conformant format, the “no more copies” process is executed.

*2: The “copy one generation” process of “source function” defined in 5CDTCP is executed for the high-speed digital interface output.

*3: Applicable to the composite and component video output. It also applies to the case where the received video signal is output after converting its format. The Macrovision control applies to the 480I composite and component video signals.

*4: Analog video signals are processed with the parameters specified by Macrovision Corp. and the specified APS_control_data, and output.

[Operational notes (TV-based media type services)]

If the service_type written in the service list descriptor of NIT is "0x01" (digital TV broadcasting service), "0xA1" (provisional video service), or "0xA5" (promotion video service), it must be coded based on the rules of Table X1-Y1.

Table X1-Y2 Operations of descriptors for audio-based media type services

<table>
<tr><th rowspan="2">Digital copy control</th><th rowspan="2">Analog copy control *4</th><th colspan="3">Operation of each descriptor</th></tr>
<tr><th>copy_control_type</th><th>digital_recording_control_data</th><th>APS_control_data</th></tr>
<tr><td>Copy permitted without constraint condition, however, note that output as MPEG_TS is currently unavailable. *1</td><td rowspan="2">Copy permitted without constraint condition</td><td>01</td><td rowspan="2">00</td><td rowspan="2">Not Applicable</td></tr>
<tr><td>Copy permitted without constraint condition</td><td>11</td></tr>
<tr><td rowspan="2">Copy prohibited *2,
Note that output as MPEG_TS is currently unavailable. *1</td><td>Copy prohibited, but no Macrovision protection added. Therefore, copy is permitted only for the conventional analog input and analog recording devices.</td><td rowspan="2">01</td><td rowspan="4">11</td><td>00</td></tr>
<tr><td>Copy prohibited *5</td><td>Other than 00</td></tr>
<tr><td rowspan="2">Copy prohibited.
Note that output as MPEG_TS is prohibited.</td><td>Copy prohibited, but no Macrovision protection added. Therefore, copy is permitted only for the conventional analog input and analog recording devices.</td><td rowspan="2">11</td><td>00</td></tr>
<tr><td>Copy prohibited *5</td><td>Other than 00</td></tr>
</table>

Only one-generation copy permitted *3 Note that output as MPEG_TS is currently unavailable. *1	Only one-generation copy is permitted, but no Macrovision protection added. Therefore, the copy is permitted for the conventional analog recording devices.	01	10	00
	Copy prohibited after one-generation copy is made *5			Other than 00
Only one-generation copy permitted. Note that output as MPEG_TS is prohibited.	Only one-generation copy is permitted, but no Macrovision protection added. Therefore, the copy is permitted for the conventional analog recording devices.	11		00
	Copy prohibited after one-generation copy is made *5			Other than 00

*1: The decision by the 5C will be followed.

*2: The “no more copies” process of the “AM824 audio source function” defined in 5CDTCP is executed for the high-speed digital interface output.

*3: The “copy one generation” process of the “AM824 audio source function” defined in 5CDTCP is executed for the high-speed digital interface output.

*4: Applicable to the composite and component video output. It also applies to the case where the received video signal is output after converting its format. The Macrovision control applies to the 480I composite and component video signals.

*5: Analog video signals are processed with the parameters specified by Macrovision Corp. and the specified APS_control_data, and output.

[Operational notes (Audio-based media type services)]

If the service_type written in the service list descriptor of NIT is "0x02" (digital audio service), "0xA2" (provisional audio service), or "0xA6" (promotion audio service), it must be coded based on the rules of Table X1-Y2.

Table X1-Y3 Operations of descriptors for data-based media type services

Digital copy control	**Analog copy control *3**	**Operation of each descriptor**		
		copy_control_type	**digital_recording_control_data**	**APS_control_data**
Copy permitted without constraint condition	Copy permitted without constraint condition	01/11	00	Not Applicable
Copy prohibited *1	Copy prohibited, but no Macrovision protection added. Therefore, copy is permitted only for the conventional analog input and analog recording devices.	01	11	00
	Copy prohibited *4			Other than 00

Copy prohibited. Note that output as MPEG_TS is prohibited.	Copy prohibited, but no Macrovision protection added. Therefore, copy is permitted only for the conventional analog input and analog recording devices.	11		00
	Copy prohibited *4			Other than 00
Only one-generation copy permitted *2	Only one-generation copy is permitted, but no Macrovision protection added. Therefore, the copy is permitted for the conventional analog recording devices.	01	10	00
	Copy prohibited after one-generation copy is made *4			Other than 00
Only one-generation copy permitted. Note that output as MPEG_TS is prohibited.	Only one-generation copy is permitted, but no Macrovision protection added. Therefore, the copy is permitted for the conventional analog recording devices.	11		00
	Copy prohibited after one-generation copy is made *4			Other than 00

★ *1: The “copy never” process of “source function” defined in 5CDTCP is executed for the high-speed digital interface output. However, if only the audio stream is output in the IEC60958 conformant format, the “no more copies” process is executed.

*2: The “copy one generation” process of “source function” defined in 5CDTCP is executed for the high-speed digital interface output.

*3: Applicable to the composite and component video output. It also applies to the case where the received video signal is output after converting its format. The Macrovision control applies to the 480I composite and component video signals.

*4: Analog video signals are processed with the parameters specified by Macrovision Corp. and the specified APS_control_data, and output.

[Operational notes (Data-based media type services)]

If the service_type written in the service list descriptor of NIT is "0xC0" (data service), "0xA3" (provisional data service), "0xA7" (promotion data service), "0xA8" (preliminary accumulation data service), "0xA9" (accumulation only data service), or "0xAA" (bookmark list data service), it must be coded based on the rules of Table X1-Y3.

[Receiving process standards]

The receiving process standards of each field are listed in Table 30-24.

Table 30-24 Receiving process standard for digital copy control descriptor (first loop of PMT)

Receiving process standards of each field	
descriptor_tag	= "0xC1": Indicates that the corresponding descriptor is a digital copy control descriptor.
descriptor_length	Indicates the length of digital copy control descriptor.
digital_recording_control_data	This 2-bit field contains the information, which controls the copy generations, and decoded according to Table X1-Y1, Table X1-Y2, and Table X1-Y3.
maximum_bit_rate_flag	='0': Indicates that the maximum transmission rate of corresponding service is within the range of default maximum bit rate defined in Table 21-1-1 and Table 21-1-2. ='1': Indicates that the maximum transmission rate of corresponding service is described in what follows.
component_control_flag	='0' : Indicates that the corresponding descriptor is valid. ='1' : Indicates that the corresponding descriptor is invalid.
copy_control_type	This 2-bit field contains the format information, which controls the copy generations, anddecoded according to Table X1-Y1, Table X1-Y2, andTable X1-Y3.
maximum_bit_rate	Indicates the maximum transmission rate of corresponding service.

[Other notes and comments]

The copy control matter of analog output signal, which is pursuant to the separate agreement between the pertinent broadcasting company and Macrovision Corporation et. al., should continue to be reviewed carefully.

If the digital copy control descriptor is not allocated in the first loop but can be found in the second loop only, the copy control information of the first loop will be treated as "copy permitted without constraint condition."

Here explains more reception processing other than the ones defined in Table X1-Y1, Table X1-Y2 and Table X1-Y3.

☐ TV-based media type services

If copy_control_type=00/10/11

- An output from the analog video output, digital audio output, and high-speed digital interface output ports is prohibited.

If copy_control_type=01, and digital_recording_control_data=01

- For the EMI of high-speed digital interface, execute the processing for "01." Other processing will follow the same procedure as the case where copy_control_type=01, and digital_recording_control_data=11.

☐ Audio and data-based media type services

If copy_control_type=00/10

- An output from the analog video output, digital audio output, and high-speed digital interface output ports is prohibited.

If copy_control_type=01, and digital_recording_control_data=01

- Only for the EMI of high-speed digital interface, execute the processing for “01.” Other processing will follow the same procedure as the case where copy_control_type=01, and digital_recording_control_data =11.

If copy_control_type=11, and digital_recording_control_data=01

- The same procedure as in the case of copy_control_type=11 and digital_recording_control_data=11 will apply.

30.3.2.3 Emergency information descriptor

Same as Part 1.

30.3.2.4 Content availability descriptor

Same as Part 1.

30.3.3 Descriptors entered in second loop of PMT (ES loop)

30.3.3.1 Conditional Access System (CAS) descriptor

Same as Part 1.

30.3.3.2 Stream ID descriptor

Same as Part 1.

30.3.3.3 Hierarchical transmission descriptor

Concerning the BS digital broadcasting, it is same as Part 1. This descriptor is not placed for the broadband CS digital broadcasting.

30.3.3.4 Digital copy control descriptor

[Usage]

Allocate these descriptors to specify digital copy and analog copy control information or to describe the maximum transmission rate for each ES of the corresponding service.

[Structure]

The structure of digital copy control descriptor is shown in Table 30-36.

Table 30-36 Structure of digital copy control descriptor

Data structure	Bits	Identifier
digital_copy_control_descriptor() {		
descriptor_tag	**8**	**uimsbf**
descriptor_length	**8**	**uimsbf**
digital_recording_control_data	**2**	**bslbf**
maximum_bit_rate_flag	**1**	**bslbf**
component_control_flag	**1**	**bslbf**
copy_control_type	**2**	**bslbf**
if(copy_control_type==01||copy_control_type==11)){		
APS_control_data	**2**	**bslbf**
}		
else {	**2**	**bslbf**
reserved_future_use		
}		
if(maximum_bit_rate_flag == 1){		
maximum_bit_rate	**8**	**uimsbf**
}		
if(component_control_flag ==1){		
component_control_length	**8**	**uimsbf**
for(j=0;j<N;j++){		
component_tag	**8**	**uimsbf**
digital_recording_control_data	**2**	**bslbf**
maximum_bitrate_flag	**1**	**bslbf**
reserved_future_use	**1**	**bslbf**
copy_control_type	**2**	**bslbf**
if(copy_control_type==01||copy_control_type==11) {		
APS_control_data	**2**	**bslbf**
}		
else{		
reserved_future_use	**2**	**bslbf**
}		
if(maximum_bitrate_flag=1){		
maximum_bitrate	**8**	**uimsbf**
}		
}		
}		
}		

[Meanings of each field]

For the meanings of each field, comply with the rules in ARIB STD-B10 part 1, section 6.2, and the definitions in part 2, section 6.2.23 and that in Appendix F.

[Transmission operation rules]

⊙ **This descriptor must always be set if the pertinent event falls under the digital copy control or analog copy control of different service during program reservation, and if such event or ES maximum transmission rate does not meet the default maximum bit rate given in Tables 21-1-1 and 21-1-2. However, the digital copy control information or analog copy control information that differs from the current service can be written only in the component having a component tag value of 0x40 to 0x7F.**

The transmission operation rules of each field are defined in Table 30-37.

Table 30-37 Transmission operation rules of digital copy control descriptor (Second loop of PMT)

Transmission operation rules of each field	
descriptor_tag	Describe “0xC1”.
descriptor_length	Describe the length of digital copy control descriptor.
digital_recording_control_data	This 2-bit field contains the information, which controls the copy generations. Table X2-Y1, Table X2-Y2, and Table X2-Y3 show the coding method to be followed.
maximum_bit_rate_flag	In order not to specify the maximum transmission rate for the applicable ES, describe ’0’. To specify the maximum transmission rate for the applicable ES, describe ’1’.
component_control_flag	If ‘0’ is set, the digital copy control information is defined for the concerned ES and there is no subsequent field after the component control length. To transmit this descriptor by PMT, always write '0' to the descriptor.
copy_control_type	This 2-bit field contains the information, which controls the copy generations. Table X2-Y1, Table X2-Y2, and Table X2-Y3 show the coding method to be followed.
APS_control_data	This field contains the information on copy control level in analog output. This 2-bit field indicates the level of copy control for analog output when the value set for copy_control_type is ‘01’ or ‘11’. Table X2-Y1, Table X2-Y2, and Table X2-Y3 show the coding method to be followed.
maximum_bit_rate	Describe the maximum transmission rate.

In addition, details of each bit are described below.

Note that, depending on the service contents, the specification of controlling each output pin varies with the use of digital copy control descriptor.

[Operational notes (applicable to all services)]

Transmission operations in a combination not defined in Tables X2-Y1, X2-Y2 and X2-Y3 are not allowed.

In reference to CGMS-A, if the value of copy_control_type field is set to "01" or "11", digital_recording_control_data as well as APS_control_data will be copied in the area specified by CGMS-A.

If this descriptor contains the copy control information, analog video output, high-speed digital interface output, and digital audio will be output after the appropriate copyright processing being applied in the receive processing. CGMS-A and MACROVISION are applied to the analog video output, 5CDTCP is applied to the high-speed digital interface output, and SCMS is applied to the digital audio output respectively. For details of this processing, see applicable specifications and standards.

When multiple components are transmitted from high-speed digital interface, the relationship in specifying

copy control (including output control) among each component will be considered as follows:

- Operation of the descriptor defined in each service is applicable to the descriptors described in the first loop and the second loop.
- Output the stream that includes component of output prohibited and output disabled will be prohibited.
- Output of the stream that contains copy_control_type=01 and copy_control_type=11 is prohibited. However, this rule does not apply to the output of copy free component in the audio-based media type service by IEC60958 and the output of copy free component in the data-based media type service by MPEG_TS or IEC60958.
- The level of strictness in the copy control is highest at “copy prohibited”, then “copy once”, and least strict at “copy free”.

It is necessary to reflect the accurate information on the category code as well as the copyright display bit of the channel status specified by IEC 60958.
In this case, if a digital copy control descriptor is assigned, the category code is “001_0000L”.
Copy permitted without constraint condition: Set the copyright information bit to 1.
Only the first generation copy permitted: Set the copyright information bit to 1, and set the L bit of category code to 0.
Copy prohibited: Set the copyright information bit to 0, and set the L bit of category code to 1.

Note that, if no descriptor is assigned, it will be treated as copy free.

Table X2-Y1 Operations of descriptors for TV-based media type services

<table>
<tr><th rowspan="2">Digital copy control</th><th rowspan="2">Analog copy control *3</th><th colspan="3">Operation of each descriptor</th></tr>
<tr><th>copy_control_type</th><th>digital_recording_control_data</th><th>APS_control_data</th></tr>
<tr><td>Copy permitted without constraint condition</td><td>Copy permitted without constraint condition</td><td rowspan="5">01</td><td>00</td><td>Not Applicable</td></tr>
<tr><td rowspan="2">Copy prohibited *1</td><td>Copy prohibited, but no Macrovision protection added. Therefore, copy is permitted only for the conventional analog input and analog recording devices.</td><td rowspan="2">11</td><td>00</td></tr>
<tr><td>Copy prohibited *4</td><td>Other than 00</td></tr>
<tr><td rowspan="2">Only one-generation copy permitted *2</td><td>Only one-generation copy is permitted, but no Macrovision protection added. Therefore, the copy is permitted for the conventional analog recording devices.</td><td rowspan="2">10</td><td>00</td></tr>
<tr><td>Copy prohibited after one-generation copy is made *4</td><td>Other than 00</td></tr>
</table>

★ *1: To output the high-speed digital interface, execute the “copy never” processing of “source function” defined in 5CDTCP. However, when exclusively outputting the audio stream in the IEC60958 conformant format, execute the “no more copies” processing.

*2: To output the high-speed digital interface, execute the “copy one generation” processing of “source function" defined in 5CDTCP.

*3: Applicable to the composite and component video output It also applies to the case where the received video signal is output after converting its format. The Macrovision control applies to the 480I composite and component video signals.

*4: In outputting analog video signals, the output is executed with the parameters specified by Macrovision Corp. using the information assigned at APS_control_data.

[Operational notes (TV-based media type services)]

If the service_type written in the service list descriptor of NIT is "0x01" (digital TV broadcasting service), "0xA1" (provisional video service), or "0xA5" (promotion video service), it must be coded based on the rules of Table X2-Y1.

Table X2-Y2 Operations of descriptors for audio-based media type services

<table>
<tr><th rowspan="2">Digital copy control</th><th rowspan="2">Analog copy control *4</th><th colspan="3">Operation of each descriptor</th></tr>
<tr><th>copy_control_type</th><th>digital_recording_control_data</th><th>APS_control_data</th></tr>
<tr><td>Copy permitted without constraint condition, however, note that output as MPEG_TS is currently unavailable. *1</td><td rowspan="2">Copy permitted without constraint condition</td><td>01</td><td rowspan="2">00</td><td rowspan="2">Not Applicable</td></tr>
<tr><td>Copy permitted without constraint condition</td><td>11</td></tr>
<tr><td rowspan="2">Copy prohibited *2. Note that output as MPEG_TS is currently unavailable. *1</td><td>Copy prohibited, but no Macrovision protection added.
Therefore, copy is permitted only for the conventional analog input and analog recording devices.</td><td rowspan="2">01</td><td rowspan="4">11</td><td>00</td></tr>
<tr><td>Copy prohibited *5</td><td>Other than 00</td></tr>
<tr><td rowspan="2">Copy prohibited. Note that output as MPEG_TS is prohibited.</td><td>Copy prohibited, but no Macrovision protection added.
Therefore, copy is permitted only for the conventional analog input and analog recording devices.</td><td rowspan="2">11</td><td>00</td></tr>
<tr><td>Copy prohibited *5</td><td>Other than 00</td></tr>
</table>

Only one-generation copy permitted. *3 Note that output as MPEG_TS is currently unavailable. *1	Only one-generation copy is permitted, but no Macrovision protection added. Therefore, the copy is permitted for the conventional analog recording devices.	01	10	00
	Copy prohibited after one-generation copy is made *5			Other than 00
Only one-generation copy permitted. Note that output as MPEG_TS is prohibited.	Only one-generation copy is permitted, but no Macrovision protection added. Therefore, the copy is permitted for the conventional analog recording devices.	11		00
	Copy prohibited after one-generation copy is made *5			Other than 00

*1: The decision by the 5C will be followed.

*2: The “no more copies” process of the “AM824 audio source function” defined in 5CDTCP is executed for the high-speed digital interface output.

*3: The “copy one generation” process of the “AM824 audio source function” defined in 5CDTCP is executed for the high-speed digital interface output.

*4: Applicable to the composite and component video output. It also applies to the case where the received video signal is output after converting its format. The Macrovision control applies to the 480I composite and component video signals.

*5: On the analog video output, the output is processed with the parameters specified by Macrovision Corp. and APS_control_data specified.

[Operational notes (Audio-based media type services)]

If the service_type written in the service list descriptor of NIT is "0x02" (digital audio service), "0xA2" (provisional audio service), or "0xA6" (promotion audio service), it must be coded based on the rules of Table X2-Y2.

Table X2-Y3 Operations of descriptors for data-based media type services

Digital copy control	**Analog copy control *3**	**Operation of each descriptor**		
		copy_control_type	**digital_recording_control_data**	**APS_control_data**
Copy permitted without constraint condition	Copy permitted without constraint condition	01/11	00	Not Applicable
Copy prohibited *1	Copy prohibited, but no Macrovision protection added. Therefore, copy is permitted only for the conventional analog input and analog recording devices.	01	11	00
	Copy prohibited *4			Other than 00
Copy prohibited. Note that output as MPEG_TS is prohibited.	Copy prohibited, but no Macrovision protection added. Therefore, copy is permitted only for the conventional analog input and analog recording devices.	11		00
	Copy prohibited *4			Other than 00
Only one-generation copy permitted *2	Only one-generation copy is permitted, but no Macrovision protection added. Therefore, the copy is permitted for the conventional analog recording devices.	01	10	00
	Copy prohibited after one-generation copy is made *4			Other than 00
Only one-generation copy permitted. Note that output as MPEG_TS is prohibited.	Only one-generation copy is permitted, but no Macrovision protection added. Therefore, the copy is permitted for the conventional analog recording devices.	11		00
	Copy prohibited after one-generation copy is made *4			Other than 00

★ *1: For a high-speed digital interface output, execute the “copy never” process of “source function" defined in 5CDTCP. However, when exclusively outputting the audio stream in the IEC60958 conformant format, execute the “no more copies” processing.

*2: To output the high-speed digital interface, execute the “copy one generation” processing of “source function" defined in 5CDTCP.

*3: Applicable to the composite and component video output. It also applies to the case where the received video signal is output after converting its format. The Macrovision control

applies to the 480I composite and component video signals.

*4: In outputting analog video signals, the output is executed with the parameters specified by Macrovision Corp. using the information assigned at APS_control_data.

[Operational notes (Data-based media type services)]

If the service_type written in the service list descriptor of NIT is "0xC0" (data service), "0xA3" (provisional data service), "0xA7" (promotion data service), "0xA8" (preliminary accumulation data service), "0xA9" (accumulation only data service), or "0xAA" (bookmark list data service), it must be coded based on the rules of Table X2-Y3.

[Receive processing standards]

The receive processing standards of each field are listed in Table 30-40.

Table 30-40 Receive processing standard for digital copy control descriptor (second loop of PMT)

	Receive processing standard of each field
descriptor_tag	= "0xC1": Indicates that this descriptor is the digital copy control descriptor.
descriptor_length	Indicates the length of digital copy control descriptor.
digital_recording_control_data	This 2-bit field contains the information, which controls the copy generations, and Table X2-Y1, Table X2-Y2, and Table X2-Y3 show the coding method to be followed.
maximum_bit_rate_flag	='0': Indicates that the maximum transmission rate of the concerned ES is within the range of default maximum bit rate defined in Table 21-1-1 and Table 21-1-2. ='1': Indicates that the maximum transmission rate of the concerned ES will be described subsequently.
component_control_flag	='0' : Indicates that the corresponding descriptor is valid. ='1' : Indicates that the corresponding descriptor is invalid.
copy_control_type	This 2-bit field indicates the control type for copy-generation and will be decoded as classified in Table X2-Y1, X2-Y2, and X2-Y3.
maximum_bit_rate	Indicates the maximum transmission rate of corresponding service.

[Other notes and comments]

The careful study for copy control of analog output signals is necessary to continue in the future as it is pursuant to the separate contract between the pertinent broadcaster and Macrovision Corporation or others.

Here explains more receive processing other than the ones defined in Tables X2-Y1, X2-Y2 and X2-Y3.

☐ TV-based media type services

If copy_control_type=00/10/11

- An output from the analog video output, digital audio output, and high-speed digital interface output ports is prohibited.

If copy_control_type=01, and digital_recording_control_data=01

- For the EMI of high-speed digital interface, execute the processing for “01”. Other processing will follow the same procedure as the case where copy_control_type=01, and digital_recording_control_data=11.

☐ Audio and data-based media type services

If copy_control_type=00/10

- An output from the analog video output, digital audio output, and high-speed digital interface output ports is prohibited.

If copy_control_type=01, and digital_recording_control_data=01

- Only for the EMI of high-speed digital interface, execute the processing for “01.” Other processing will follow the same procedure as the case where copy_control_type=01, and digital_recording_control_data =11.

If copy_control_type=11, and digital_recording_control_data=01

- The same procedure as in the case of copy_control_type=11 and digital_recording_control_data=11 will apply.

30.3.3.5 Data coding system descriptor

Same as Part 1.

30.3.3.6 Target area descriptor

Same as Part 1.

30.3.3.7 Video decode control descriptor

Same as Part 1.

31 Operation of All-Station SI Table

31.1 NIT (Network Information Table)

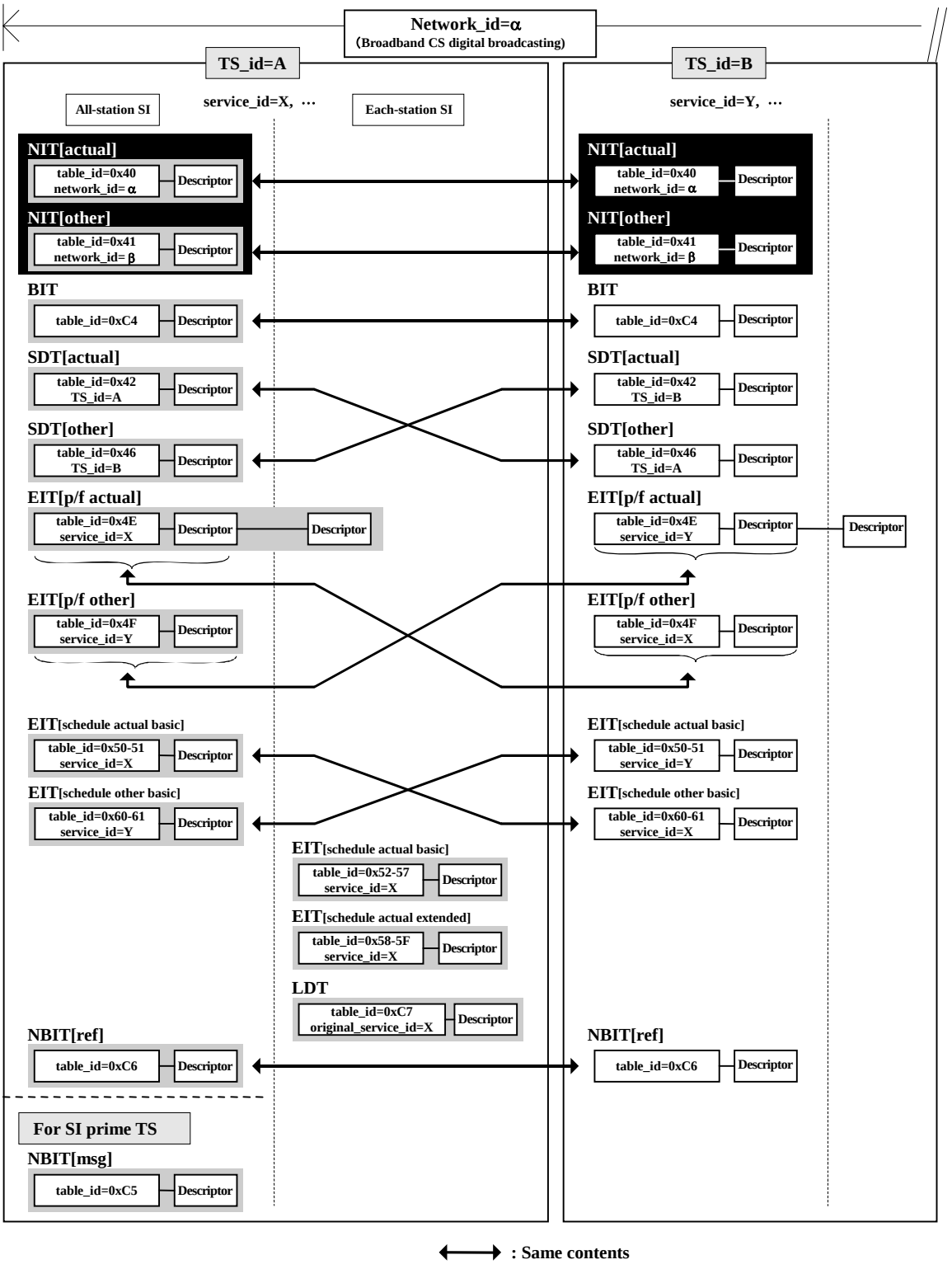


Figure 31-1 The part explained in Section 31.1 (NIT) [colored background]

31.1.1 NIT structure and operation

[Usage]

It transmits the information that associates the broadcasting service with the transmission channel such as module frequency. It shows a service structure of the entire network.

[Structure]

The structure of NIT is shown in Table 31-1.

Table 31-1 Structure of NIT (Network Information Table)

Data structure	Bits	Identifiers
network_information_section(){		
table_id	**8**	**uimsbf**
section_syntax_indicator	**1**	**bslbf**
reserved_future_use	**1**	**bslbf**
reserved	**2**	**bslbf**
section_length	**12**	**uimsbf**
network_id	**16**	**uimsbf**
reserved	**2**	**bslbf**
version_number	**5**	**uimsbf**
current_next_indicator	**1**	**bslbf**
section_number	**8**	**uimsbf**
last_section_number	**8**	**uimsbf**
reserved_future_use	**4**	**bslbf**
network_descriptor_length	**12**	**uimsbf**
for (i = 0;i< N;i++) {		
descriptor()		
}	**4**	**bslbf**
reserved_future_use	**12**	**uimsbf**
transport_stream_loop_length		
for (i = 0;i< N;i++) {		
transport_stream_id	**16**	**uimsbf**
original_network_id	**16**	**uimsbf**
reserved_future_use	**4**	**bslbf**
transport_descriptors_length	**12**	**uimsbf**
for (j = 0;j< N;j++) {		
descriptor()		
}		
}		
CRC_32	**32**	**rpchof**
}		

[Meanings of each field]

The meaning of each field shall follow the standards given in Section 5.2.4 of Part 2 of ARIB STD-B10.

[Transmission operation rules]

⊙ **NIT must be transmitted when a stream is included in the transport stream.**

○ The re-transmission cycle must follow the standards given in Section 12.4 of this Guide.

○ The update frequency must follow the standards given in Section 12.9 of this Guide.

○ For NIT and SDT, the same service information is described as a general rule. However, this rule does not apply to the transition period.

○ If other network exists in the broadband CS digital broadcasting, transmit the NIT[other] in the corresponding network.

○ To describe the NIT[other], which is used for the other network in broadband CS digital broadcasting, be sure to describe the typical multiple TS information.

○ It is mandatory to describe the BS digital broadcasting network by NIT[other] and describe the engineering service only.

The transmission operation rules of each field are listed in table 31-2.

Table 31-2 Transmission operation rule for NIT

Transmission operation rule of each field	
table_id	actual: Describe “0x40”. other: Describe “0x41”.
section_syntax_indicator	Write ‘1’.
section_length	Describe the section length of NIT. (Maximum 1021 byte) Always set "0x00" to the first 2 bits.
network_id	Describe network_id.
version_number	Describe the value that increments by 1 per version update for the normal operation. However, in case of a system malfunction, it is possible to describe a value that increments by 1 or greater.
current_next_indicator	Write ‘1’. Operation conforms to the MPEG standard.
section_number	
last_section_number	
network_descriptor_length	Do not specify the maximum count of loops.
[1st_loop]	
[descriptor]	
transport_stream_loop_length	
[2nd_loop]	Describe the information on each transport stream included in the target network. Do not specify the maximum count of loops.
transport_stream_id	
original_network_id	Describe the same value as network_id.
transport_descriptors_length	Do not specify the maximum value.
[descriptor]	

[Receiving process standards]

○ For the BS digital broadcasting, the receiver operates according to the NIT information accumulated in the non-volatile memories for the receive processing since NIT is not characterized as a table that

updates its version frequently, thus it can shorten the operation time. For the broadband CS digital broadcasting, it is necessary to perform version updates of NIT on an irregular basis (however, the update does not continue at frequent intervals), and accurately comply with the increase or decrease of service. If it is not possible to receive NIT within the specified re-transmission cycle, it indicates that there is no stream available for reception in the transport stream or the transmission system is not operating properly. Upon receiving NIT, it must operate in accordance with the information.

- If the description of service for the NIT and SDT does not correspond, it is considered as the transition period.
- If NIT[other] is sent out, it is considered that multiple networks exist as BS / broadband CS digital broadcasting.

The receiving process standards of each field are listed in Table 31-3.

Table 31-3 Receiving process standards of NIT

Receiving process standards of each field	
table_id	= ”0x40”: Indicates NIT[actual]. = ”0x41”: Indicates NIT[other].
section_syntax_indicator	= ‘0’ : The corresponding section is invalid. = ‘1’ : The corresponding section is valid.
section_length	Indicates the section length of NIT.
network_id	Indicates the network_id of corresponding network.
version_number	If there is any change, it indicates that the corresponding table has been updated.
current_next_indicator	= ‘0’ : The corresponding section is invalid. = ‘1’ : The corresponding section is valid.
section_number	
last_section_number	
network_descriptor_length	Do not specify the maximum count of loops.
[1st_loop]	
[descriptor]	
transport_stream_loop_length	
[2nd_loop]	Indicates the information on each transport stream included in the target network.
transport_stream_id	
original_network_id	
transport_descriptors_length	
[descriptor]	

[Other notes and comments]

None

31.1.2 Descriptors to be inserted at the first loop of NIT (network loop)

31.1.2.1 Network name descriptor

Same as Part 1.

31.1.2.2 System management descriptor

[Usage]

If broadcasting of the corresponding network is inactive or active, this descriptor is used to identify the standard method.

[Structure]

The structure of system management descriptors is shown in Table 31-7.

Table 31-7 Structure of system management descriptor

Data structure	Bits	Identifiers
system_management_descriptor () {		
descriptor_tag	**8**	**uimsbf**
descriptor_length	**8**	**uimsbf**
system_management_id{		**uimsbf**
broadcasting_flag	**2**	**uimsbf**
broadcasting_identifier	**6**	**uimsbf**
additional_broadcasting_identification	**8**	**uimsbf**
}		
for (i = 0;i< N;i++) {		
additional_identification_info	**8**	**uimsbf**
}		
}		

[Meanings of each field]

For the meaning of each field, follow the standards given in Section 6.2 of Part 1 of ARIB STD-B10, and the definitions given in Section 6.2.21 of Part 2.

[Transmission operation rule]

⊙ **Be sure to allocate this descriptor when NIT is transmitted.**

The transmission operation rules of each field are listed in table 31-8.

Table 31-8 Transmission operation rule of system management descriptor

Transmission operation rule of each field	
descriptor_tag	Describe “0xFE”.
descriptor_length	Describe the length of system management descriptor.
[system_management_id]	
broadcasting_flag	Write ‘00’. (Indicates active broadcasting)
broadcasting_identifier	Write ‘000100’. (Indicates the broadcasting method of broadband CS digital broadcasting)
additional_broadcasting_identification	Describe “0x01”.
[loop]	
additional_identification_info	Do not write anything.

[Receiving process standards]

○ It determines if the target network is active or inactive. If it is active, it also determines if the broadcasting is the broadband CS digital network.

The receiving process standards of each field are listed in Table 31-9.

Table 31-9 Receiving process standards of system management descriptor

Receiving process standards of each field	
descriptor_tag	If this field is “0xFE”, it indicates that the corresponding descriptor is system management descriptor.
descriptor_length	Indicates the length of system management descriptor.
[system_management_id]	
broadcasting_flag	= ‘00’: Indicates the broadcasting of corresponding network is active. ≠ ‘00’: The broadcasting of corresponding network is in other than active state.
broadcasting_identifier	= ‘000010’: Indicates that the corresponding network is BS digital broadcasting. = ‘000100’: Indicates that the corresponding network is broadband CS digital broadcasting.
additional_broadcasting_identification	To be ignored.
[loop]	
additional_identification_info	To be ignored.

[Other notes and comments]

None

31.1.2.3 CA EMM TS descriptor

[Usage]

It specifies the TS that transmits EMM information in a time of emergency, and describes the duration time of EMM reception after turning the power off at the receiver. It is used when changing the work key for targeted conditional access system of all receivers all at once with urgency, in case of an illicit obtainment or

alteration of secret key.

[Structure]

The structure of CA_EMM_TS descriptor is shown in Table 31-10.

Table 31-10 Structure of CA_EMM_TS descriptor

Data structure	Bits	Identifiers
CA_EMM_TS_descriptor () {		
descriptor_tag	**8**	**uimsbf**
descriptor_length	**8**	**uimsbf**
CA_system_id	**16**	**uimsbf**
transport_stream _id	**16**	**uimsbf**
original_network_id	**16**	**uimsbf**
power_supply_period	**8**	**uimsbf**
}		

[Meanings of each field]

The meanings of each field is listed in Table 31-11.

Table 31-11 Meanings of each field for CA_EMM_TS descriptor

Meanings of each field	
CA_system_id	This 16-bit field indicates the conditional acceptance system identification to be targeted.
transport_ stream_id	This 16-bit field is an identification of transport stream that transports the EMM information to be received after turning off the power of receiver.
original_network_id	This 16-bit field is a label to identify the network of original distribution system.
power_supply_period	This 8-bit field indicates the retention period (in minutes) of power supply for receiving the EMM information after turning off the power of receiver.

[Transmission operation rule]

⊙ **This descriptor is placed for a specific period only if a broadcaster considers it necessary to transmit a different EMM than that of an ordinary operation for all receivers to have reception with controlled conduction.**

To use multiple conditional access systems for the multiple receptions with controlled conduction simultaneously, be sure to allocate one of this descriptor for every conditional access system id.

The transmission operation rules of each field are listed in table 31-12.

Table 31-12 Transmission operation rule of CA_EMM_TS descriptor

Transmission operation rule of each field	
descriptor_tag	Write "0xCA".
descriptor_length	Describe the length of this descriptor. Fixed as 7.
CA_system_id	Describe a conditional access system ID. Do not use IDs other than the one to be applied to the broadband CS digital broadcasting.
transport_stream_id	After the power off operation at the receiver, describe the TS identifier for transmitting EMM information to be received.
original_network_id	Describe a network_id for the corresponding network.
power_supply_period	After the power off operation at the receiver, describe the power retention period in the units of minute. 1 to 255.

[Receiving process standards]

- ○ If the corresponding descriptor exists in the 1st loop of NIT, try to acquire the corresponding EMM information.
- ○ If the corresponding descriptor does not exist in the 1st loop of NIT, it indicates that the corresponding EMM information is not utilized.

The receiving process standards of each field are listed in Table 31-13.

Table 31-13 Receiving process standards of CA_EMM_TS descriptor

Receiving process standards of each field	
descriptor_tag	= "0xCA": Indicates that the corresponding descriptor is a CA_EMM_TS descriptor.
Descriptor_length	Indicates the length of corresponding descriptor.
CA_system_id	= ID applied to the broadband CS digital broadcasting: Indicates an ID of the corresponding conditional access system descriptor. *1 = Value other than above: Indicates an invalid value.
transport_stream_id	Indicates a TS identifier for transmitting EMM information to be received. If this value is not the one to be described in NIT, it indicates an invalid value.
original_network_id	Indicates a network_id. Depending on the receiver, this id might be ignored.
power_supply_period	=0: This field is invalid. ≠0: Indicates a power retention period (in the units of minute) for the reception of EMM information.

*1 If the value is other than CA_system_ID of the corresponding conditional access system, it indicates that the corresponding conditional access system descriptor is invalid

[Other notes and comments]

For operational details of conditional access, see Volume 5.

31.1.3 Descriptors to be inserted in the second loop of NIT (TS loop)

31.1.3.1 Service list descriptor: Same as Part 1, except for the following table items.

Table 31-16 service_type

service_type	
0x01	Digital TV service
0x02	Digital audio service
0xC0	Data service
0xA1	Provisional image service
0xA2	Provisional audio service
0xA3	Provisional data service
0xA4	Engineering service (Note 1)
0xA5	Promotion image service
0xA6	Promotion audio service
0xA7	Promotion data service
0xA8	Preliminary accumulation data service
0xA9	Accumulation only data service
0xAA	Bookmark list data service

* Note that there might be additions for this service_type in the future.

Note 1: For details, see applicable standards in Volume 1. This service will not be implemented in broadband CS digital broadcasting.

31.1.3.2 Satellite delivery system descriptor

Same as Part 1.

31.2 BIT (Broadcaster Information Table)

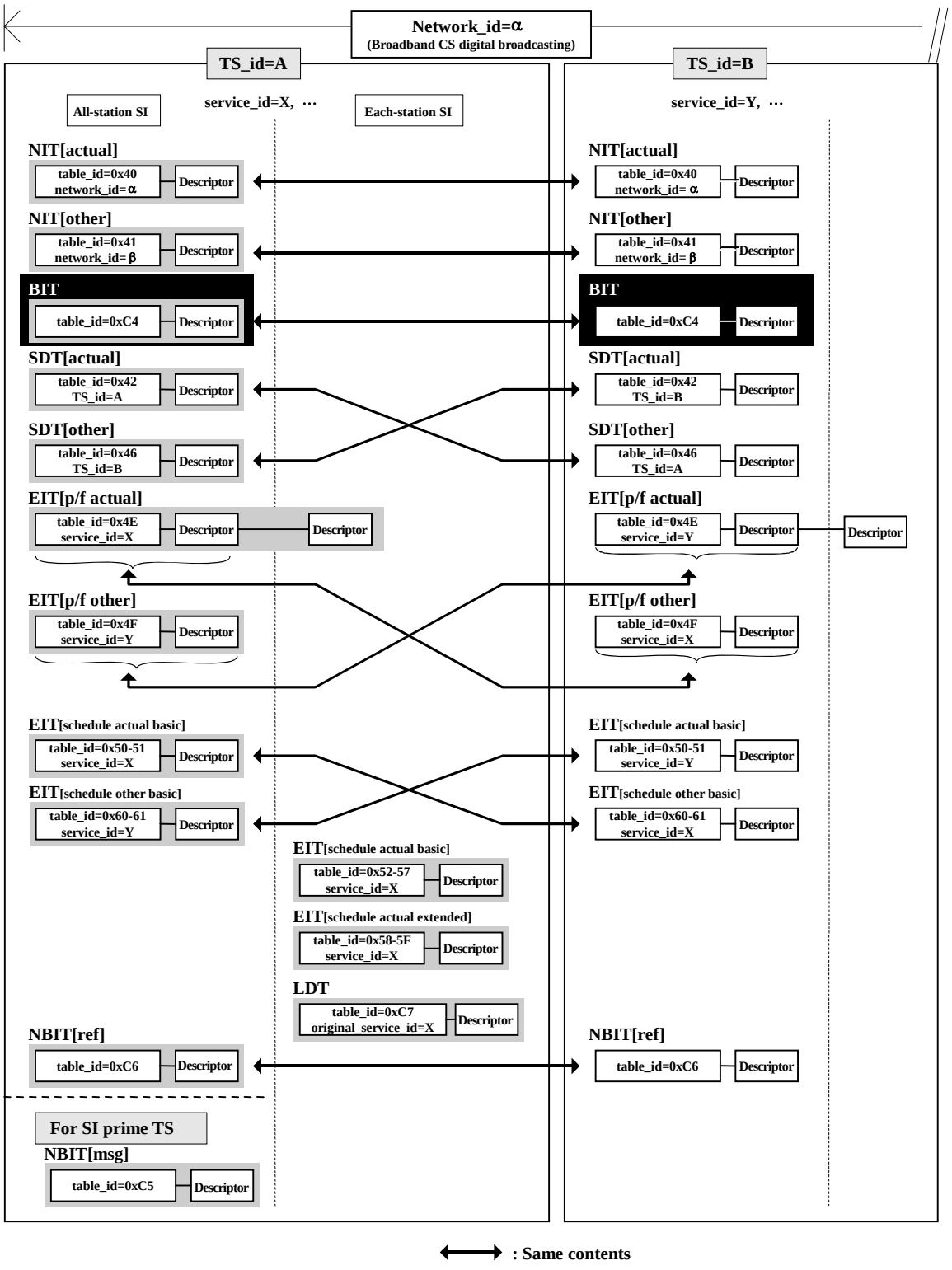


Figure 31-2 The part explained in Section 31.2 (BIT) [colored background]

31.2.1 Structure and operations of BIT

[Usage]

It is used to present the information of broadcasters that exist on the network.

Simultaneously, it describes each transmission parameter of all-station SI and each-station SI.

[Explanation]

BIT constructs a sub-table per original network and has information loop per broadcaster. There are descriptor loops for each original network and broadcaster in a sub-table, and each corresponding information can be specified in the structure.

All all-station SI transmission parameters are set using the SI transmission parameter descriptor for the information per original network. For the broadband CS digital broadcasting, it is possible to specify the TS that utilizes short-cycle TS and NBIT[msg] using the SI prime TS descriptor.

For the information per broadcaster, set the transmission parameter of each-station SI to be utilized per broadcaster as well as the broadcaster name and service list provided by the broadcasters. Broadcaster name is specified by the broadcaster name descriptor. This broadcaster name can be useful when realizing the function per broadcaster unit in such a case where selecting channel per broadcaster or presenting program list per broadcaster. Specify the service list using the service list descriptor. Each-station SI transmission parameter is specified with the SI transmission parameter descriptor.

For details of broadcaster, see descriptions in section 9.3.

[Structure]

The structure of BIT is shown in Table 31-21.

Table 31-21 Structure of BIT (Broadcaster Information Table)

Data structure	Bits	Identifiers
broadcaster_information_section(){		
table_id	**8**	**uimsbf**
section_syntax_indicator	**1**	**bslbf**
reserved_future_use	**1**	**bslbf**
reserved	**2**	**bslbf**
section_length	**12**	**uimsbf**
original_network_id	**16**	**uimsbf**
reserved	**2**	**bslbf**
version_number	**5**	**uimsbf**
current_next_indicator	**1**	**bslbf**
section_number	**8**	**uimsbf**
last_section_number	**8**	**uimsbf**
reserved_future_use	**3**	**bslbf**
broadcast_view_propriety(T.B.D.)	**1**	**bslbf**
first_descriptors_length	**12**	**uimsbf**
for (i = 0;i< N1;i++) {		
descriptor()		
}		
for (j = 0;j< N2;j++) {		
broadcaster_id	**8**	**uimsbf**
reserved_future_use	**4**	**bslbf**
broadcaster_descriptors_length	**12**	**uimsbf**
for(k=0;k<N3;k++){		
descriptor()		
}		
}		
CRC_32	**32**	**rpchof**
}		

[Meanings of each field]

The meanings of each field for BIT are listed in Table 31-22.

Table 31-22 Meanings of each field for BIT

Field	Meaning
broadcast_view_propriety	This 1-bit field is a bit that indicates if information based on the existence of broadcaster is appropriate at the receiver side.
first_descriptors_length	This 12-bit field indicates the descriptor length of descriptor field that follows. This field is encoded by the 12-bit binary and the unit is byte.
broadcaster_id	This 8-bit field indicates the broadcaster to be described in the corresponding loop.
broadcaster_descriptors_length	This 12-bit field indicates the descriptor length of descriptor field that follows. This field is encoded by the 12-bit binary and the unit is byte.

[Transmission operation rule]

⊙ Transmission is mandatory for the broadband CS digital broadcasting.

⊙ Each service belongs to one broadcaster for all services with no exception.

⊙ As an all-station SI, the same contents will be transmitted to all TS.

⊙ Sub-table is constructed per original_network_id.

○ The re-transmission cycle must follow the standards given in Section 12.4 of this Guide.

○ The update frequency must follow the standards given in Section 12.9 of this Guide.

The transmission operation rules of each field are listed in Table 31-23.

Table 31-23 Transmission operation rule for BIT

Transmission operation rule of each field	
table_id	Describe “0xC4”.
section_syntax_indicator	Write “1”.
section_length	Describe the section length of BIT. Since the maximum section length of BIT is 1024 byte, this value must be 1021 or less.
original_network_id	Describe the network_id for the target network of BIT.
version_number	If there is an update of the contents of sub-table, describe the value incremented by 1.
current_next_indicator	Write “1”.
section_number	Describe section number. Section number of the first section is 0, and as the section increments by 1, set the corresponding value incremented by 1.
last_section_number	Describe the last section number.
broadcast_view_propriety	=’0’: The information based on broadcaster existence is not significant. =’1’: The information based on broadcaster existence is significant.
first_descriptors_length	Describe the loop length of descriptor that follows. For the section that follows the section numbered at 1, describe 0.
[descriptor loop]	Allocate the valid information in the entire network as descriptor.
[broadcaster loop]	Description is required for all broadcasters that exist in the corresponding network. Note that section cannot be partitioned in the middle of this loop.
broadcaster_id	Describe broadcaster_id for broadcaster. This value is set uniquely within the network_id field. There is no set value for the maximum number of broadcasters.
broadcaster_descriptors_length	Describe the broadcaster descriptor length that follows.
[descriptor loop]	Allocate the valid information for each broadcaster as descriptor.

[Receiving process standards]

○ The receiver operates according to the BIT information accumulated in the non-volatile memories for the receive processing since BIT is not characterized as a table that updates its version frequently, thus it can shorten the operation time.

The receiving process standards of each field are given in Table 31-24.

Table 31-24 Receiving process standards of BIT

Receiving process standards of each field	
table_id	If the value of this field is "0xC4", it indicates that the corresponding table is BIT only when this table is received by the TS (to be determined by original_network_id) that transmits BS digital broadcasting.
section_syntax_indicator	="0": The corresponding section is invalid. ="1": The corresponding section is valid.
section_length	≤1021: Section length >1021: The corresponding section is invalid.
original_network_id	If this value is the same one as your own network ID, it indicates that it is the BIT of your network. If an unknown value is described, ignore this corresponding section.
version_number	If there is a change, it indicates that the corresponding sub-table is updated.
current_next_indicator	= "0" : The corresponding section is invalid. = "1" : The corresponding section is valid.
section_number	≤ last_section_number: Indicates a section number in the corresponding sub-table. > last_section_number: The corresponding section is invalid.
last_section_number	Indicates the last section number in the corresponding sub-table.
broadcast_view_propriety	='0': Presentation of information based on the existence of broadcaster is inappropriate. ='1': Presentation of information based on the existence of broadcaster is appropriate.
first_descriptors_length	Indicates the loop length of descriptor that follows. When this field value is considered to be abnormal based on the section_length value, the corresponding section itself is determined as invalid. If this value is 0, there is no descriptor in the descriptor loop. In the section where its section number is set to other than '0', this value is '0'. If this value is other than 0, without reading descriptor length specified by this field (in other words, skip the contents of the descriptor loop that follows), and continue the execution.
[descriptor loop]	In this loop, the valid descriptors in the entire network are assigned with no space between. It should enable the processing of descriptors declared in this field only without reading the other descriptors.
[broadcaster loop]	Loop length of the corresponding loop is determined from the value set at section_length field and first_descriptors_length field per section. The number of broadcasters in this loop at the time of receiving the entire sub-table are the total count of broadcasters that exist in the network.
broadcaster_id	It indicates the broadcaster to be described in the corresponding broadcaster loop.
broadcaster_descriptors_length	Indicates the loop length of descriptor that follows. If this value is 0, there is no descriptor in the descriptor loop. When this field value is considered to be abnormal based on the section_length value, the corresponding section itself is determined as invalid.
[descriptor loop]	In this loop, the valid descriptors in the corresponding broadcaster are assigned with no space between. It should enable the processing of descriptors declared in this field only without reading the other descriptors.

[Other notes and comments]

None

31.2.2 Descriptors to be inserted at the first loop of BIT (network loop)

31.2.2.1 SI transmission parameter descriptor

Same as Part 1, except for the items and tables described below.

Table 31-26 Structure of table_description_byte per table_id (the first loop of BIT)

table_id	table_description_byte	Bits	Identifier
0x40 (NIT[actual])	**table_cycle**	**8**	**bslbf**
0x41 (NIT[other])	**table_cycle**	**8**	**bslbf**
0xC4 (BIT)	**table_cycle**	**8**	**bslbf**
0x42 (SDT[actual])	**table_cycle**	**8**	**bslbf**
0x46 (SDT[other])	**table_cycle**	**8**	**bslbf**
0x4E (EIT[p/f actual])	**table_cycle**	**8**	**bslbf**
0x4F (EIT[p/f other])	**table_cycle**	**8**	**bslbf**
0x50 (EIT[schedule actual]) **0x60 (EIT[schedule other])**	**for(;;){** **media_type** **pattern** **reserved** **schedule_range** **base_cycle** **reserved** **cycle_group_count** **for(i=0;i<cycle_group_count;i++){** **num_of_segment** **cycle** **}** **}**	 **2** **2** **4** **8** **12** **2** **2** **8** **8**	 **uimsbf** **uimsbf** **bslbf** **bslbf** **bslbf** **bslbf** **uimsbf** **bslbf** **bslbf**
0XC3 (SDTT)	**table_cycle**	**16**	**bslbf**
0xC6 (NBIT[ref])	**table_cycle**	**8**	**bslbf**

[Transmission operation rule]

- ⊙ **Be sure to allocate this descriptor when you change the all-station transmission parameter from its default settings. In this case, be sure to allocate this descriptor at least 8 days prior to the modification.**
- ⊙ **The field table_id is described in the SI transmission parameter descriptors for the first loop of BIT only when the cycle is changed from its default settings. It does not have any correlation with the existence of table itself, but concerning the NBIT[ref] and NIT[other] only, existence or nonexistence of this description indicates those of transmission.**
- ○ When you change the transmission parameter of all-station SI, you need to change from 0 o'clock sharp (all TS all at once).
- ○ This description can be omitted for the default transmission parameter and the table type without any modification. (Description is only required for the table type that has been modified)

○ Value to be set for the transmission parameter should not exceed the preset range.

○ Multiple descriptors with different update_time can be allocated in the same loop. For example, in the case where valid descriptor is placed at the current moment and the parameters will be changed 3 days later, it means that the multiple descriptors will be allocated.

[Receiving process standards]

⊙ **If this descriptor does not exist in the first descriptor loop of BIT, it indicates that the all-station SI is transmitted as the default transmission parameter. However, for the NBIT[ref], it indicates that the table is not being transmitted.**

⊙ **The contents stated by this descriptor becomes valid from 0 hour 0 minute of the time specified by the update_time field.**

⊙ **Even when this descriptor exists in the first descriptor loop of BIT, if there is no valid descriptor at the moment (to be determined by update_time field in the descriptor), it indicates that the all-station SI (at the moment) is transmitted as the default transmission parameter.**

⊙ **If a description of the table type included in all-station SI does not exist in the corresponding descriptor, it indicates that the corresponding table type is transmitted as the transmission parameter set as default.**

○ If there are multiple SI transmission parameter descriptors allocated, the valid descriptor at the moment is the one with update_time value that indicates the most recent time in the past.

31.2.2.2 SI prime TS descriptor

[Usage]

Specify if the SI prime TS is used and describe the table used for the TS.

[Structure]

Structure of SI prime TS descriptor as well as the structure of table_description_byte per table_id is listed in Table 31-111 and Table 31-112.

Table 31-111 Structure of SI prime TS descriptor

Data structure	Bits	Identifier
SI_prime_ts_descriptor () {		
descriptor_tag	**8**	**uimsbf**
descriptor_length	**8**	**uimsbf**
parameter_version	**8**	**uimsbf**
update_time	**16**	**uimsbf**
SI_prime_ts_network_id	**16**	**uimsbf**
SI_prime_transport_stream_id	**16**	**uimsbf**
for (i = 0; i< N; i++) {		

table_id	**8**	**uimsbf**
table_descriptoion_length	**8**	**uimsbf**
for (j = 0; j < table_description_length; j++) {		
table_description_byte	**8**	**uimsbf**
}		
}		
}		

Table 31-112 Structure of table_description_byte per table_id

table_id	table_description_byte	Bits	Identifier
0x42 (SDT[actual])	**table_cycle**	**8**	**bslbf**
0x46 (SDT[other])	**table_cycle**	**8**	**bslbf**
0x4E (EIT[p/f actual])	**table_cycle**	**8**	**bslbf**
0x4F (EIT[p/f other])	**table_cycle**	**8**	**bslbf**
0x50 (EIT[schedule actual])	**for(;;){**		
0x60 (EIT[schedule other])	**media_type**	**2**	**uimsbf**
	pattern	**2**	**uimsbf**
	reserved	**4**	**bslbf**
	schedule_range	**8**	**bslbf**
	base_cycle	**12**	**bslbf**
	reserved	**2**	**bslbf**
	cycle_group_count	**2**	**uimsbf**
	for(i=0;i<cycle_group_count;i++){		
	num_of_segment	**8**	**bslbf**
	cycle	**8**	**bslbf**
	}		
	}		
0xC5 (NBIT[msg])	**table_cycle**	**8**	**bslbf**
0xC6 (NBIT[ref])	**table_cycle**	**8**	**bslbf**

[Meanings of each field]

For the meaning of each field, follow the standards given in Section 6.2 of Part 1 of ARIB STD-B10, and the definitions given in Section 6.2.38 of Part 2.

[Transmission operation rule]

- ⊙ **This descriptor must be assigned per TS in the network when the SI prime TS is utilized.**
- ⊙ **Except for the critical accidents or in case of an unavoidable circumstance, the SI prime TS must not be moved.**
- ○ Change of the transmission parameter must be made at 0 o'clock sharp.
- ○ Value to be set for the transmission parameter should not exceed the preset range.
- ○ Multiple descriptors with different update_time can be allocated in the same loop. For example, in the case where valid descriptor is placed at the current moment and the parameters will be changed 3 days later, it means that the multiple descriptors will be allocated.
- ○ Tables that are not described in this descriptor will follow the rules of SI transmission parameter descriptor.

The transmission operation rules of each field are listed in Table 31-113 and Table 31-114.

Table 31-113 Transmission operational rule of SI prime TS descriptor

Transmission operation rule of each field	
descriptor_tag	Describe “0xDA”.
descriptor_length	Describe the length of SI prime TS descriptor.
parameter_version	Increment by 1 per update of a descriptor.
update_time	The date/month/year when this descriptor becomes valid needs to be described with the lowest 16-bit of MJD. In the actual SI transmission, the transmission must follow the parameter specified by this descriptor from 0 o’clock sharp of the date indicated by this field.
SI_prime_ts_network_id	For broadband CS digital broadcasting, describe the original network ID of SI prime TS to distinguish the SI prime TS network.
SI_prime_transport_stream_id	Describe the transport stream ID of SI prime TS descriptor.
[table_id loop]	
table_id	Describe this table ID to use NBIT[msg]. For the short-cycle operation in the other tables, describe the corresponding table ID.
table_description_length	Describe the loop length of table_description_byte loop that follows.
[table_description_byte]	Describe the SI transmission parameter in accordance with the format separately defined per table ID. See Table 31-26 and Table 31-28 for the details of description for each table ID.

Table 31-114 Transmission operation rule of table_description_byte

table_description_byte : Transmission operation rule of each field	
table_cycle	Describe the re-transmission cycle per table ID in the units of second.
[media_type loop]	In the all-station EIT[schedule], be sure to describe this field for the media type in which the default transmission parameter is modified. For the media type with modification, description of this field is not required.
media_type	Specify the media type in which transmission parameter is described. It targets all media types that transmit all-station EIT[schedule]. For the relationship between the value of media type and service type, see Table 9-1. Describe the same value as the all-station SI.
pattern	Describe the operation pattern of all-station EIT[schedule]. Always write 0 here regardless of the media type. Describe the same value as the all-station SI.
schedule_range	Describe the transmission range for the corresponding media type of all-station EIT[schedule] in the units of day. The same value needs to be described for actual and other. See section 12.4 for the range of values that can be described. Describe the same value as the all-station SI.
base_cycle	Describe the re-transmission cycle of the base cycle group for the corresponding media type of all-station EIT[schedule] in the units of second. See section 12.4 for the range of values that can be described.
cycle_group_count	Describe the existing number of extended cycle groups in the corresponding media type of all-station EIT[schedule]. The number of configurable groups varies depending on the media type. For the TV-based media type, up to 2 groups can be set. For the audio-based and data-based type, up to 1 group can be set if table_id=0x50. If table_id=0x60 for the audio-based and data-based type, the extended cycle group cannot be set, thus write 0. (See section 12.3.2) Describe the same value as the all-channel SI.

[cycle_group loop]	Concerning the loop, the extended cycle group of the earlier time needs to be described first. (Describe in the order of extended cycle group 1, then extended cycle group 2) Describe the same value as the all-station SI.
num_of_segment	Specify a segment range (the number of segments per service that belong to the corresponding cycle group) of the extended cycle group to be described in the corresponding loop. See section 12.4 for the range of values that can be described. Describe the same value as the all-channel SI.
cycle	Specify the re-transmission cycle of extended cycle group to be described in the corresponding loop in the units of second. Do not assign a larger value than that of the re-transmission cycle of base cycle group defined by base_cycle field. See section 12.4 for the range of values that can be described.

[Receiving process standards]

- ○ The operational state of SI prime TS and tables utilized in the corresponding TS can be determined.
- ○ The contents stated by this descriptor becomes valid from 0 hour 0 minute of the time specified by the update_time field.
- ○ Even when this descriptor exists in the first descriptor loop of BIT, if there is no valid descriptor at the moment (to be determined by update_time field in the descriptor), the operation follows the rule of all-station SI transmission parameter descriptor (at the moment).
- ○ If a description of table id does not exist in the corresponding descriptor, the identification of corresponding table will follow the rule of SI transmission parameter descriptor.
- ○ If there are multiple SI prime TS descriptors allocated, the valid descriptor at the moment is the one with update_time value that indicates the most recent time in the past.

The receiving process standards of each field are given in Table 31-115 and Table 31-116.

Table 31-115　Receiving process standards of SI prime TS descriptor

Receiving process standard of each field	
descriptor_tag	If the value is “0xDA”, the corresponding descriptor is determined as SI prime TS descriptor.
descriptor_length	Indicates the length of SI prime TS descriptor.
parameter_version	This field can be used for the updated number of SI prime TS descriptor.
update_time	This field is used for the date/month/year of the transmission parameter of the corresponding descriptor to be validated. The change of actual transmission parameter becomes valid at 0 hour 0 minute 0 second of the corresponding date. Since it is encoded at the lowest 16 bits of MJD, follow the description of TOT for how to handle a case such as year 2038.
SI_prime_ts_network_id	Indicates the network ID of SI prime TS.
SI_prime_transport_stream_id	Indicates the transport stream ID of SI prime TS.
[table_id loop]	

table_id	It indicates a table ID to be described in the corresponding loop. If NBIT[msg] is described, it indicates that NBIT[msg] is utilized. For the other table, it indicates that the short-cycle operation is utilized.
table_description_length	Indicates the loop length of table_description_byte loop that follows.
[table_description_byte]	

Table 31-116 Receiving process standards of table_description_byte

table_description_byte : Receiving process standards of each field	
table_cycle	The re-transmission cycle of corresponding table type is described in the units of second. To receive the corresponding table type after the date specified by update_time field of the corresponding descriptor, you might want to perform the receive processing based on the value described in this field. See section 12.4 for the range of values that can be described. If a value falls outside of this range, it indicates an abnormal state.
[media_type loop]	The media type that does not exist in the corresponding loop is determined to be operated by the transmission parameter specified as default. In case there is a media type that is not supported by the own receiver, it should be implemented as skipping the loop itself in order to avoid malfunction. For more information on default transmission parameter, see section 12.4.
media_type	It indicates a media type to be described in the corresponding loop. For the relationship between the value of media type and service type, see Table 9-1.
pattern	This field must not be referenced.
schedule_range	The transmission range for the corresponding media type of all-station EIT[schedule] is described in the units of day. See section 12.4 for the range of values that can be described. If a value falls outside of this range, it indicates an abnormal state.
base_cycle	The re-transmission cycle of the base cycle group for the corresponding media type of all-station EIT[schedule] is described in the units of second. Note that the latest value in the entire cycle group of corresponding media type is set for the re-transmission cycle of base cycle group, thus the value set in this field can be used for the time-out setting for the table reception of corresponding media type. See section 12.4 for the range of values that can be described. If a value falls outside of this range, it indicates an abnormal state.
cycle_group_count	The number of extended cycle group for the corresponding media type of all-station EIT[schedule] is described. The value is same as the number of loops that follows. The value of this field has been determined per table type/media type. See section 12.3.2. In other words, the value of this field is up to 2 for the TV-based type and up to 1 for the audio or data-based type regardless of the table type. If a value described does not correspond with this value, it indicates an abnormal state.
[cycle_group loop]	The corresponding loop count is the same value as cycle_group_count field.

num_of_segment	The number of segments per service is described as a segment range of the extended cycle group to be described in the corresponding loop. Since the cycle group of earlier time is described first in this loop, the start segment of this cycle group can be determined by the total value of num_of_segment field in the preceding loops. Note that the start segment of the first cycle group in the loop is considered as the segment that includes the current time. See section 12.4 for the range of values that can be described. If a value falls outside of this range, it indicates an abnormal state.
cycle	The re-transmission cycle of extended cycle group to be described in the corresponding loop is specified in the units of second. See section 12.4 for the range of values that can be described. If a value falls outside of this range, it indicates an abnormal state.

[Other notes and comments]

None

31.2.3 Descriptors to be inserted at the second loop of BIT (broadcaster loop)

31.2.3.1 Broadcaster name descriptor

Same as Part 1.

31.2.3.2 Service list descriptor

Same as Part 1.

31.2.3.3 SI transmission parameter descriptor

Same as Part 1, except for the items and tables described below.

Table 31-42 Structure of table_description_byte per table_id (the second loop of BIT)

table_id	table_description_byte	Bits	Identifier
0x50 (Each-station EIT[schedule basic) **0x58 (Each-station EIT[schedule extended)**	**for(;;){** **media_type** **pattern** **EIT_other_flag** **reserved** **schedule_range** **base_cycle** **reserved** **cycle_group_count** **for(i=0;i<cycle_group_count;i++){** **num_of_segment** **cycle** **}** **}**	 **2** **2** **1** **3** **8** **12** **2** **2** **8** **8**	 **uimsbf** **uimsbf** **uimsbf** **bslbf** **bslbf** **bslbf** **bslbf** **uimsbf** **bslbf** **bslbf**
0xC7(LDT)	**table_cycle**	**16**	**bslbf**

Table 31-44 Meanings of each field in table_description_byte (the second loop of BIT)

Field	Meaning
table_cycle	Describe the re-transmission cycle of table ID in the units of second.
media_type	This 2-bit field indicates the media type to be described in the corresponding loop.
Pattern	This 2-bit field indicates the operational pattern of corresponding table type/media type.
EIT_other_flag	This 1-bit field indicates if each-station EIT[other] is being transmitted when the corresponding media_type service group in the broadcaster is across the multiple TS. If '0' is set, it indicates that each-station EIT[other] is not being transmitted. If '1' is set, it indicates that each-station EIT[other] is being transmitted. Note that the value of this field corresponds with the description of "0x58" as table_id value (EIT[schedule extended]); it also indicates if there is an addition of each-station SI descriptor in EIT[p/f other].
schedule_range	This 8-bit field indicates a transmission range of each-station EIT[schedule]. It is encoded by the 2 digit of BCD and is in the units of day.
base_cycle	This 12-bit field indicates a re-transmission cycle in the base cycle group of each-station EIT[schedule]. It is encoded by the 3 digit of BCD and is in the units of second.
cycle_group_count	This 2-bit field indicates the number of extended cycle group.
num_of_segment	This 8-bit field indicates a segment range (the number of segments per service) in the extended cycle group of each-station EIT[schedule]. It is encoded by the 2 digit of BCD and is in the units of segments.
cycle	This 8-bit field indicates a re-transmission cycle in the extended cycle group of each-station EIT[schedule]. It is encoded by the 2 digit of BCD and is in the units of second.

Table 31-46 Transmission operation rule of table_description_byte (the second loop of BIT)

table_description_byte : Transmission operation rule of each field	
table_cycle	The re-transmission cycle of corresponding table type is described in the units of second. To receive the corresponding table type after the date specified by update_time field of the corresponding descriptor, you might want to perform the receive processing based on the value described in this field. See section 12.4 for the range of values that can be described. If a value falls outside of this range, it indicates an abnormal state.
[media_type loop]	Be sure to describe this field for the media type operated under the corresponding table type of each-station EIT[schedule].
media_type	Specify the media type in which transmission parameter is described. For the relationship between the value of media type and service type, see Table 9-1.
pattern	If table_id = 0x50, describe the operation patter that corresponds to the each-station EIT[schedule basic]. If table_id=0x58, describe the corresponding operation pattern for EIT[schedule extended]. See Table 31-47 for the value to be described. This field is used by the receiver side only as a reference and does not have to be followed strictly.

EIT_other_flag	When the service group of corresponding media_type in the broadcaster is across the multiple TS, set '1' if each-station EIT[other] is transmitted; set '0' otherwise. In addition, concerning the value of the field that corresponds to the description of table_id value as "0x58" (EIT[schedule extended]), do not insert each-station SI descriptor in the EIT[p/f other] if EIT[schedule other extended] will not be transmitted since it also indicates if there is an addition of each-station SI descriptor in EIT[p/f other]. If the service group of corresponding media_type in the broadcaster is not across the multiple TS, set '0' to this field.
schedule_range	Describe the transmission range for the corresponding media type of each-station EIT[schedule] in the units of day. The operation case for each-station EIT[schedule] has been determined in advance and the value to be set in this field will be determined based on the media type or operation case. If table_id = 0x50, describe either 15, 22, or 32 for the TV-based type. describe either 8, 15, 22, or 32 for the audio-based or data-based type. If table_id = 0x58, describe the same value as the description range (field value of schedule_range) of all-station EIT[schedule] or description range (field value of schedule_range as table_id = 0x50) of each-station EIT[schedule basic]. See section 13.2.2.1 for details.
base_cycle	Describe the re-transmission cycle of the base cycle group for the corresponding table type/media type of each-station EIT[schedule] in the units of second. The configurable re-transmission cycles are set per table type/media type. See section 12.4.
cycle_group_count	Describe the existing number of extended cycle groups in the corresponding table type/media type of each-station EIT[schedule]. If the corresponding table type/media type is included in the base cycle group, write 0. If table_id=0x50, always write 0 to this field. If table_id=0x58, the maximum value that can be set to this field is 1. For details, see section 12.3.3 and 13.2.
[cycle_group loop]	Concerning the loop, a cycle group of the earlier time needs to be described first.
num_of_segment	Specify a segment range (the number of segments per service that belong to the corresponding cycle group) of the cycle group to be described in the corresponding loop.
cycle	Specify the re-transmission cycle of cycle group to be described in the corresponding loop in the units of second. Do not assign a larger value than that of the re-transmission cycle of base cycle group defined by base_cycle field.

31.3 SDT (Service Description Table)

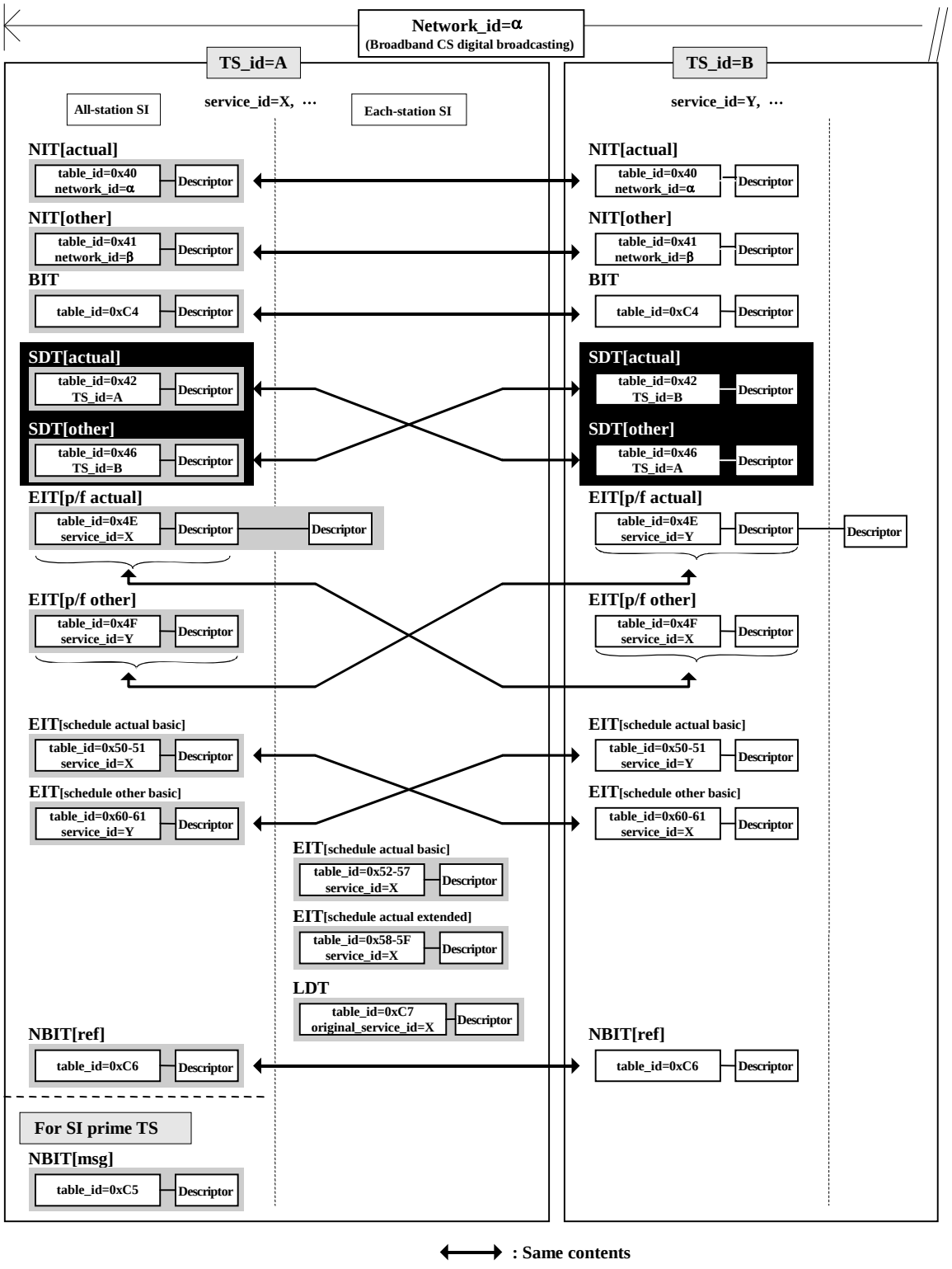


Figure 31-3 The part explained in Section 31.3 (SDT all stations shown on colored background)

31.3.1 Structure and operations of SDT

Same as Part 1, except for the items and tables described below.

[Receiving process standards]

- When the contents of SDTs for the same TS are different between 'actual' and 'other', that of actual will take precedence. However, it is only the time lag period at the contents update time when the contents of actual and other are different; under normal conditions, the contents of actual and other will never be different.
- In normal operations, 'other' sub-table's version_numbers for the same TS at the transmission time will be the same for all TSs.

31.3.2 Descriptors to be inserted into SDT (service loop)

Same as Part 1.

31.3.2.1 Service descriptors

Same as Part 1.

31.3.2.2 Digital copy control descriptors

[Usage]

Allocate these descriptors to specify digital copy and analog copy control information or to describe the maximum transmission rate for the overall services applicable.

[Structure]

The structures of digital copy control descriptors are shown in Table 31-57.

Table 31-5 Structure of digital copy control descriptor

Data structure	Bits	Identifier
digital_copy_control_descriptor() {		
descriptor_tag	**8**	**uimsbf**
descriptor_length	**8**	**uimsbf**
digital_recording_control_data	**2**	**bslbf**
maximum_bit_rate_flag	**1**	**bslbf**
component_control_flag	**1**	**bslbf**
copy_control_type	**2**	**bslbf**
if(copy_control_type==01||copy_control_type==11)){		
APS_control_data	**2**	**bslbf**
}		
else{	**2**	**bslbf**
reserved_future_use		
}		

if(maximum_bit_rate_flag == 1){		
maximum_bit_rate	**8**	**uimsbf**
}		
if(component_control_flag ==1){		
component_control_length	**8**	**uimsbf**
for(j=0;j<N;j++){		
component_tag	**8**	**uimsbf**
digital_recording_control_data	**2**	**bslbf**
maximum_bitrate_flag	**1**	**bslbf**
reserved_future_use	**1**	**bslbf**
copy_control_type	**2**	**bslbf**
if(copy_control_type==01||copy_control_type==11) {		
APS_control_data	**2**	**bslbf**
}		
else{		
reserved_future_use	**2**	**bslbf**
}		
if(maximum_bitrate_flag=1){		
maximum_bitrate	**8**	**uimsbf**
}		
}		
}		
}		

[Meanings of each field]

For the meanings of each field, follow the standards in Section 6.2 of Part 1 of ARIB STD-B10, and the definitions given in Section 6.2.23 of Part 2 and in Appendix F.

[Transmission operation rules]

⊙ **This descriptor must always be set if this service is intended to use digital copy control and analog copy control, or the maximum transmission rate for this service falls outside the range of default maximum bit rate described in table 21-1-1 and 21-1-2. However the components in which digital copy control and analog copy control information can be written are the ones which take the value 0X40 to 0X7F as the component tag.**

The transmission operation rules of each field are defined in Table 31-58.

Table 31-58 Transmission operation rules of digital copy control descriptor (SDT)

Transmission operation rules of each field	
descriptor_tag	Describe “0xC1”.
descriptor_length	Describe the length of digital copy control descriptor.
digital_recording_control_data	This 2-bit field contains the information which controls the copy generations, and is coded according to Table X3-Y1, X3-Y2 and X3-Y3. Be sure to specify the same value as the one for overall operation when component_control_flag =1 and it is supposed to be specified for each component, and when component_tag falls outside the range of 0x40 to 0x7F.

maximum_bit_rate_flag	Write “0” not to specify the maximum transmission rate of the service. Write “1” to specify the maximum transmission rate of the corresponding service.
component_control_flag	If ‘1’, the fields after the component control length will be enabled and the digital copy control information will be specified for each component. If ‘0’, the digital copy control information will be specified for the entire program, and the fields after the component control length will not be written.
copy_control_type	This 2 bit field contains the information for formats controlling the copy generations and is coded according to Table X3-Y1, X3-Y2 and X3-Y3. Be sure to specify the same value as the one for overall operation when component_control_flag =1 and it is supposed to be specified for each component, and when component_tag falls outside the range of 0x40 to 0x7F.
APS_control_data	Analog output copy control information. This 2 bit field contains the information for controlling the copy of analog output when the copy_control_type are '01’ and ’11’ and is coded according to Table X3-Y1, X3-Y2 and X3-Y3. Be sure to specify the same value as the one for overall operation when component_control_flag =1 and it is supposed to be specified for each component, and when component_tag falls outside the range of 0x40 to 0x7F.
maximum_bit_rate	Describe the maximum transmission rate.

In addition, details of each bit are described below.

Note that, depending on the service contents, the specification of controlling each output pin varies with the use of digital copy control descriptor.

[Operational notes (applicable to all services)]

Do not perform transmission operation with combinations rather than those described Table X3-Y1, X3-Y2 and X3-Y3.

For CGMS-A, when copy_control_type is set to ”01” or ”11”, digital_recording_control_data and APS_control_data will be copied to the areas specified by CGMS-A.

If this descriptor contains the copy control information, analog video output, high-speed digital interface output, and digital audio will be output after the appropriate copyright processing being applied in the receive processing. CGMS-A and MACROVISION are applied to the analog video output, 5CDTCP is applied to the high-speed digital interface output, and SCMS is applied to the digital audio output respectively. For details of processing, see applicable specifications and standards.

When multiple services is transmitted from high-speed digital interface, the relationship in specifying copy control (including output control) among each service will be considered as follows.

- Stream output that includes output prohibited and output disabled services will be prohibited.
- Output stream with mixed services of copy_control_type=01 and copy_control_type=11 will be prohibited. However, output is enabled when a Copy Free service exists.
- Copy control is considered more strict in the order of prohibited (Copy Prohibited), permitted only one generation (Copy Once), and permitted without constraints (Copy Free).

It is necessary to reflect the accurate information on the category code as well as the copyright display bit of the channel status specified by IEC 60958.

In this case, if a digital copy control descriptor is assigned, the category code is “001_0000L.”

Copy permitted without constraint condition: Set the copyright information bit to 1.

Only the first generation copy permitted: Set the copyright information bit to 1, and set the L bit of category code to 0.

Copy prohibited: Set the copyright information bit to 0, and set the L bit of category code to 1.

Note that, if no descriptor is assigned, it will be treated as copy free.

Table X3-Y1　Operations of descriptors for TV-based media type services

<table>
<tr><th rowspan="2">Digital copy control</th><th rowspan="2">Analog copy control *3</th><th colspan="3">Operation of each descriptor</th></tr>
<tr><th>copy_control_type</th><th>digital_recording_control_data</th><th>APS_control_data</th></tr>
<tr><td>Copy permitted without constraint condition</td><td>Copy permitted without constraint condition</td><td rowspan="4">01</td><td>00</td><td>Not Applicable</td></tr>
<tr><td rowspan="2">Copy prohibited *1</td><td>Copy prohibited, but no Macrovision protection added.
Therefore, copy is permitted only for the conventional analog input and analog recording devices.</td><td rowspan="2">11</td><td>00</td></tr>
<tr><td>Copy prohibited *4</td><td>Other than 00</td></tr>
<tr><td rowspan="2">Only one-generation copy permitted *2</td><td>Only one-generation copy is permitted, but no Macrovision protection added. Therefore, the copy is permitted for the conventional analog recording devices.</td><td rowspan="2">10</td><td>00</td></tr>
<tr><td>Copy prohibited after one-generation copy *4</td><td>Other than 00</td></tr>
</table>

★ *1: For a high-speed digital interface output, execute the “copy never” process of “source function" defined in 5CDTCP. However, if only the audio stream is output in the IEC60958 conformant format, the “no more copies” process is executed.

*2: The “copy one generation” process of “source function” defined in 5CDTCP is executed for the high-speed digital interface output.

*3: Applicable to the composite and component video output. It also applies to the case where the received video signal is output after converting its format. The Macrovision control applies to the 480I composite and component video signals.

*4: On the analog video output, the output is processed with the parameters specified by Macrovision Corp. and APS_control_data specified.

[Operational notes (TV-based media type services)]

If the service_type written in the service list descriptor of NIT is "0x01" (digital TV broadcasting service), "0xA1" (provisional video service), or "0xA5" (promotion video service), it must be coded based on the rules of Table X3-Y1.

Table X3-Y2 Operations of descriptors for audio-based media type services

<table>
<tr><th rowspan="2">Digital copy control</th><th rowspan="2">Analog copy control *4</th><th colspan="3">Operation of each descriptor</th></tr>
<tr><th>copy_control_type</th><th>digital_recording_control_data</th><th>APS_control_data</th></tr>
<tr><td>Copy permitted without constraint condition, however, note that output as MPEG_TS is currently unavailable. *1</td><td rowspan="2">Copy permitted without constraint condition</td><td>01</td><td rowspan="2">00</td><td rowspan="2">Not Applicable</td></tr>
<tr><td>Copy permitted without constraint condition</td><td>11</td></tr>
<tr><td rowspan="2">Copy prohibited. *2 Note that output as MPEG_TS is currently unavailable. *1</td><td>Copy prohibited, but no Macrovision protection added. Therefore, copy is permitted only for the conventional analog input and analog recording devices.</td><td rowspan="2">01</td><td rowspan="4">11</td><td>00</td></tr>
<tr><td>Copy prohibited *5</td><td>Other than 00</td></tr>
<tr><td rowspan="2">Copy prohibited. Note that output as MPEG_TS is prohibited.</td><td>Copy prohibited, but no Macrovision protection added. Therefore, copy is permitted only for the conventional analog input and analog recording devices.</td><td rowspan="2">11</td><td>00</td></tr>
<tr><td>Copy prohibited *5</td><td>Other than 00</td></tr>
</table>

Only one-generation copy permitted. *3 Note that output as MPEG_TS is currently unavailable. *1	Only one-generation copy is permitted, but no Macrovision protection added. Therefore, the copy is permitted for the conventional analog recording devices.	01	10	00
	Copy prohibited after one-generation copy is made *5			Other than 00
Only one-generation copy permitted. Note that output as MPEG_TS is prohibited.	Only one-generation copy is permitted, but no Macrovision protection added. Therefore, the copy is permitted for the conventional analog recording devices.	11		00
	Copy prohibited after one-generation copy is made *5			Other than 00

*1: The decision by the 5C will be followed.

*2: The “no more copies” process of the “AM824 audio source function” defined in 5CDTCP is executed for the high-speed digital interface output.

*3: The “copy one generation” process of the “AM824 audio source function” defined in 5CDTCP is executed for the high-speed digital interface output.

*4: Applicable to the composite and component video output. It also applies to the case where the received video signal is output after converting its format. The Macrovision control applies to the 480I composite and component video signals.

*5: On the analog video output, the output is processed with the parameters specified by Macrovision Corp. and APS_control_data specified.

[Operational notes (Audio-based media type services)]

If the service_type written in the service list descriptor of NIT is "0x02" (digital audio service), "0xA2" (provisional audio service), or "0xA6" (promotion audio service), it must be coded based on the rules of Table X3-Y2.

Table X3-Y3 Operations of descriptors for data-based media type services

Digital copy control	**Analog copy control *3**	**Operation of each descriptor**		
		copy_control_type	**digital_recording_control_data**	**APS_control_data**
Copy permitted without constraint condition	Copy permitted without constraint condition	01/11	00	Not Applicable
Copy prohibited *1	Copy prohibited, but no Macrovision protection added. Therefore, copy is permitted only for the conventional analog input and analog recording devices.	01	11	00
	Copy prohibited *4			Other than 00
Copy prohibited. Note that output as MPEG_TS is prohibited.	Copy prohibited, but no Macrovision protection added. Therefore, copy is permitted only for the conventional analog input and analog recording devices.	11		00
	Copy prohibited *4			Other than 00
Only one-generation copy permitted. *2	Only one-generation copy is permitted, but no Macrovision protection added. Therefore, the copy is permitted for the conventional analog recording devices.	01	10	00
	Copy prohibited after one-generation copy is made *4			Other than 00
Only one-generation copy permitted. Note that output as MPEG_TS is prohibited.	Only one-generation copy is permitted, but no Macrovision protection added. Therefore, the copy is permitted for the conventional analog recording devices.	11		00
	Copy prohibited after one-generation copy is made *4			Other than 00

★ *1: For a high-speed digital interface output, execute the “copy never” process of “source function" defined in 5CDTCP. However, when exclusively outputting the audio stream in the IEC60958 conformant format, execute the “no more copies” processing.

*2: To output the high-speed digital interface, execute the “copy one generation” processing of “source function" defined in 5CDTCP.

*3: Applicable to the composite and component video output. It also applies to the case where the received video signal is output after converting its format. The Macrovision control applies to the 480I composite and component video signals.

*4: In outputting analog video signals, the output is executed with the parameters specified by Macrovision Corp. using the information assigned at APS_control_data.

[Operational notes (Data-based media type services)]

If the service_type written in the service list descriptor of NIT is "0xC0" (data service), "0xA3" (provisional data service), "0xA7" (promotion data service), "0xA8" (preliminary accumulation data service), "0xA9" (accumulation only data service), or "0xAA" (bookmark list data service), it must be coded based on the rules of Table X3-Y3.

[Receive processing standards]

The receiving process standards of each field are listed in Table 31-61.

Table 31-61 Receiving process standards of digital copy control descriptor (SDT)

Receiving process standards of each field	
descriptor_tag	= "0xC1": Indicates that this descriptor is the digital copy control descriptor.
descriptor_length	Indicates the length of digital copy control descriptor.
digital_recording_control_data	This 2-bit field contains the information which controls the copy generations, and is decoded based on Table X3-Y1, X3-Y2, and X3-Y3. If the component_tag value is outside of 0x40 to 0x7F, the absence of component description is determined even when the component_control_flag is "1" and the component description exists.
maximum_bit_rate_flag	='0': Indicates that the maximum transmission rate of the concerned service is within the range of default maximum bit rate defined in Table 21-1-2 and Table 21-1-2. ='1': Indicates that the maximum transmission rate of the concerned service is described in what follows.
component_control_flag	='0' : Indicate that there is no description for each component. ='1' : Indicate that there is a description for each component.
copy_control_type	This 2 bit field contains the information for controlling the copy generations and is decoded based on Table X3-Y1, X3-Y2 and X3-Y3. If the component_tag value is outside of 0x40 to 0x7F, the absence of component description is determined even when the component_control_flag is "1" and the component description exists.
maximum_bit_rate	The maximum transmission rate of this service is determined.

[Other notes and comments]

The careful study for copy control of analog output signals is necessary to continue in the future as it is pursuant to the separate contract between the pertinent broadcaster and Macrovision Corporation or others.

The receiving process not defined in Tables X3-Y1, X3-Y2, and X3-Y3 is defined below.

☐ TV-based media type services

If copy_control_type=00/10/11

- An output from the analog video output, digital audio output, and high-speed digital interface output ports is prohibited.

If copy_control_type=01, and digital_recording_control_data=01

- The same process is executed as if copy_control_type=01 and digital_recording_control_data=11.

☐ Audio and data-based media type services

If copy_control_type=00/10

- An output from the analog video output, digital audio output, and high-speed digital interface output ports is prohibited.

If copy_control_type=01, and digital_recording_control_data=01

- Only for the EMI of high-speed digital interface, execute the processing for “01.” Other processing will follow the same procedure as the case where copy_control_type=01, and digital_recording_control_data =11.

If copy_control_type=01, and digital_recording_control_data=01

- The same process is executed as if copy_control_type is “11” and digital_recording_control_data is “11”.

31.3.2.3 CA contract information descriptor

Same as Part 1.

31.3.2.4 Linkage descriptor

[Usage]

Indicate the link destination toward a CA alternative service.

[Structure]

The structure of linkage descriptors is shown in Table 31-117.

Table 31-117 Structure of linkage descriptor

Data structure	Bits	Identifier
LDT_linkage_descriptor () {		
descriptor_tag	**8**	**uimsbf**
descriptor_length	**8**	**uimsbf**
transport_stream_id	**16**	**uimsbf**
original_network_id	**16**	**uimsbf**
service_id	**16**	**uimsbf**
linkage_type	**8**	**uimsbf**
for (i = 0;i< N;i++) {		
private_data_byte	**8**	**bslbf**
}		
}		

[Meanings of each field]

For the meaning of each field, follow the standards given in Section 6.2 of Part 1 of ARIB STD-B10, and the definitions given in Section 6.2.8 of Part 2.

[Transmission operation rules]

⊙ **Only one descriptor can be set for one service.**

The transmission operation rules of each field are defined in Table 31-118.

Table 31-118 Transmission operation rules of linkage descriptor

Transmission operation rules of each field	
descriptor_tag	Describe “0x4A”.
descriptor_length	Write the length of linkage descriptor.
transport_stream_id	Write the transport stream ID including the link destination service.
original_network_id	Write the network ID in which the link destination service is being transmitted.
service_id	Write the link destination service ID.
linkage_type	Write “0x03” (CA alternative service).
[private_data_byte]	When specifying massages, write the massage number on the first byte. The massage number should be unique within all networks of broadband CS digital broadcasting, and the range is from 1 to 20 (0x01 to 0x14). The massage body starts from the second byte, and is within 160 byte long (full-width 80 characters). When specifying the same massage number within a sub-table, the massage body can be omitted. However, the first massage body with same massage number being posted cannot be omitted.

[Receiving process standards]

The receiving process standards of each field are given in Table 31-119.

Table 31-119 Receiving process standards of linkage descriptors

Receiving process standards of each field	
descriptor_tag	If “0x4A”, it is determined to be the linkage descriptor.
descriptor_length	The length of linkage descriptor is determined.
transport_stream_id	Considered as the transport stream ID containing the link destination service.
original_network_id	Considered as the network ID the link destination service being transmitted.
service_id	Considered as the service ID of the link destination.
linkage_type	If ”0x03”, considered as a CA alternative service. If not ”0x03”, considered as invalid.
[private_data_byte]	Can be considered the first byte as the massage number and the second byte or later as the massage body. When the massage body exceeds 160 bytes (full-width 80 characters) length, the massage after the 160 bytes will be taken as invalid. In addition, when the massage number is the same, the massage body can be considered as identical. When the message content corresponding to the massage number does not exist within the sub-table , it can be treated as if the area itself didn't exist. See Part 2, Volume 5, Section 4.22.2 for the exception handlings.

[Other notes and comments]

None

31.4 EIT (Event Information Table)

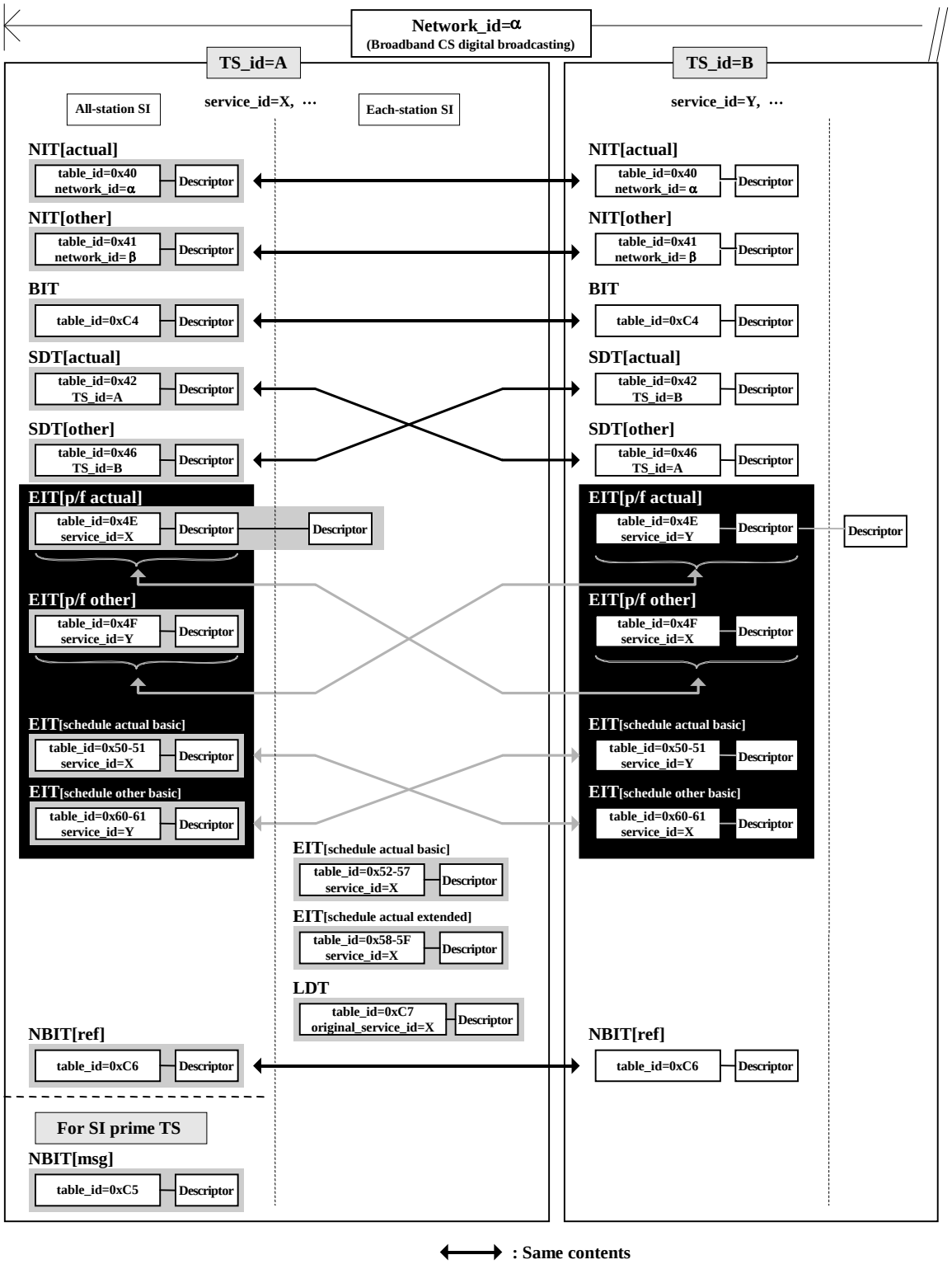


Figure 31-4 The part explained in Section 31.4 (EIT all stations shown on colored background)

31.4.1 Structure of EIT

Same as Part 1 except that the transmission operation rules of "last_section_number" field of Table 31-67 have been changed to: "Write the maximum section number. It is fixed to 0x01 for the "present/following". Write the last section number of the last segment of sub table for the "schedule"."

31.4.2 Descriptors inserted into event loop (EIT)

The descriptors to be placed in an event loop of EIT (all-station SI) are listed in Table 31-69.

Table 31-69 Descriptors placed in an event loop of EIT (all-station SI)

Tag value	Descriptor	EIT[p/f]	EIT[schedule basic]
0x4D	Short event descriptor	⊙	⊙
0x4E	Extended event descriptor	×*1	×
0x50	Component descriptor	⊙*2	⊙*2
0x54	Content descriptor	○	○
0x55	Parental rate descriptor	○	○
0xC1	Digital copy control descriptor	○	○
0xC4	Audio component descriptor	⊙*3	⊙*3
0xC5	Hyperlink descriptor	×*1	×
0xC7	Data contents descriptor	○	○
0xCB	CA contract info descriptor	○	○
0xD6	Event group descriptor	○	○*4
0xD9	Component group descriptor	○	○
0xD5	Series descriptor	○	○
0xDC	LDT linkage descriptor	×	○
0x42	Staff descriptor	○	○

⊙: Must be entered in the table.

○: May or may not be entered in the table.

×: Must not be entered in the table.

*1: Not placed as the all-station SI, but can be added to the EIT[p/f] as each-station SI.

*2: At least one descriptor is required for the digital TV broadcasting service.

*3: At least one descriptor is required for the digital TV broadcasting service and digital-broadcasting audio service.

*4: If the event_group descriptor specifying the “Share event” group_type is entered on the EIT[schedule basic] and if the “Source reference” is set for another service_id, all descriptors can be omitted except for the event group descriptor. See Chapter 17 “Event Sharing.”

31.4.2.1 Short event descriptor

Same as Part 1.

31.4.2.2 Component descriptor

Same as Part 1.

31.4.2.3 Audio component descriptor

Same as Part 1.

31.4.2.4 Data contents descriptor

Same as Part 1.

31.4.2.5 Content descriptor

Same as Part 1 except for the following table items.

Table 31-84 Transmission operation rules of content descriptor

Transmission operation rules of each field	
descriptor_tag	Write “0x54”.
descriptor_length	Write the content descriptor length. The maximum loop count is 7 (3 for content_nibble setting; 4 for user_nibble setting). Therefore, the maximum descriptor length is 14 bytes.
[loop]	
content_nibble_level_1	Write the major program category. Specify “0xE” to show the program property.
content_nibble_level_2	Write the intermediate program category. If content_nibble_level1 is “0xE”, write the type of program property code table (see Appendix A).
user_nibble	Write the program property only when content_nibble_level1 is “0xE”. Write “0xFF” for others. If content_nibble=“0xE0” (auxiliary program information for BS/broadband CS digital broadcasting) is specified, it must be written by following the rules given in Appendix B. If content_nibble=“0xE1” (the extended information for broadband CS digital broadcasting) is specified, it must be written by following the rules given in Appendix A.

Table 31-85 Receiving process standards of content descriptor

Receive processing standards of each field	
descriptor_tag	If “0x54”, it is determined to be the content descriptor.
descriptor_length	The end of data written in this descriptor can be determined. - If 14 bytes or less, the description is valid. - If more than 14 bytes, the excess description may be ignored.
[loop]	

content_nibble_level_1	The major program category is determined, and both the major and intermediate program categories can be used for search, display and others. However, if it is “0xE”, the program category is not determined (and program property is determined to be set by the subsequent user_nibble).
content_nibble_level_2	The intermediate program category is determined, and both the major and intermediate program categories can be used for search, display and others. If content_nibble_level1 is “0xE”, it is assumed to be the type of program property code table (see Appendix A).
user_nibble	The program property is determined only if content_nibble_level1 is “0xE”. If content_nibble is “0xE0”, it is considered to be the auxiliary program information of BS and broadband CS digital broadcasting. For the auxiliary program information, see Appendix B. If content_nibble is “0xE1”, it is determined to be the extended information for broadband CS digital broadcasting. For the extended information, see Appendix A. If content_nibble_level1 is not equal to “0xE”, it is always ignored. If content_nibble_level2 (the type of program property code table) is downloaded and added in future for the content_nibble_level1=“0xE” (for program property setting), the program property is determined based on the added program property code table.

31.4.2.5.1 Operation details of content descriptor

Same as Part 1 except for the following items.

- In the initial phase of broadband CS digital broadcasting, only the auxiliary program information for BS/broadband CS digital broadcasting and the extended information for broadband CS digital broadcasting can be specified in the user_nibble (see Appendix B). In this case, content_nibble must be “0xE0” or “0xE1”.
- A completely different program property code table may be added to user_nibble. In such case, however, the “0xEX” (where, X is 2 to F) category will be added to content_nibble in order to identify the type of this code table. Therefore, only “0xE” is allowed for content_nibble_level1 and ”0x0” or ”0x1” for content_nibble_level2 in the initial stage of broadband CS digital broadcasting. Any other value must not be set (it is ignored by the receivers). However, another value may be added in future by downloading or others.

31.4.2.6 Digital copy control descriptor

[Usage]

Use this descriptor to provide the digital copy or analog copy control information for the specific event or to write the maximum transmission rate during program reservation.

[Structure]

The structure of digital copy control descriptor is shown in Table 31-86.

Table 31-86 Structure of digital copy control descriptor

Data structure	Bits	Identifiers
digital_copy_control_descriptor() {		
descriptor_tag	**8**	**uimsbf**
descriptor_length	**8**	**uimsbf**
digital_recording_control_data	**2**	**bslbf**
maximum_bit_rate_flag	**1**	**bslbf**
component_control_flag	**1**	**bslbf**
copy_control_type	**2**	**bslbf**
if(copy_control_type==01|| copy_control_type==11)){		
APS_control_data	**2**	**bslbf**
}		
else {	**2**	**bslbf**
reserved_future_use		
}		
if(maximum_bit_rate_flag == 1){		
maximum_bit_rate	**8**	**uimsbf**
}		
if(component_control_flag ==1){		
component_control_length	**8**	**uimsbf**
for(j=0;j<N;j++){		
component_tag	**8**	**uimsbf**
digital_recording_control_data	**2**	**bslbf**
maximum_bitrate_flag	**1**	**bslbf**
reserved_future_use	**1**	**bslbf**
copy_control_type	**2**	**bslbf**
if(copy_control_type==01||copy_control_type==11) {		
APS_control_data	**2**	**bslbf**
}		
else{		
reserved_future_use	**2**	**bslbf**
}		
if(maximum_bitrate_flag=1){		
maximum_bitrate	**8**	**uimsbf**
}		
}		
}		
}		

[Meanings of each field]

For the meanings of each field, comply with the rules in ARIB STD-B10 part 1, section 6.2, and the definitions in part 2, section 6.2.23 and that in Appendix F.

[Transmission operation rules]

⊙ **This descriptor must always be set if the pertinent event falls under the digital copy control or analog copy control of different service during program reservation, and if such event or ES maximum transmission rate does not meet the default maximum bit rate given in Tables 21-1-1 and 21-1-2. However, the digital copy control information or analog copy control information that differs from the current service can be written only in the component having a component tag**

value of 0x40 to 0x7F.

The transmission operation rules of each field are defined in Table 31-87.

Table 31-87 Transmission operation rules of digital copy control descriptor (EIT)

Transmission operation rules of each field	
descriptor_tag	Write “0xC1”.
descriptor_length	Write the length of digital copy control descriptor.
digital_recording_control_data	This 2-bit field contains the information for controlling the copy generations and coded according to Tables X4-Y1, X4-Y2 and X4-Y3. Be sure to specify the same value as the one for overall operation if component_control_flag=1 and suppose to be specified for each component, and if component_tag is outside of 0x40 to 0x7F.
maximum_bit_rate_flag	- Write “0” not to specify the maximum transmission rate of the service. - Write “1” to specify the maximum transmission rate of the service.
component_control_flag	If “1” is set, the fields after the component control length are made valid and the digital copy control information is defined for each program component. If “0” is set, the digital copy control information is defined for the entire program. The subsequent fields after the component control length do not exist.
copy_control_type	This 2-bit field contains the information for controlling the copy generations and coded according to Tables X4-Y1, X4-Y2 and X4-Y3. Be sure to specify the same value as the one for overall operation if component_control_flag=1 and suppose to be specified for each component, and if component_tag is outside of 0x40 to 0x7F.
APS_control_data	This is the analog output copy control information. This 2-bit field contains the information for controlling the analog output copy if copy_control_type is “01” or “11”, and this is coded according to Tables X4-Y1, X4-Y2 and X4-Y3. Be sure to specify the same value as the one for overall operation if component_control_flag=1 and suppose to be specified for each component, and if component_tag is outside of 0x40 to 0x7F.
maximum_bit_rate	Specify the maximum transmission rate.

In addition, details of each bit are described below.

Note that, depending on the service contents, the specification of controlling each output pin varies with the use of digital copy control descriptor.

[Operational notes (applicable to all services)]

The transmission operations in a combination not defined on Tables X4-Y1, X4-Y2 and X4-Y3 are not allowed.

In reference to CGMS-A, if copy_control_type is "01" or "11", the digital_recording_control_data and APS_control_data are copied to the area specified by CGMS-A.

If this descriptor contains the copy control information, analog video output, high-speed digital interface

output, and digital audio will be output after the appropriate copyright processing being applied in the receive processing. CGMS-A and MACROVISION are applied to the analog video output, 5CDTCP is applied to the high-speed digital interface output, and SCMS is applied to the digital audio output respectively. For details of processing, see applicable specifications and standards.

It is necessary to reflect the accurate information on the category code as well as the copyright display bit of the channel status specified by IEC 60958.

In this case, if a digital copy control descriptor is assigned, the category code is “001_0000L”.

Copy permitted without constraint condition: Set the copyright information bit to 1.

Only the first generation copy permitted: Set the copyright information bit to 1, and set the L bit of category code to 0.

Copy prohibited: Set the copyright information bit to 0, and set the L bit of category code to 1.

Note that, if no descriptor is assigned, it will be treated as copy free.

Table X4-Y1 Operations of descriptors for TV-based media type services

<table>
<tr><th rowspan="2">Digital copy control</th><th rowspan="2">Analog copy control *3</th><th colspan="3">Operation of each descriptor</th></tr>
<tr><th>copy_control_type</th><th>digital_recording_control_data</th><th>APS_control_data</th></tr>
<tr><td>Copy permitted without constraint condition</td><td>Copy permitted without constraint condition</td><td rowspan="4">01</td><td>00</td><td>Not Applicable</td></tr>
<tr><td rowspan="2">Copy prohibited *1</td><td>Copy prohibited, but not added by Macrovision. Therefore, the copy is permitted for the conventional analog input and analog recording devices.</td><td rowspan="2">11</td><td>00</td></tr>
<tr><td>Copy prohibited *4</td><td>Other than 00</td></tr>
<tr><td rowspan="2">Only one-generation copy permitted *2</td><td>Only one-generation copy is permitted, but not added by Macrovision. Therefore, the copy is permitted for the conventional analog recording devices.</td><td rowspan="2">10</td><td>00</td></tr>
<tr><td>Copy prohibited after one-generation copy *4</td><td>Other than 00</td></tr>
</table>

★ *1: The “copy never” process of “source function” defined in 5CDTCP is executed for the high-speed digital interface output. However, if only the audio stream is output in the IEC60958 conformant format, the “no more copies” process is executed.

*2: The “copy one generation” process of “source function” defined in 5CDTCP is executed for the high-speed digital interface output.

*3: Applied to the composite and component video output. The format conversion and output of the received video signals are also included. The Macrovision control applies to the 480I

composite and component video signals.

*4: Analog video signals are processed with the parameters specified by Macrovision Corp. and the specified APS_control_data, and output.

[Operational notes (TV-based media type services)]

If the service_type written in the service list descriptor of NIT is "0x01" (digital TV broadcasting service), "0xA1" (temporary video service), or "0xA5" (promotion video service), it must be coded based on the rules of Table X4-Y1.

Table X4-Y2 Operations of descriptors for audio-based media type services

<table>
<tr><th rowspan="2">Digital copy control</th><th rowspan="2">Analog copy control *4</th><th colspan="3">Operation of each descriptor</th></tr>
<tr><th>copy_control_type</th><th>digital_recording_control_data</th><th>APS_control_data</th></tr>
<tr><td>Copy permitted without constraint condition, however, note that output as MPEG_TS is currently unavailable *1</td><td rowspan="2">Copy permitted without constraint condition</td><td>01</td><td rowspan="2">00</td><td>Not Applicable</td></tr>
<tr><td>Copy permitted without constraint condition</td><td>11</td><td></td></tr>
<tr><td rowspan="2">Copy prohibited *2. Note that output as MPEG_TS is currently unavailable *1</td><td>Copy prohibited, but not added by Macrovision. Therefore, the copy is permitted for the conventional analog input and analog recording devices.</td><td rowspan="2">01</td><td rowspan="4">11</td><td>00</td></tr>
<tr><td>Copy prohibited *5</td><td>Other than 00</td></tr>
<tr><td rowspan="2">Copy prohibited. Note that output as MPEG_TS is prohibited.</td><td>Copy prohibited, but not added by Macrovision. Therefore, the copy is permitted for the conventional analog input and analog recording devices.</td><td rowspan="2">11</td><td>00</td></tr>
<tr><td>Copy prohibited *5</td><td>Other than 00</td></tr>
<tr><td rowspan="2">Only one-generation copy permitted *3 Note that output as MPEG_TS is currently unavailable *1</td><td>Only one-generation copy is permitted, but not added by Macrovision. Therefore, the copy is permitted for the conventional analog recording devices.</td><td rowspan="2">01</td><td rowspan="2">10</td><td>00</td></tr>
<tr><td>Copy prohibited after one-generation copy *5</td><td>Other than 00</td></tr>
</table>

Only one-generation copy permitted Note that output as MPEG_TS is prohibited	Only one-generation copy is permitted, but not added by Macrovision. Therefore, the copy is permitted for the conventional analog recording devices.	11		00
	Copy prohibited after one-generation copy *5			Other than 00

*1: The decision by the 5C will be followed.

*2: The “no more copies” process of the “AM824 audio source function” defined in 5CDTCP is executed for the high-speed digital interface output.

*3: The “copy one generation” process of the “AM824 audio source function” defined in 5CDTCP is executed for the high-speed digital interface output.

*4: Applied to the composite and component video output. The format conversion and output of the received video signals are also included. The Macrovision control applies to the 480I composite and component video signals.

*5: Analog video signals are processed with the parameters specified by Macrovision Corp. and the specified APS_control_data, and output.

[Operational notes (Audio-based media type services)]

If the service_type written in the service list descriptor of NIT is "0x02" (digital audio service), "0xA2" (temporary audio service), or "0xA6" (promotion audio service), it must be coded based on the rules of Table X4-Y2.

Table X4-Y3 Operations of descriptors for data-based media type services

Digital copy control	**Analog copy control *3**	**Operation of each descriptor**		
		copy_control_type	**digital_recording_control_data**	**APS_control_data**
Copy permitted without constraint condition	Copy permitted without constraint condition	01/11	00	Not Applicable
Copy prohibited *1	Copy prohibited, but not added by Macrovision. Therefore, the copy is permitted for the conventional analog input and analog recording devices.	01	11	00
	Copy prohibited *4			Other than 00
Copy prohibited. Note that output as MPEG_TS is prohibited.	Copy prohibited, but not added by Macrovision. Therefore, the copy is permitted for the conventional analog input and analog recording devices.	11		00

	Copy prohibited *4			Other than 00
Only one-generation copy permitted *2	Only one-generation copy is permitted, but not added by Macrovision. Therefore, the copy is permitted for the conventional analog recording devices.	01	10	00
	Copy prohibited after one-generation copy *4			Other than 00
Only one-generation copy permitted. Note that output as MPEG_TS is prohibited.	Only one-generation copy is permitted, but not added by Macrovision. Therefore, the copy is permitted for the conventional analog recording devices.	11		00
	Copy prohibited after one-generation copy *4			Other than 00

★ *1: The “copy never” process of “source function” defined in 5CDTCP is executed for the high-speed digital interface output. However, if only the audio stream is output in the IEC60958 conformant format, the “no more copies” process is executed.

*2: The “copy one generation” process of “source function” defined in 5CDTCP is executed for the high-speed digital interface output.

*3: Applied to the composite and component video output. The format conversion and output of the received video signals are also included. The Macrovision control applies to the 480I composite and component video signals.

*4: Analog video signals are processed with the parameters specified by Macrovision Corp. and the specified APS_control_data, and output.

[Operational notes (Data-based media type services)]

If the service_type written in the service list descriptor of NIT is "0xC0" (data service), "0xA3" (temporary data service), "0xA7" (promotion data service), "0xA8" (preliminary accumulation data service), "0xA9" (accumulation only data service), or "0xAA" (bookmark list data service), it must be coded based on the rules of Table X4-Y3.

[Receive processing standards]

The receive processing standards of each field are given in Table 31-90.

Table 31-90 Receive processing standards of digital copy control descriptor (EIT)

Receive processing standards of each field	
descriptor_tag	If "0xC1", the digital copy control descriptor is determined.
descriptor_length	The length of digital copy control descriptor is determined.
digital_recording_control_data	This 2-bit field contains the information for controlling the copy generations and decoded according to Tables X4-Y1, X4-Y2 and X4-Y3. If the component_tag value is outside of 0x40 to 0x7F, the absence of component description is determined even when the component_control_flag is "1" and the component description exists.
maximum_bit_rate_flag	- If "0", the maximum transmission rate of this service is determined to be within the default maximum bit rate that is defined in Tables 21-1-1 and 21-1-2. - If "1", the maximum transmission rate of this service is determined to be given later.
component_control_flag	- If "0", the digital copy control does not apply to each component. - If "1", the digital copy control applies to each component.
copy_control_type	This 2-bit field contains the information for controlling the copy generations and decoded according to Tables X4-Y1, X4-Y2 and X4-Y3. If the component_tag value is outside of 0x40 to 0x7F, the absence of component description is determined even when the component_control_flag is "1" and the component description exists.
maximum_bit_rate	The maximum transmission rate of this service is determined.

[Other notes and comments]

The careful study for copy control of analog output signals is necessary to continue in the future as it is pursuant to the separate contract between the pertinent broadcaster and Macrovision Corporation or others.

The reception process not defined in Tables X4-Y1, X4-Y2 and X4-Y3 is defined below.

☐ TV-based media type services

If copy_control_type=00/10/11

- An output from the analog video output, digital audio output, and high-speed digital interface output ports is prohibited.

If copy_control_type=01, and digital_recording_control_data=01

- For the EMI of high-speed digital interface, execute the processing for "01." Other processing will follow the same procedure as the case where copy_control_type=01, and digital_recording_control_data=11.

☐ Audio and data-based media type services

If copy_control_type=00/10

- An output from the analog video output, digital audio output, and high-speed digital interface output ports is prohibited.

If copy_control_type=01, and digital_recording_control_data=01

- Only for the EMI of high-speed digital interface, execute the processing for "01." Other processing

will follow the same procedure as the case where copy_control_type=01, and digital_recording_control_data =11.

If copy_control_type=11, and digital_recording_control_data=01

- The same process is executed as if copy_control_type is “11” and digital_recording_control_data is “11”.

31.4.2.7 Parental rate descriptor

Same as Part 1.

31.4.2.8 CA contract info descriptor

Same as Part 1.

31.4.2.9 Event group descriptor

Same as Part 1.

31.4.2.10 Component group descriptor

Same as Part 1.

31.4.2.11 Series descriptor

Same as Part 1.

31.4.2.12 LDT linkage descriptor

[Usage]

Used to link the pertinent event information to the information entered on the LDT.

[Structure]

The structure of LDT linkage descriptor is shown in Table 31-120.

Table 31-120 Structure of LDT linkage descriptor

Data structure	Bits	Identifier
LDT_linkage_descriptor () {		
descriptor_tag	**8**	**uimsbf**
descriptor_length	**8**	**uimsbf**
original_service_id	**16**	**uimsbf**
transport_stream_id	**16**	**uimsbf**
original_network_id	**16**	**uimsbf**
for (i = 0; i< N; i++) {		
description_id	**16**	**uimsbf**
reserved_future_use	**4**	**uimsbf**
description_type	**4**	**uimsbf**
reserved_for_future_use	**8**	**uimsbf**
}		
}		

[Meanings of each field]

For the meaning of each field, follow the standards given in Section 6.2 of Part 1 of ARIB STD-B10, and the definitions given in Section 6.2.40 of Part 2.

[Transmission operation rules]

⊙ **Only one descriptor can be set for one event.**

⊙ **The contents cannot be changed if description_id is not changed.**

⊙ **The destination link must always exist.**

⊙ **The destination link is limited to the original TS, regardless of EIT[actual]/[other] setting.**

⊙ Only one description_id loop is allowed in a loop.

⊙ The maximum number of sections for each LDT sub table is 40.

The transmission operation rules of each field are defined in Table 31-121.

Table 31-121 Transmission operation rules of LDT linkage descriptor

Transmission operation rules of each field	
descriptor_tag	Write “0xDC”.
descriptor_length	Write the length of LDT linkage descriptor.
original_service_id	Write the table_id_extention of the destination LDT.
transport_stream_id	Write the transport stream ID having the destination LDT.
original_network_id	Write the original network ID.
[description_id loop]	
description_id	Write the description information ID.
description_type	Write “0x03” (extended event descriptor).

[Receive processing standards]

⊙ **If the description_id is changed, a change of information at the destination link is assumed.**

○ If the destination link is not found, the descriptor is made invalid.

○ If the destination link is not the original TS, the descriptor is made invalid.

The receive processing standards of each field are given in Table 31-122.

Table 31-122 Receive processing standards of LDT linkage descriptor

Receive processing standards of each field	
descriptor_tag	If “0xDC”, the LDT linkage descriptor is determined.
descriptor_length	The length of LDT linkage descriptor is determined.
original_service_id	The table_id_extention of the destination LDT is determined.
transport_stream_id	The transport stream ID having the destination LDT is determined.
original_network_id	This is made invalid if it differs from the original network ID.
[description_id loop]	
description_id	The description ID is determined.
description_type	- If "0x03", the extended event descriptor is determined. - If not, it is made invalid.

[Other notes and comments]

None

31.5 NBIT[ref](Network Board Information Table)

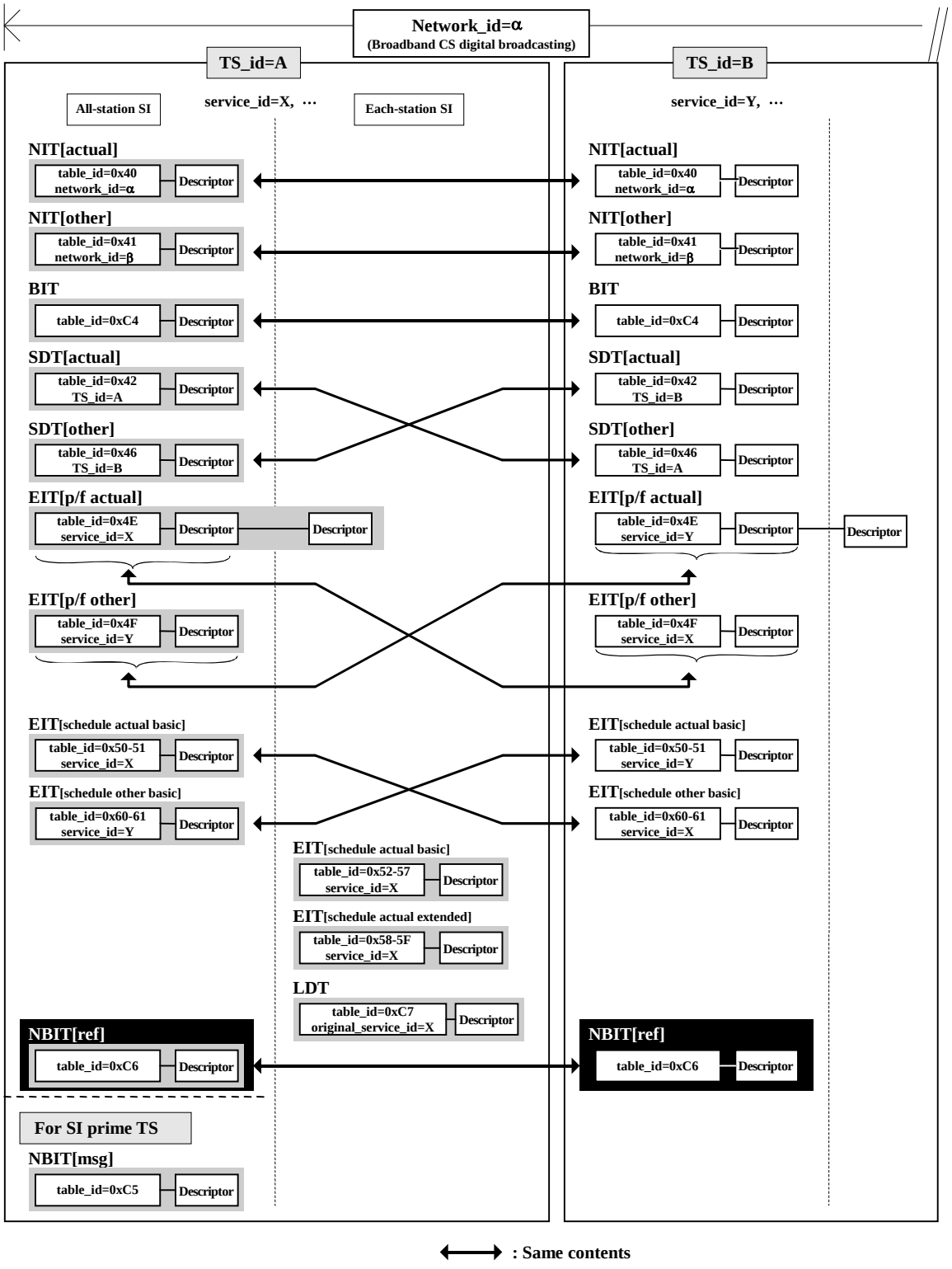


Figure 31-5 The part explained in Section 31.5 (NBIT[ref] shown on colored background)

31.5.1 Structure and operation of NBIT[ref]

[Usage]

Transmit the title of information, announcement and others as well as the information obtained from the NBIT[msg] text within the network.

[Structure]

The structure of NBIT[ref] is shown in Table 31-123.

Table 31-123 Structure of NBIT[ref] (Network Board Information Table)

Data structure	Bits	Identifier
network_board_information_section(){		
table_id	**8**	**uimsbf**
section_syntax_indicator	**1**	**bslbf**
reserved_future_use	**1**	**bslbf**
reserved	**2**	**bslbf**
section_length	**12**	**uimsbf**
original_network_id	**16**	**uimsbf**
reserved	**2**	**bslbf**
version_number	**5**	**uimsbf**
current_next_indicator	**1**	**bslbf**
section_number	**8**	**uimsbf**
last_section_number	**8**	**uimsbf**
for (i = 0; i< N; i++) {		
information_id	**16**	**uimsbf**
information_type	**4**	**bslbf**
description_body_location	**2**	**uimsbf**
reserved_future_use	**2**	**bslbf**
message_section_number	**8**	**uimsbf**
number_of_keys	**8**	**uimsbf**
for (j = 0; j< number_of_keys; j++) {		
key_id	**16**	**uimsbf**
}		
reserved_future_use	**4**	**bslbf**
description_loop_length	**12**	**uimsbf**
for (j = 0; j< M; j++) {		
descriptor()		
}		
}		
CRC_32	**32**	**rpchof**
}		

[Meanings of each field]

The meaning of each field shall follow the standards given in Section 5.2.14 of Part 2 of ARIB STD-B10.

[Transmission operation rules]

⊙ The NBIT must always be sent when a message is transmitted on the corresponding network.

⊙ **The title alone cannot be sent. The message text must also be sent.**

○ The re-transmission cycle must follow the standards given in Section 12.4 of this Guide.

⊙ **The contents cannot be changed if description_id is not changed.**

⊙ Up to 50 information IDs can exist on a single network.

The transmission operation rules of each field are defined in Table 31-124.

Table 31-124 NBIT transmission operation rules

Transmission operation rules of each field	
table_id	Write "0xC6".
section_syntax_indicator	Write '1'.
section_length	Write the section length of NBIT. This value must be 4093 or less as the entire section length is 4096 bytes maximum.
original_network_id	Write the network ID supported by NBIT.
version_number	Describe the value that increments by 1 per version update for the normal operation. However, in case of a system malfunction, it is possible to describe a value that increments by 1 or greater.
current_next_indicator	Write '1'.
section_number	Write a section number in the corresponding sub table.
last_section_number	Write the last section number in the corresponding sub table.
[information_id_loop]	The maximum loop count should be 50.
information_id	Write the information ID of the message. Write a unique value in the network that is incremented by 1 for each different message for the normal operation. The information ID that was assigned to the already erased message cannot be used within 100 days. "0x0000" and "0xffff" cannot be used.
information_type	Write the information ID of the message.
description_body_location	Write the location of TS where the table having the message contents exists. It is fixed to '10' for broadband CS digital broadcasting.
message_section_number	Write the section number of the NBIT[msg] where the message contents are described.
number_of_keys	Write the loop count of the key_id loop described later. The maximum loop count is 2.
[key_id loop]	
key_id	Write a key ID.
[descriptor_loop]	

The information ID assignment used for the broadband CS digital broadcasting is shown in Table 31-125.

Table 31-125 Information IDs that can be specified in the initial stage of broadband CS digital broadcasting

information_type	**Definition**	Key ID
0x01	**Bulletin information**	None
0x02	**Bulletin information having service ID**	service_id
0x03	**Bulletin information having category**	content_nibble, user_nibble

[Receiving process standards]

○ When the message titles are listed, they should be shown in the sequence as listed on the table.

The receiving process standards of each field are shown in Table 31-126.

Table 31-126 NBIT receiving process standards

Receiving process standards of each field	
table_id	If "0xC6", the table is determined to be the NBIT (reference information).
section_syntax_indicator	If "0", the corresponding section is invalid. If "1", the corresponding section is valid.
section_length	If 4093 or less, the section length is shown. If larger than 4093, the corresponding section is invalid.
original_network_id	
version_number	If there is any change, it indicates that the corresponding table has been updated.
current_next_indicator	If "0", the corresponding section is invalid. If "1", the corresponding section is valid.
section_number	If it is equal to or less than the last section number, the section number of the corresponding sub table is determined. If greater than the last section number, the corresponding section is invalid.
last_section_number	The last section number of the corresponding sub table is determined.
[information_id_loop]	
information_id	If "0x0000" or "0xffff", it is made invalid.
information_type	The information ID of the message is determined.
description_body_location	If "10", this infroamtion_id loop is made valid. If not "10", this infroamtion_id loop is made invalid.
message_section_number	The section number of the NBIT[msg] where the message text is described is determined.
number_of_keys	The key_id loop described below is determined. A loop exceeding the maximum loop count may be ignored.
[key_id loop]	
key_id	The key ID for the information_id is determined.
[descriptor loop]	

[Other notes and comments]

None

31.5.2 Descriptors inserted into NBIT[ref]

31.5.2.1 Board information descriptor

[Usage]

Write the board information title.

[Structure]

The structure of board information descriptor is shown in Table 31-127.

Table 31-127 Structure of board information descriptor

Data structure	Bits	Identifier
board_information_descriptor () {		
descriptor_tag	**8**	**uimsbf**
descriptor_length	**8**	**uimsbf**
title_length	**8**	**uimsbf**
for (i = 0; i< title_length; i++) {		
title_char	**8**	**uimsbf**
}		
text_length	**8**	**uimsbf**
for (i = 0; i< text_length; i++) {		
text_char	**8**	**uimsbf**
}		
}		

[Meanings of each field]

For the meaning of each field, follow the standards given in Section 6.2 of Part 1 of ARIB STD-B10, and the definitions given in Section 6.2.39 of Part 2.

[Transmission operation rules]

⊙ **Only one descriptor can be set for one event.**

The transmission operation rules of each field are defined in Table 31-128.

Table 31-128 Transmission operation rules of board information descriptor

Transmission operation rules of each field	
descriptor_tag	Write “0xDB”.
descriptor_length	Write the length of board information descriptor.
title_length	Write a title length that is 40 bytes (20 double-byte characters) or less.
[title_char]	Write a title that is 40 bytes (20 double-byte characters) long or less. A New Line code cannot be used.
text_length	Write “0x00”.
[text_length]	Do not write anything.

[Receiving process standards]

○ The message title for the information_id can be used during display and others.

⊙ **If the information_id is cleared from the corresponding table, it is assumed that the message text has been cleared.**

The receiving process standards of each field are shown in Table 31-129.

Table 31-129 Receiving process standards of board information descriptor

Receiving process standards of each field	
descriptor_tag	If "0xDB", the board information descriptor is determined.
descriptor_length	The length of board information descriptor is determined.
title_length	If equal to or less than 40 bytes (20 double-byte characters), the title length is determined. If greater than 40 bytes (20 double-byte characters), the excess title may be ignored.
[title_char]	A title is determined.
text_length	
[text_char]	It is made invalid.

[Other notes and comments]

None

31.6 NBIT[msg](Network Board Information Table)

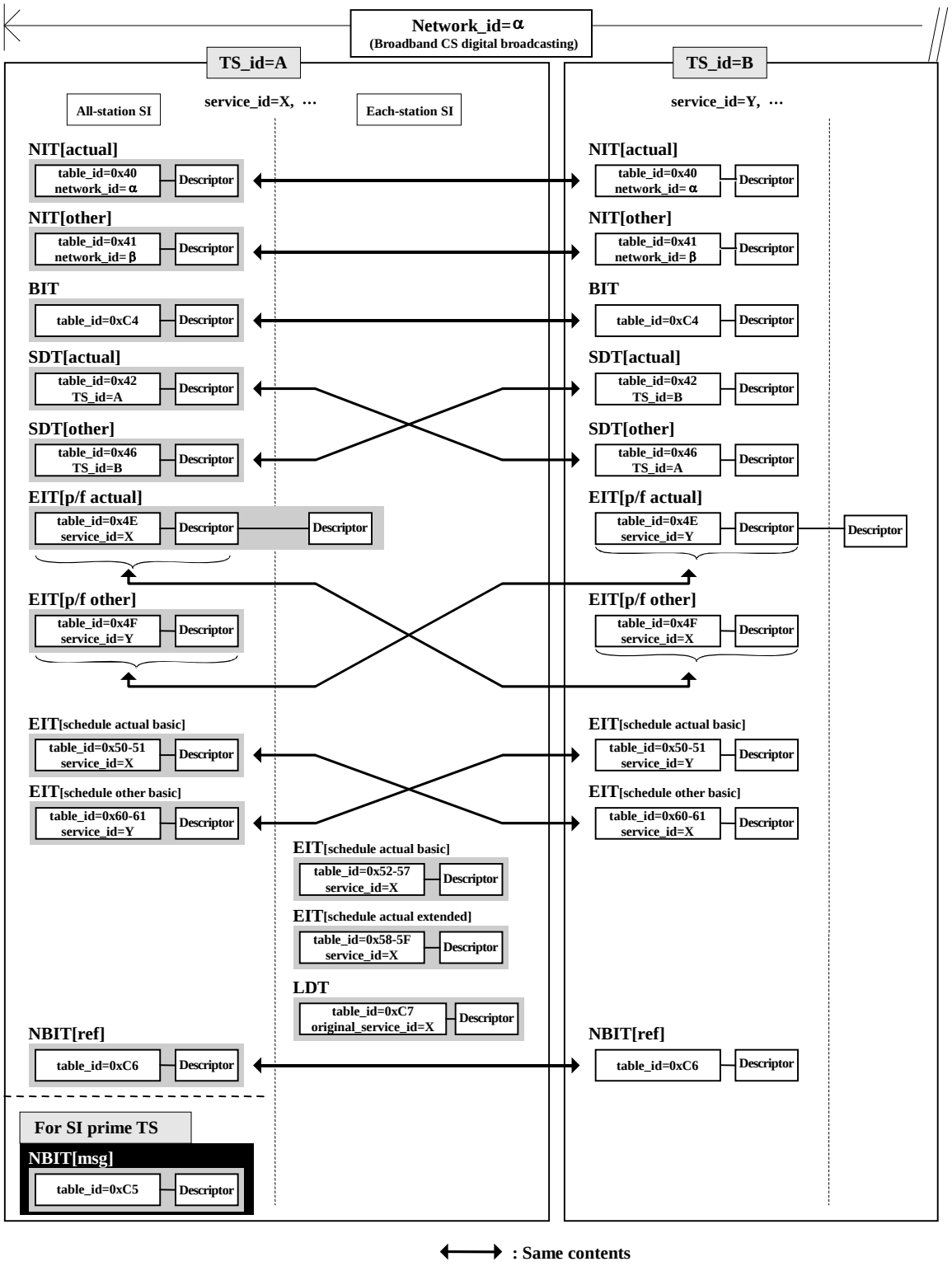


Figure 31-6 The part explained in Section 31.6 (NBIT[msg] shown on colored background)

31.6.1 Structure and operation of NBIT[msg]

[Usage]

Describe the message text such as information and announcement within the network.

[Structure]

The structure of NBIT[msg] is shown in Table 31-130.

Table 31-130 Structure of NBIT (Network Board Information Table)

Data structure	Bits	Identifier
network_board_information_section(){		
table_id	**8**	**uimsbf**
section_syntax_indicator	**1**	**bslbf**
reserved_future_use	**1**	**bslbf**
reserved	**2**	**bslbf**
section_length	**12**	**uimsbf**
original_network_id	**16**	**uimsbf**
reserved	**2**	**bslbf**
version_number	**5**	**uimsbf**
current_next_indicator	**1**	**bslbf**
section_number	**8**	**uimsbf**
last_section_number	**8**	**uimsbf**
for (i = 0; i< N; i++) {		
information_id	**16**	**uimsbf**
information_type	**4**	**bslbf**
description_body_location	**2**	**uimsbf**
reserved_future_use	**2**	**bslbf**
user_defined	**8**	**uimsbf**
number_of_keys	**8**	**uimsbf**
for (j = 0; j< number_of_keys; j++) {		
key_id	**16**	**uimsbf**
}		
reserved_future_use	**4**	**bslbf**
description_loop_length	**12**	**uimsbf**
for (j = 0; j< M; j++) {		
descriptor()		
}		
}		
CRC_32	**32**	**rpchof**
}		

[Meanings of each field]

The meaning of each field shall follow the standards given in Section 5.2.14 of Part 2 of ARIB STD-B10.

[Transmission operation rules]

⊙ **The NBIT must always be sent when a message is transmitted on the corresponding network.**

○ The re-transmission cycle must follow the standards given in Section 12.4 of this Guide.

⊙ The contents cannot be changed if description_id is not changed.

⊙ Up to 50 information IDs can exist on a single network.

The transmission operation rules of each field are defined in Table 31-131.

Table 31-131 NBIT[msg] transmission operation rules

Transmission operation rules of each field	
table_id	Write “0xC5”.
Section_syntax_indicator	Write ‘1’.
section_length	Write the section length of NBIT. This value must be 4093 or less as the entire section length is 4096 bytes maximum.
original_network_id	Write the network ID supported by NBIT.
version_number	Describe the value that increments by 1 per version update for the normal operation. However, in case of a system malfunction, it is possible to describe a value that increments by 1 or greater.
current_next_indicator	Write ‘1’.
section_number	Write a section number in the corresponding sub table.
Last_section_number	Write the last section number in the corresponding sub table.
[information_id_loop]	The maximum loop count should be 50.
information_id	Write the information ID of the message. “0x0000” and “0xffff” cannot be used.
Information_type	Write the information ID of the message.
description_body_location	Write the location of TS where the table having the message contents exists. It is fixed to ‘10’ for broadband CS digital broadcasting.
number_of_keys	Write the loop count of the key_id loop described later. The maximum loop count is 2.
[key_id loop]	
key_id	Write a key ID.
[descriptor_loop]	

The information ID assignment used for the broadband CS digital broadcasting is the same as for NBIT[ref].

[Receiving process standards]

○ See Section 4.1.5 “Board information” in Volume 2 of Part 2.

○ It can be used as the message text for the information_id.

⊙ **If the information_id is cleared from the corresponding table, it is assumed that the message text has been cleared.**

The receiving process standards of each field are shown in Table 31-132.

Table 31-132 NBIT[msg] receiving process standards

Receiving process standards of each field	
table_id	If "0xC5", the table is determined to be the NBIT (text information).
section_syntax_indicator	If "0", the corresponding section is invalid. If "1", the corresponding section is valid.
section_length	If 4093 or less, the section length is shown. If larger than 4093, the corresponding section is invalid.
original_network_id	
version_number	If there is any change, it indicates that the corresponding table has been updated.
current_next_indicator	If "0", the corresponding section is invalid. If "1", the corresponding section is valid.
section_number	If it is equal to or less than the last section number, the section number of the corresponding table is determined. If greater than the last section number, the corresponding section is invalid.
last_section_number	The last section number of the corresponding sub table is determined.
[information_id_loop]	
information_id	If "0x0000" or "0xffff", it is made invalid.
information_type	The information ID of the message is determined.
description_body_location	If "10", this information_id loop is made valid. If not "10", this information_id loop is made invalid.
number_of_keys	The key_id loop described below is determined. A loop exceeding the maximum loop count may be ignored.
[key_id loop]	
key_id	The key ID for the information_id is determined.
[descriptor loop]	

[Other notes and comments]

None

31.6.2 Descriptors inserted into NBIT[msg]

31.6.2.1 Board information descriptor

[Usage]

Describe the message text of board information.

[Structure]

The structure of board information descriptor is shown in Table 31-133.

Table 31-133 Structure of board information descriptor

Data structure	Bits	Identifier
board_information_descriptor () {		
descriptor_tag	**8**	**uimsbf**
descriptor_length	**8**	**uimsbf**
title_length	**8**	**uimsbf**
for (i = 0; i< title_length; i++) {		
title_char	**8**	**uimsbf**
}		
text_length	**8**	**uimsbf**
for (i = 0; i< text_length; i++) {		
text_char	**8**	**uimsbf**
}		
}		

[Meanings of each field]

For the meaning of each field, follow the standards given in Section 6.2 of Part 1 of ARIB STD-B10, and the definitions given in Section 6.2.39 of Part 2.

[Transmission operation rules]

- ⊙ **Up to two descriptors can be set if necessary.**
- ⊙ **When a text that is 200 bytes long or more is sent, it can be indicated by two continuously placed descriptors. In this case, the text descriptions must be in the order of their placement.**

The transmission operation rules of each field are shown in Table 31-134.

Table 31-134 Transmission operation rules of board information descriptor

Transmission operation rules of each field	
descriptor_tag	Write “0xDB”.
descriptor_length	Write the length of board information descriptor.
title_length	Write “0x00”.
[title_char]	Do not write anything.
text_length	Write a text length that is 200 bytes or less.
[text_length]	Describe a text that is 200 bytes long or less.

[Receiving process standards]

- ○ It can be used as the message text for the information_id.
- ○ See Section 4.1.5 “Board information” in Volume 2 of Part 2.

The receiving process standards of each field are shown in Table 31-135.

Table 31-135 Receiving process standards of board information descriptor

Receiving process standards of each field	
descriptor_tag	If "0xDB", the board information descriptor is determined.
descriptor_length	The length of board information descriptor is determined.
title_length	
[title_char]	It is made invalid.
text_length	If equal to or less than 200 bytes, the text length is determined. If greater than 200 bytes, the excess text description may be ignored.
[text_char]	The text description is determined. If two descriptors are placed, the continuous character strings are processed in the order of their placement.

[Other notes and comments]

None

32 Operation of Each-Station SI Table

32.1 EIT (Event Information Table)

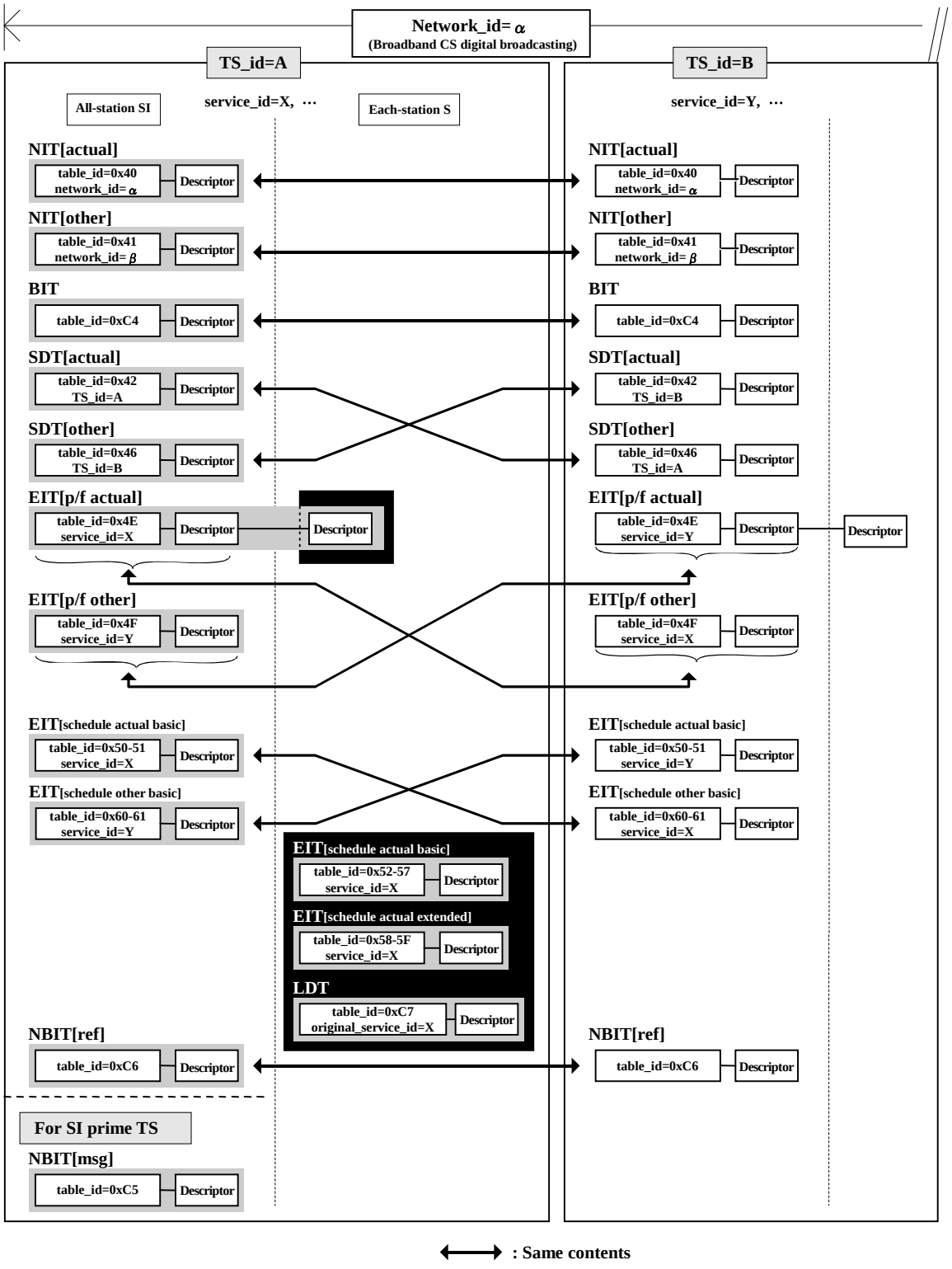


Figure 32-1 The part explained in Section 32.1 (EIT each-station SI shown on colored background)

32.1.1 Structure and operation of EIT[p/f]

The structure and operations of EIT[p/f] for each-station SI is the same as for the EIT of all-station SI. See Section 31.4.1.

32.1.2 Descriptors added to the EIT[p/f] (event loop)

The EIT operations defined for all-station SI should be used as they are. In addition, the following descriptors can be added as each-station SI.

32.1.2.1 Extended event descriptor

Same as Part 1.

32.1.2.1.1 Operation of item description

Same as Part 1.

32.1.2.1.2 Operation of item name (reserved words)

Same as Part 1.

32.1.2.1.3 Operation of extended description

Same as Part 1.

32.1.2.2 Hyperlink descriptor

Same as Part 1.

32.1.3 Descriptors to be inserted into the EIT[schedule] (event loop)

Same as Part 1.

32.1.4 Structure and operations of EIT[schedule basic] (for each-station SI)

The operation of information entered on the table of EIT[schedule basic] (for each-station SI) (and the operation of descriptors) is the same as for the operation of EIT[schedule basic] that is sent for all-station SI (see Section 31.4). However, the LDT link descriptor is not operated for each-station SI.

○ The re-transmission cycle must follow the standards given in Section 12.4 of this Guide.

32.1.5 Structure and operation of EIT[schedule extended]

Same as Part 1.

32.1.6 Descriptors to be inserted into the EIT[schedule extended] (event loop)

32.1.6.1 Extended event descriptor

Same as Part 1.

32.1.6.1.1 Operation details of extended event descriptors

Same as Part 1.

32.1.6.2 Hyperlink descriptor

Same as Part 1.

32.2 LDT (Linked Description Table)

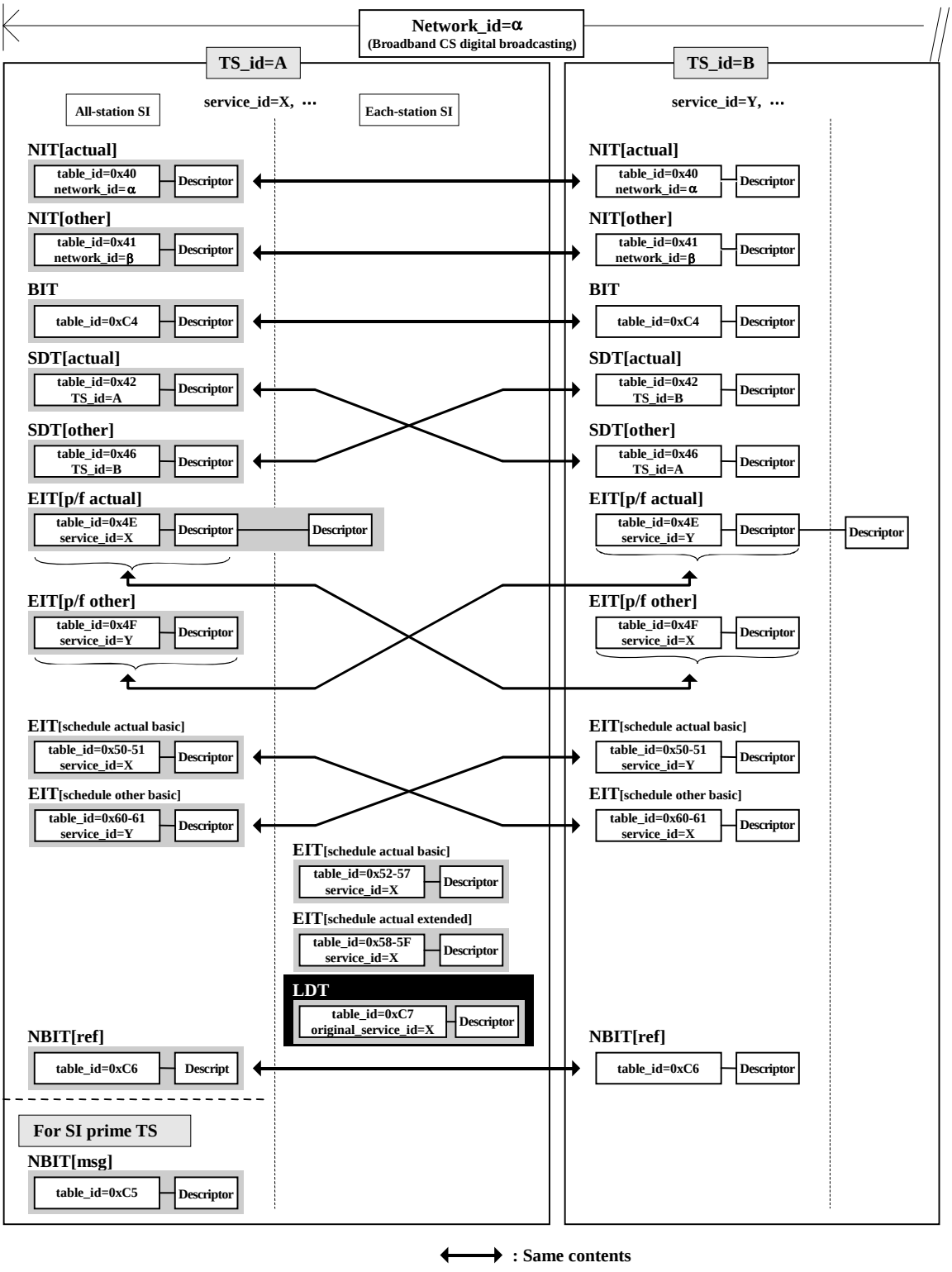


Figure 32-2 The part explained in Section 32.2 (LDT) shown on colored background

32.2.1 Structure and Operations of LDT

[Usage]

Describe the consolidated information of descriptors for each-station SI that can be referred to from the EIT[schedule_basic].

[Structure]

The structure of LDT is shown in Table 32-11.

Table 32-11 Structure of LDT (Linked Description Table)

Data structure	Bits	Identifier
linkage_description_section(){		
table_id	**8**	**uimsbf**
section_syntax_indicator	**1**	**bslbf**
reserved_future_use	**1**	**bslbf**
reserved	**2**	**bslbf**
section_length	**12**	**uimsbf**
original_service_id	**16**	**uimsbf**
reserved	**2**	**bslbf**
version_number	**5**	**uimsbf**
current_next_indicator	**1**	**bslbf**
section_number	**8**	**uimsbf**
last_section_number	**8**	**uimsbf**
transport_stream_id	**16**	**uimsbf**
original_network_id	**16**	**uimsbf**
for (i = 0; i< N; I++) {		
description_id	**16**	**uimsbf**
reserved_future_use	**12**	**bslbf**
descriptors_loop_length	**12**	**uimsbf**
for (j = 0; j< M; j++) {		
descriptor()		
}		
}		
CRC_32	**32**	**rpchof**
}		

[Meanings of each field]

The meaning of each field shall follow the standards given in Section 5.2.15 of Part 2 of ARIB STD-B10.

[Transmission operation rules]

- ⊙ **If the EIT[schedule_extended] is operated on the network, no descriptor field must be sent.**
- ⊙ **If any change has been made in the description_id loop, the description_id must be reassigned. At the same time, the description_id of the LDT linkage descriptor must be reassigned the same value on the EIT[schedule_basic].**
- ○ The re-transmission cycle must follow the standards given in Section 12.4 of this Guide.

The transmission operation rules of each field are defined in Table 32-12.

Table 32-12 Transmission operation rules of LDT

Transmission operation rules of each field	
table_id	Write “0xC7”.
section_syntax_indicator	Write ‘1’.
section_length	Write the section length of LDT. This value must be 4093 or less as the entire section length is 4096 bytes maximum.
original_service_id	Write the original service ID to identify the group for consolidation of descriptions in this sub-table.
version_number	Describe the value that increments by 1 per version update for the normal operation. However, in case of a system malfunction, it is possible to describe a value that increments by 1 or greater.
current_next_indicator	Write ‘1’.
section_number	Write a section number in the corresponding sub-table.
last_section_number	Write the last section number in the corresponding sub-table.
transport_stream_id	Write the transport stream ID of the original TS.
original_network_id	Write the original network ID.
[description_id_loop]	
description_id	Write the description information ID. The original service ID must be unique.
descriptor_loop_length	Write the length of subsequent descriptor loop.
[descriptor_loop]	

[Receiving process standards]

○ If the description_id has been cleared from the table, it is determined that the description information has been cleared.

The receiving process standards of each field are listed in Table 32-13.

Table 32-13 Receiving process standards of LDT

Receiving process standards of each field	
table_id	If “0xC7”, the table is determined to be the LDT.
section_syntax_indicator	If “0”, the corresponding section is invalid. If “1”, the corresponding section is valid.
section_length	If 4093 or less, the section length is shown. If larger than 4093, the corresponding section is invalid.
original_service_id	The original service ID is determined to use to identify the group for consolidation of descriptions on this sub-table.
version_number	If there is any change, it indicates that the corresponding table has been updated.
current_next_indicator	If “0”, the corresponding section is invalid. If “1”, the corresponding section is valid.
section_number	If it is equal to or less than the last section number, the section number of the corresponding table is determined. If greater than the last section number, the corresponding section is invalid.
last_section_number	The last section number of the corresponding sub-table is determined.

transport_stream_id	If equal to the original TS, this table is valid. If equal to another TS, this table is invalid.
original_network_id	If equal to the original network ID, this table is valid. If equal to another network ID, this table is invalid.
[description_id_loop]	
description_id	It is determined to be the description information ID.
descriptor_loop_length	The length of the subsequent descriptor loop is determined.
[descriptor loop]	

[Other notes and comments]

None

32.2.2 Descriptors to be inserted in LDT

32.2.2.1 Extended event descriptor

[Usage]

Describe the detailed character information about an event.

[Structure]

For the structure of extended event descriptor, see Table 32-1.

[Meanings of each field]

For the meaning of each field, follow the standards given in Section 6.2 of ARIB STD-B10 Part 1, and definitions given in Section 6.2.7 of ARIB STD-B10 Part 2.

[Transmission operation rules]

⊙ **Any number of descriptors can be output. (Up to 16 descriptors can be entered in the description_id.)**

The transmission operation rules of each field are defined in Table 32-9.

Table 32-9 Transmission operation rules of extended event descriptors (LDT)

Transmission operation rules of each field	
descriptor_tag	Write “0x4E”.
descriptor_length	Write the length of extended event descriptor. Do not specify the maximum value.
descriptor_number	Write the number of the extended event descriptor if an information is separated and described. - The description number must be written for each item name. - If an item name exceeds 200 bytes long, the next field should be sent

	without being initialized.
last_descriptor_number	Write the number of the last and related extended event descriptor.
ISO_639_language_code	Write “jpn (“0x6A706E”)”.
length_of_items	Write the length of items.
[item_loop]	
item_description_length	Write the item description length using a 16-byte (or 8 double-byte characters) or less length value.
[item_description_char]	Write the item name in 16 bytes (8 double-byte characters) long or less.
item_length	Write the item description length using a 200-byte or less length value.
[item_char]	Write the item description in 200 bytes or less.
text_length	Must be “0x00”.
[text_char]	Do not write anything.

[Receiving process standards]

- The detailed character information about an event is determined, and it can be displayed when necessary.

The receiving process standards of each field are listed on Table 32-10.

Table 32-10 Receiving process standards of extended event descriptors (LDT)

Receiving process standards of each field	
descriptor_tag	If it is “0x4E”, the extended event descriptor is determined.
descriptor_length	The length of the corresponding descriptor is determined.
descriptor_number	It is compared with the number of the last extended event descriptor, and the end of information is determined.
last_descriptor_number	The number of the last extended event descriptor is determined.
ISO_639_language_code	The language ID of characters included in the descriptor is determined.
length_of_items	The length of items is indicated.
[item_loop]	
Item_description_length	If equal to or less than 16 bytes (8 double-byte characters), the item name length is determined. If greater than 16 bytes (8 double-byte characters), the excess item name may be ignored. If equal to 0, the description of item having the last descriptor_number is determined to continue.
[item_description_char]	The item name is indicated.
item_length	If equal to or less than 200 bytes, the item description length is determined. If greater than 200 bytes, the excess item description may be ignored. If the item_description_length is 0, the description of item name having the last descriptor_number is determined to continue. They are handled as the continuous character strings including both direction and call states. In such case, the field should no be initialized.
[item_char]	
text_length	
[text_char]	It is made invalid.

[Other notes and comments]

None

33 Other Tables and Descriptor Operations

33.1 TOT (Time Offset Table)

33.1.1 Structure and operations of TOT

Same as Part 1.

33.1.2 Descriptors to be inserted in TOT

33.1.2.1 Local time offset descriptor

Same as Part 1.

33.2 ST (Stuffing Table)

33.2.1 Structure and operations of ST

Same as Part 1.

33.3 Descriptors not defined in each table

33.3.1 Stuffing descriptor

Same as Part 1.

Appendix

Appendix A: Genre code table used in initial phase of broadcasting

The “major category of genre” and “intermediate category of genre” of program genres should be operated in the same way as described in Part 1 of this Guide. For broadband CS digital broadcasting, on the other hand, the areas of direction category (the direction of type on the program property code table) is used to allow referencing to the user_nibble of “0xE”. The new “extended information for broadband CS digital broadcasting” is defined by content_nibble_level_1=“0xE” and content_nibble_level_2=“0x1”. In addition, an additional genre should be allowed to describe using the user_nibble.

Explanation of areas of “Extended information for broadband CS digital broadcasting”

Upper 4 bits of user_nibble	Lower 4 bits of user_nibble	Descriptions
0x0	*	**Sports**
0x0	0x0	Tennis
0x0	0x1	Basketball
0x0	0x2	Rugby
0x0	0x3	Football
0x0	0x4	Boxing
0x0	0x5	Professional wrestling
0x0	0x6	
0x0	0x7	
0x0	0x8	
0x0	0x9	
0x0	0xA	
0x0	0xB	
0x0	0xC	
0x0	0xD	
0x0	0xE	
0x0	0xF	Others

Upper 4 bits of user_nibble	Lower 4 bits of user_nibble	Descriptions
0x1	*	**Foreign movies**
0x1	0x0	Action movies
0x1	0x1	SF/fantasy movies
0x1	0x2	Comedy movies
0x1	0x3	Suspense/mystery movies
0x1	0x4	Love/romance movies
0x1	0x5	Horror/thriller movies
0x1	0x6	Western movies
0x1	0x7	Drama/social drama
0x1	0x8	Animation movies
0x1	0x9	Documentary movies
0x1	0xA	Adventure movies
0x1	0xB	Musical movies
0x1	0xC	Domestic drama
0x1	0xD	
0x1	0xE	
0x1	0xF	Others
0x2	*	**Japanese movies**
0x2	0x0	Action movies
0x2	0x1	SF/fantasy movies
0x2	0x2	Comedy
0x2	0x3	Suspense/mystery movies
0x2	0x4	Love/romance movies
0x2	0x5	Horror/thriller movies
0x2	0x6	Young/campus/idol dramas
0x2	0x7	Japanese gangster/costume drama
0x2	0x8	Animation movies
0x2	0x9	Documentary movies
0x2	0xA	Adventure movies
0x2	0xB	Musical movies
0x2	0xC	Domestic drama
0x2	0xD	
0x2	0xE	
0x2	0xF	Others

If the upper 4 bits of user_nibble are 0x3 to 0xF, they are “reserved areas”.

A.1 Expected Operations

The user_nibble for broadband CS digital broadcasting that is added in this time covers TV channels for more specialized audience when compared with the BS digital broadcasting. For example, most of program genres of Nihon Eiga Satellite Broadcasting Corp. are Content_nibble_ level_1=0x6 and Content_nibble_level_2=0x1. Therefore, the program genres are more segmented for the enhanced convenience of audience.

- The extended information for broadband CS digital broadcasting is used for broadband CS digital broadcasting only. It is not used for BS digital broadcasting.

Also, the receivers that support a program search at an intermediate category level only are considered, and the following basic operations must be used.

- In addition to the extended information for broadband CS digital broadcasting, the information appropriate to major and intermediate categories of the corresponding genre should be described as much as possible.

  For example, the following two items must be described for the “Japanese animation movies”:

  Content_nibble_ level_1=0x6, Content_nibble_level_2=0x2, user_nibble=0xff

  Content_nibble_ level_1=0xe, Content_nibble_level_2=0x1, user_nibble=0x28

Appendix B: Program property code table (user_nibble operations)

Same as Part 1.

Appendix C: List of reserved words in initial phase of broadcasting

Same as Part 1.

Appendix D: Estimating the amount of all-station SI information

In broadband CS digital broadcasting, each SI is operated independently on each network.

Similar to the all-station SI for BS digital broadcasting, all TSs send the following tables.

- TOT
- BIT
- SDT[actual], SDT[other]
- EIT[p/f actual], EIT[p/f other]
- EIT[schedule actual basic], EIT[schedule other basic]

The rough amount of information is shown for each of the above tables (except for the TOT).

Note that more services are provided by the broadband CS digital broadcasting when compared with the BS digital broadcasting. A possible increase of SI information amount due to the change in the number of services and the number of programs should be estimated as well.

D.1 Network A

D.1.1 Conditions precedent

The conditions precedent that have been set for the estimation are shown below. Many of those conditions are hypothetical, and they do not mean the operations under the pertinent conditions . In addition, the aggregate constraint based on the upper limit of information amount does not apply.
Basically, an excessive amount of information should not be estimated and the realistic expectation should be made.

- ○ Number of TSs included in the network: : 8
- ○ Number of services included in one TS: : 7
- ○ Number of services included in the network: : 56
- ○ Number of programs per service and per day: : 48
- ○ Number of programs per service and per segment: : 6
- ○ Length of program name included in a program: : 80 bytes
- ○ Length of program description included in a program : 160 bytes

As the total amount of information including the EIT[schedule] is greatly affected by TV broadcasting services, the information amount required for digital audio service and data service is not included in the estimation of this total information amount. However, the information amount of SDT and EIT[p/f] should be carefully considered as it generally increases according to the increase of services.

D.1.2 BIT

Approximately 1K to 2K bytes is estimated as its details are difficult to estimate.

D.1.3 SDT

- ● SDT header: 11 bytes
- ○ Service loop
  - ● Service loop header : 5 bytes
  - ● Descriptor loop : 127 bytes
    - ○ Service descriptor
    - ○ Digital copy control descriptor
    - ○ CA contract information descriptor
- ● Total service loop: 924 bytes (=132x7 bytes)
- ● CRC: 4 bytes

Number of bytes of SDT per TS: 939 bytes (=11+924+4 bytes)

Number of bytes of SDT of entire network A: 7,512 bytes (=939x8 bytes)

D.1.4 EIT[p/f]

- EIT header: 14 bytes
- Event loop
  - Event loop header : 12 bytes
  - Total descriptor loop : 378 bytes
    - Short event descriptor
    - Component descriptor
    - Content descriptor
    - Audio component descriptor
    - Digital copy control descriptor
    - CA contract information descriptor
- CRC: 4 bytes

Number of bytes of EIT per program: 408 bytes (=14+12+378+4 bytes)

Number of bytes of EIT[p/f] per service: 816 bytes (=408x2 bytes)

Number of bytes of EIT[p/f] of entire network A: 45,696 bytes (=816x56 bytes)

D.1.5 EIT[schedule basic]

- EIT header: 14 bytes
- Event loop
  - Event loop header : 12 bytes
  - Total descriptor loop : 394 bytes
    - Short event descriptor
    - Component descriptor
    - Content descriptor
    - Audio component descriptor
    - Digital copy control descriptor
  - CA contract information descriptor
  - LDT linkage descriptor
- CRC: 4 bytes

Number of bytes of EIT per program: 406 bytes (=12+394 bytes)

Number of bytes of EIT[sch basic] per segment: 2,454 bytes (=14+406x6+4 bytes)

Number of bytes of EIT[sch basic] per service and per day: 19,632 bytes (=2,454x8 bytes)

Number of bytes of EIT[sch basic] of entire network A: 8,795,136 bytes (=19,632x8x56 bytes)

D.1.6 Conclusion

The above estimation results are concluded in the following table.

Table A-1 Total amount of information equivalent to all-station SI

Table type	Total information amount for broadband CS digital broadcasting of network A
BIT	Approximately 1K to 2K bytes
SDT	Approximately 7.6K bytes
EIT[p/f]	Approximately 45.7K bytes
EIT[schedule basic]	Approximately 8.8M bytes

D.2 Network B

D.2.1 Conditions precedent

The conditions precedent that have been set for the estimation are shown below. Many of those conditions are hypothetical, and they do not mean the operations under the pertinent conditions . In addition, the aggregate constraint based on the upper limit of information amount does not apply.

Basically, an excessive amount of information should not be estimated and the realistic expectation should be made.

- ○ Number of TSs included in the network : 5
- ○ Number of services included in one TS : 14
  (3 for TV service, 4 for audio service, and 7 for data service)
- ○ Number of TV services included in the network : 15
- ○ Number of audio services included in the network : 20
- ○ Number of data services included in the network : 35
- ○ Number of programs per service and per day :48
- ○ Number of programs per service and per segment : 6
- ○ Length of program name included in a program : 80 bytes
- ○ Length of program description included in a program : 160 bytes

D.2.2 BIT

Approximately 1K to 2K bytes is estimated as its details are difficult to estimate.

D.2.3 SDT

- SDT header: 11 bytes
- Service loop
  - Service loop header : 5 bytes
  - Descriptor loop : 251 bytes
    - Service descriptor
    - Digital copy control descriptor
    - CA contract information descriptor
- Total service loop: 3,584 bytes (=256x14 bytes)
- CRC: 4 bytes

Number of bytes of SDT per TS: 3,599 bytes (=11+3,584+4 bytes)

Number of bytes of SDT of entire network B: 17,995 bytes (=3,599x5 bytes)

D.2.4 EIT[p/f]

* The digital copy control descriptor and CA contract information descriptor are entered for PPV programs only. However, they are not included in the estimation as the rate of their entry seems to be limited in the total number of events.

* The length of data content descriptor, included in the data broadcasting service, is estimated to approximately 40 bytes. However, this length may greatly increase or decrease.

D.2.4.1 Digital TV service

- EIT header: 14 bytes
- Event loop
  - Event loop header : 12 bytes
  - Total descriptor loop : 272 bytes
    - Short event descriptor
    - Component descriptor
    - Content descriptor
    - Audio component descriptor
- CRC: 4 bytes

Number of bytes of EIT per program: 302 bytes (=14+12+272+4 bytes)

Number of bytes of EIT[p/f] per service: 604 bytes (=302x2 bytes)

Number of bytes of TV service EIT[p/f] of entire network: 9,060 bytes (=604x15 bytes)

D.2.4.2 Digital audio service

- EIT header: 14 bytes
- Event loop
  - Event loop header : 12 bytes
  - Total descriptor loop : 264 bytes
    - Short event descriptor : 247 bytes
    - Content descriptor : 6 bytes
    - Audio component descriptor : 11 bytes
- CRC: 4 bytes

Number of bytes of EIT per program: 294 bytes (=14+12+264+4 bytes)

Number of bytes of EIT[p/f] per service: 588 bytes (=294x2 bytes)

Number of bytes of audio service EIT[p/f] of entire network: 11,760 bytes (=588x20 bytes)

D.2.4.3 Data service

- EIT header: 14 bytes
- Event loop
  - Event loop header : 12 bytes
  - Total descriptor loop : 143 bytes
    - Short event descriptor : 97 bytes
    - Content descriptor : 6 bytes
    - Data content descriptor : 40 bytes
- CRC: 4 bytes

Number of bytes of EIT per program: 173 bytes (=14+12+143+4 bytes)

Number of bytes of EIT[p/f] per service: 346 bytes (=173x2 bytes)

Number of bytes of TV service EIT[p/f] of entire network: 12,110 bytes (=346x35 bytes)

Number of bytes of EIT[p/f] of entire network B: 32,930 bytes (=9,060+11,760+12,110 bytes)

D.2.5 EIT[schedule basic]

* This value is estimated in the similar way to the EIT[schedule basic] estimation for BS digital broadcasting.
* In this estimation, each of contracted broadcasting companies is assumed to restrict the total amount of information during transmission so that the amount per service and per 8 segments (one day) does not exceed 40 TSP (=5x8 TSP) or 7320 bytes (=183x40 bytes).

D.2.5.1 Digital TV service (total amount for 8 days)

878,400 bytes (=40 TSP x 8 days x 15 services)

D.2.5.2 Digital audio service (total amount for 3 days)

439,200 bytes (=40 TSP x 3 days x 20 services)

D.2.5.3 Data service (total amount for 3 days)

768,600 bytes (=40 TSP x 3 days x 35 services)

Number of bytes of EIT[sch basic] of entire network B: 2,086,200 bytes (=878,400+439,200+768,200 bytes)

D.2.6 Conclusion

The above estimation results are concluded in the following table.

Table A-2 Total amount of information equivalent to all-station SI

Table type	Total information amount for broadband CS digital broadcasting of network B
BIT	Approximately 1K to 2K bytes
SDT	Approximately 17.6K bytes
EIT[p/f]	Approximately 32.2K bytes
EIT[schedule basic]	Approximately 2.0M bytes

D.2.7 Reference

The following estimates the data amount for each-station EIT[schedule] as a reference. In this estimation, the service period consists of 24 days for digital TV service, 5 days for digital audio service, and 5 days for data service. Each of contracted broadcasting companies is assumed to restrict the total amount of information during transmission so that the amount per service and per 8 segments (one day) does not exceed 40 TSP (=5x8 TSP) or 7320 bytes (=183x40 bytes).

464,820 bytes = (40 TSP x (24 days x 15 services + 5 days x 20 services + 5 days x 35 services))

Also, the number of bytes of EIT[schedule actual extended] is estimated as 80 TSP per service and per 8 segments (one day).
13,468,800 bytes (=80 TSP x (32 days x 15 services + 8 days x 20 services + 8 days x 35 services))

Therefore, the total number of bytes of each-station EIT[schedule] is approximately 13.3M bytes.

Appendix E: Character set used in SI

Same as Part 1.

Appendix F: Requests for integrated operation and display (draft)

Same as Part 1.

Appendix G: Expected item names

Same as Part 1.

Reference Material

Reference (PSI/SI Receiver Guideline)

The PSI/SI receiver guidelines that relate to the BS digital receivers are as that described in Part 1 of this Guide. For the PSI/SI receiver guidelines that relate to the broadband CS digital broadcasting receivers, see the relating sections in Part 2 of this Guide.

(This page is intentionally left blank.)

Volume 5

Broadband CS Digital Broadcasting Operation Rules for the Conditional Access System (CAS) and Receiver Specifications

Contents

1 Introduction

1.1 Preface

The conditional access system in the broadband CS digital broadcasting is provided according to the Ministry of Internal Affairs and Communications ordinance and announcements and the provisions in Part 1, "Reception Control System (Conditional Access System)," "Conditional Access System Specifications for Digital Broadcasting" (ARIB STD-B25, Part 1) defined by the Association of Radio Industries and Businesses (hereinafter, referred to as ARIB).

This volume defines the required specifications and operational specifications for receivers by providing supplement to Part 1, ARIB STD-B25. For information on any item not described in this volume, see Part 1, ARIB STD-B25.

1.2 Purpose

This volume defines signal transmission standards and receiver specifications for broadband CS digital broadcasting in conformity with Part 1 of ARIB STD-B25 "Conditional Access System for Digital Broadcasting."

1.3 Scope

This standard document is applied to the transmission operation and receiver specifications associated with the conditional access system of the broadband CS digital broadcasting.

2 Related Documents

(1) Telecommunication Technology Council Advisory Report No.17
(2) Telecommunication Technology Council Advisory Report No.74
(3) 2003 The Ministry of Internal Affairs and Communications Ordinance No. 26
(4) 2003 The Ministry of Internal Affairs and Communications Announcement No. 36
(5) 2003 The Ministry of Internal Affairs and Communications Announcement No. 37
(6) 2003 The Ministry of Internal Affairs and Communications Announcement No. 40
(7) ARIB STD-B10, "Service Information for Digital Broadcasting System"
(8) ARIB STD-B20, "Transmission System for Digital Satellite Broadcasting"
(9) ARIB STD-B21 "Receiver for Digital Broadcasting"
(10) ARIB STD-B25, "Conditional Access System Specifications for Digital Broadcasting", Part 1
(11) ARIB STD-B24 "Data Coding and Transmission Specification for Digital Broadcasting"

3 Terms and Abbreviation

Table 3-1 Terms and abbreviation description

ARIB (Association of Radio Industries and Businesses)	Association of Radio Industries and Businesses. This institution standardizes and regulates technologies related to the use of radio waves in Japan. Broadcasting companies, telecommunications carriers, and manufacturers belong to this association.
CA (Conditional Access) system	Conditional Access System. CAS is defined as a system that controls reception of services (service channels) and events (programs).
CAT (Conditional Access Table)	Specifies a packet identifier of the TS packet which transmits individual information from relevant information which comprises broadcast with conditional access.
Component	Component. Elements making up events (programs), such as video, audio, characters, and various types of data.
Descriptor	Descriptor. Description areas which are allocated in a table to convey various types of information.
ECM (Entitlement Control Message)	Commonly shared information which consists of program information (information related to programs and keys for descrambling) and control information (forcible on/off order for the decode scrambling function).
EIT (Event Information Table)	Event information table. Information related to programs is described, such as the program name, broadcasting date and time, and contents of programs.
EMM (Entitlement Management Message)	Individual information, which includes contract information for each subscriber and work keys to decode commonly shared information.
ES (Elementary Stream)	Elementary stream. ES is defined as the coded video, audio or independent data in PES packet. One ES is transmitted in a sequence of PES packets with the same stream ID.
Event	Event. A set of streams whose start and end time are determined in the same service (organization channel), such as news and dramas.
PID (Packet Identifier)	Packet ID (Identifier). This is 13-bit stream identification information, indicating an attribute of individual stream of a corresponding packet.
PMT (Program Map Table)	Specifies a packet ID of the TS packet which transmits each coding signal which comprises programs and commonly shared information from pay broadcasting related information.
PPV (Pay Per View)	Pay per View. PPV is the system for chargeable broadcasting, in which viewers pay for individual program or program group according to their viewing style.
SDT (Service Description Table)	Service description table. Information related to the organization channel is described, such as the organization channel name and broadcaster name.
Automatic displayed messages	Messages which are EMM messages sent for each IC card and stored in the IC card. These messages are simultaneously displayed during the reception of programs.
Mail	Messages which are EMM messages sent for each IC card and stored in the receiver. These messages can be called arbitrarily based on user operations.
Parental control (Access restriction based on age)	Based on the parental rate described as a program property (access restriction rate) and the parental level which is set on the receiver by a user (minimum access age), this mechanism restrict access to programs using a password (security code).

Parental control level (Minimum access age)	Data which is set as minimum access age to the receiver to achieve the parental control (access restriction based on age).
Password (Security code)	Confirmation code which is used for the parental control (access restriction based on age) or the purchase limit control function for PPV programs. This consists of 4-digit number.
CA alternative service	CA alternative service is a service that directs viewers to “Information channels” operated by broadcasting companies when scrambled channels are selected and the viewer is not a subscriber to the service.
Conditional access broadcasting	Broadcasting which uses conditional access system descriptors. Conditional access broadcasting includes pay programs, broadcast using EMM messages, and free program with content protection.
Pay program	Programs for which the default ES group is to be charged. Programs which are described in the SDT and EIT with free_CA_mode=1.
Free program	Programs for which the default ES group is not to be charged. Programs which are described in the SDT and EIT with free_CA_mode=0.
Protected free program	Protected free program is defined as a free program for secure content transmission that ensures content right protection without customer management.

4 Required Specification of the Receiver

4.1 Configuration of the Receiver

Same as Part 1.

4.2 User Interface

Same as Part 1.

4.3 Memory

- The following NVRAM is required in relation to the conditional access service of the BS and broadband CS dual-purpose digital receiver:
  1) 19.2K byte or more space for mail reception. In addition, 19.2K byte is the size required to store a maximum of 24 800-byte mails.
  2) To confirm resent mail using a message ID, it is necessary to store 13 message IDs and the reception time for each company. There are more than 32 broadcasters.
  3) Due to power-on control management and power-on call control in each broadcaster (a maximum of 32 records), in some cases, an additional memory might be needed, depending on design of the receiver, such as a control example of power-on control shown in Reference 2 3.12.2 of Part 1 of the ARIB STD-B25. However, its size and implementation method can be determined by the receiver.
  4) If the function described in 4.10.5 PPV purchase record and display is to be installed as an optional function, the purchase history should be recorded on the NVRAM.
- From the viewpoint of protecting personal information used in CAS (leakage prevention) when the receiver is transferred or disposed of, there should be a function to delete personal information stored on the NVRAM in relation to conditional access.
- If personal information related to conditional access is password-protected, it is desirable to erase (delete) it after entering the password.
- See the related description in Part 2 of this document, 4.13.10 Clear Function of Personal Information of this standard.
- Regarding the functions defined in this volume, the personal information to be deleted is as follows:
  1) PPV-related information
     (1) PPV monthly purchase upper limit amount (see 4.10.3 of this volume)
     (2) PPV per-program purchase upper limit amount (see 4.10.4 of this volume)
     (3) PPV purchase record (see 4.10.5 of this volume)
  2) EMM mail (see 4.14 of this volume)
  3) Parental control-related information
     (1) Parental level (see 4.15.2 of this volume)
     (2) Password (see 4.15.3 of this volume)

4.4 Power Saving

Same as Part 1.

4.5 Power-on Control

4.5.1 Function overview

In addition to the contents in Part 1, the following contents should be considered in the BS and broadband CS digital-broadcasting dual-purpose receivers.

- Power-on control is not always conducted only in the TS in the network which has received the corresponding EMM. It is possible for the TS to be designated to control power-on in another broadband CS digital network. The receiver must take this point into account. For example, when a single broadcaster operates both broadband CS digital broadcasting and BS digital broadcasting, this type of operation can be considered.
- When the CA_EMM_TS descriptor is described in the NIT, network_id of the original network shall be always designated.
- During the period of power-on control, it is desirable to obtain not only the EMM but also EMM messages.

4.5.2 Related standards

Same as Part 1.

4.6 Power-on Call Control

4.6.1 Function Overview

Same as Part 1.

4.6.2 Related standards

Same as Part 1.

4.7 Priority in Operations in Waiting

Same as Part 1.

4.8 Viewing Control for Protected Free Programs and Pay Programs

4.8.1 Viewing process

Same as Part 1.

4.8.2 Related standards

Same as Part 1.

4.9 Reservation for Pay Programs

4.9.1 Function overview

- Reservation for programs should be processed with no regard to whether a program is chargeable or not. It is desirable that pay broadcasting be included in the function scope when the receiver is equipped with a program reservation function.
- To determine whether a pay program to be reserved can be viewed or not, the CA contract information descriptor is used from the SDT or EIT. Then, contract confirmation command/response provides the IC card with information of whether the program is viewable, recording control, and viewing format. The viewing format can be judged through the return code. When this view format is PPV, a response from the IC card includes PPV viewing charge 1, PPV viewing charge 2 when recording purchase is allowed, and reservation purchase due. Reservation purchase due refers to the end of the period during which the PPV purchase command can be accepted. Specifically, the offset time after the program starts is described. For example, when the program starts, it is raining, and this prevents program from being viewed. In this case, at the point of reservation, it is understood that it is impossible to purchase the program after reservation purchase due once the program begins.
- During program reservation, it is considered to be possible to reserve a program unconditionally when no CA contract information descriptor is placed and free_CA_mode is set to 0 in the SDT or EIT. (Free program)

  However, the insertion of an IC card is still required to receive a program because it could be a protected free program. Therefore, it is desirable to display a message prompting for insertion of a valid IC card if no IC card or an invalid IC card is inserted at the time of reservation of a free program.
- It is impossible to reserve a program when there is no CA contract information descriptor and free_CA_mode is 1.
- The CA contract information descriptor defines contract confirmation information of the entire service in the SDT and that of each program in the EIT. When this descriptor is defined both in the SDT and in the EIT, the definition in the EIT is given a priority.
- Even when a response from the IC card by the corresponding CA contract information descriptor indicates non-contract in a program to be reserved and when the link descriptor for the CA alternative service for the corresponding service is described in the SDT, the CA alternative service is not launched.

4.9.2 Cancellation of a reserved program

Same as Part 1.

4.9.3 Related standards

Same as Part 1.

4.10 PPV Viewing Process

4.10.1 Function overview

Same as Part 1.

4.10.2 Related standards

Same as Part 1.

4.10.3 PPV monthly purchase upper limit control

Same as Part 1.

4.10.4 One PPV program purchase upper limit control

Same as Part 1.

4.10.5 PPV purchase record and display

Same as Part 1.

4.10.6 Billing for each component

4.10.6.1 When the group of default ES is to be charged

Same as Part 1.

4.10.6.2 When the group of default ES is free

Same as Part 1.

4.11 Copy Control in Pay Broadcasting

4.11.1 Recording control information

Same as Part 1.

4.11.2 Copy control in the flat/tier contract

Same as Part 1.

4.11.3 Copy control in PPV

Same as Part 1.

4.11.4 Copy control in PPV for which recording can be purchased

4.11.4.1 Basic concept

Same as Part 1.

4.11.4.2 Transmission rules and receiver process in PPV for which recording can be purchased

Same as Part 1.

4.12 Transmission of Viewing History Information

4.12.1 Function overview

Same as Part 1.

4.12.2 Retry over notification function

Same as Part 1.

4.12.3 User call request function

Same as Part 1.

4.12.4 Viewing history information upload date and time notification function

Same as Part 1.

4.12.5 Related standards

Same as Part 1.

4.13 Automatic Displayed Messages

4.13.1 Basic operations

Same as Part 1.

4.13.2 Related standards

Same as Part 1.

4.13.3 Display

Same as Part 1.

4.13.4 Automatic displayed messages for playback of accumulated programs on receivers with accumulation function

Same as Part 1.

4.14 Mail Display

4.14.1 Basic operations

- This function is a required function for CAS.
- Similar to automatic displayed messages, a mail consists of EMM individual messages (IRD accumulated messages) and EMM common messages.
- Different from automatic displayed messages, a mail message is stored not in the IC card but in the receiver.
- In some cases, EMM individual messages are encrypted, but in other cases, are not. When EMM individual messages are encrypted, the messages are decrypted using the IC card and finally are stored in the receiver.
- To identify whether an EMM message is a mail or automatic displayed message, message control of the non-encrypting header in the message body is referenced in the EMM individual message section. If it indicates “IRD accumulation (0x02)”, that message corresponds to a mail.
- When an EMM individual message is encrypted, using the EMM individual message reception command/response, the receiver sends message code areas to the installed IC card and obtains a response message code. When the length of the message code area is greater than the split message length which is obtained by the initial setting command, the area is split according to the split message length and these split sections are sent to the IC card in order. In the last command, only extra section is sent.
- The contents of the response message code area is as follows:

Table 4.14-1 Mail response message code area

Items in the message code area	Description	The number of bits
Reserved	Reserved	16
Reserved	Reserved	16
fixed_message_ID	Message fixed format number	16
extra_ message_format_version	Difference format number	8
extra_message_length	Difference information length	16
extra_message_code	Difference information	N
stuffing	Stuffing	M*

*: In the case of the IRD accumulated message, stuffing is not sent (0 byte).

When split messages are sent, obtained response message codes are connected and used.

Difference information length represents valid difference information length.

- Some mails have fixed formats and others have no fixed formats (message fixed format number = 0). If there is a fixed format, the receiver first receives the corresponding EMM common message from the message fixed format number. Next, the received EMM common message information and difference information of the EMM individual message are combined. Then, the mail body are combined and stored.
- The receiver memorizes at least 24 mails. Mails are stored in the NVRAM. The maximum size of a mail is 800 bytes. Therefore, it is necessary to secure a minimum of 19.2k bytes in the memory for mails. When a mail with the size exceeding a memory capacity is received, mails with the least recent reception date can

be deleted. In addition, in the receiver, mails can be managed based on the reception date which indicates when the mails are accumulated in the receiver with no regard to whether the mails are from the BS or broadband CS network.

- The maximum size of a mail is no more than 400 double-byte characters and 800 bytes. The display method (the number of characters displayed in one line or display with page break) is arbitrarily determined by the receiver.
- It is desirable that the receiver is equipped with a display function which means “Get message” to users. “Get message” indicates the case in which unread mails are stored.
- A mail consists of EMM individual messages and EMM common messages. When the messages are stored, the receiver considers that mail reception has been completed and notifies users through the notification method described above.
- Even if an IC card with a different card ID from when the mail was memorized is installed, the receiver units will not delete the memorized mail. Additionally, even if an IC card with a different CA_system_id from when the mail was memorized is installed, the receiver units will not delete the memorized mail. (The most recent 24 or more mails are memorized on the receiver unit.)
- Even if an IC card with a different card ID from when the mail was memorized is installed, the display processing is arbitrarily determined by the receiver. The following processes are assumed.

  Example 1: A mail with a different card ID is not displayed.

  Example 2: A mail with a different card ID is not displayed. However, if a mail with a different card ID is accumulated, users are notified of this.

  Example 3: With no regard to an equipped card ID, all accumulated mails are displayed.
- Whether read mails are deleted by user operation or not is arbitrarily determined by the receiver.
- For mail, the resending check of the same mail is done by using the broadcaster identifier with the message ID described in the EMM individual message section. The receiver units should be provided with a mechanism that prevents deleted mail from being acquired again by, for example, memorizing the identification ID of the deleted mail after confirming the contents (message ID and broadcaster identifier) to prevent the same mail from being received again. When IC cards with different CA_system_id from previously installed IC cards are installed, the receiver units may reset the message ID management data such as the identification ID of the memorized mail (message ID and broadcaster identifier).
- When a received mail is used as a title, approximately first 10 characters are used.
- Mail display can be arbitrarily determined by the receiver. However, it is desirable to display a mail in the center of the screen with easy-to-read font size.

4.14.2 Related standards

Same as Part 1.

4.14.3 Message ID processing

- The receiver provides 13 areas to store message IDs and reception time for each broadcaster.
  (13 areas mean ensured 2N-1 areas. N: Messages that can be concurrently transmitted by the broadcaster (number of mails). In the BS digital broadcasting, N is set at N=4. In the broadband CS digital broadcasting, N is set at N=7.
- For areas whose reception time indicates that a mail was received 15 days ago, the transmission period is considered to end and the contents are deleted.
- When all information in the 13 areas is occupied and the new 14^{th} message (mail) is received, the message ID and reception time are overwritten in the area with the least recent time.
- For the transmission period and receiver operation examples, see Part 1 of this document and read the section of the 7 message ID process as if the 13 message ID process were described for the BS digital-broadcasting receiver.

4.15 Parental Control (Access Restriction Based on Age)

4.15.1 Function overview

Same as Part 1.

4.15.2 Parental level (minimum access age)

Same as Part 1.

4.15.3 Password (security code)

(1) Digit number of the password
  - The password consists of 4-digit decimal number.

(2) Deletion of the password
  - To delete the password, a function with the IC card order via the EMM is required. When data is received while the password input screen is being displayed, the screen display is immediately erased. In addition, the deletion method other than this method can be arbitrarily determined by the receiver.
  - To delete the password via the EMM, users request customer centers in which they are registered to delete the password. Then, the EMM for deletion is received in the receiver, and based on the IC card instruction, “password deletion” is set. In this case, the password is deleted.
  - Whether the message indicating that the password has been deleted is displayed after the deletion of the password or not can be arbitrarily determined by the receiver.
  - When any function to use the password other than the functions described in Part 1 and Volume 5 of Part 2 of this document is installed to the receiver, the method to delete the password using any other function than the EMM shall be implemented, considering the use by people who have not subscribed

pay broadcasting services. The implementation method depends on receiver.

4.15.4 Restriction release state

Same as Part 1.

4.15.5 Display of information for programs for which viewing access is controlled

Same as Part 1.

4.15.6 Related standards

Same as Part 1.

4.16 Valid/Invalid/Unavailable IC Cards

- Valid IC cards must obtain a response for ca_system_id and system_management_id listed as the initial setting commands in Part 1 of ARIB STD-B25 and described in Volume 7, Part 1 of this guideline.
  In other words, for system_management_id, at least a response of an identification value applied to the BS digital method is included, the IC card becomes valid. In addition to an identification value applied to the BS digital method, if system_management_id, which indicates the broadband CS digital broadcasting, is included in a response, the IC card is also valid.
- Invalid IC card means IC cards which do not meet the requirements for IC cards and with the card type of “00” (prepaid card, which is not included due to operational reasons).
- Even if the IC card is valid, when the return code is A1FF or A102, the IC card is regarded as invalid. Therefore, this document considers that the IC card cannot be used.
- When a receiving program is scrambled, and if the IC card is invalid or the card is not accepted, error messages described in 4.18 Error Notification Display of this volume is displayed.
- When a receiving program is non-scrambled and service_id of the selected channel is described in the CA service descriptor which is described in the CAT, and if the IC card is invalid, the operation, which is described in 4.19 Operation When Valid IC Cards are Not Inserted of this volume, is performed. When the card is not accepted, error messages described in 4.18 Error Notification Display are displayed.

4.17 IC Card Information Display

4.17.1 Function overview

Same as Part 1.

4.17.2 Related standards

Same as Part 1.

4.18 Error Notification Display

4.18.1 Function overview

Same as Part 1.

4.18.2 Related standards

Same as Part 1.

4.19 Operation When Valid IC Cards are Not Inserted

4.19.1 Error message display when valid IC cards are not inserted

Same as Part 1.

4.19.1.1 Conditions for displaying error messages

Same as Part 1.

4.19.1.2 Display method

Same as Part 1 except for the following items that should be modified.

- When an EMM common message is to be acquired when an IC card has not been inserted, the corresponding EMM message should be acquired by using the CA_system_id for the default message code described below.
- The default message should be defined with the corresponding EMM individual messages in this service. That means, the receiver should issue the reception command for the EMM individual message to the IC card in response to the broadcaster identifier of the CA service descriptor and process assuming that it has received the following message code from the IC card.
- The default message code should be as follows.

Expiration date	:	0xFFFF
Message fixed phrase number	:	The upper bytes represent this broadcaster identifier; the lower bytes are fixed to 0x01.
Difference format number	:	0x01
Difference information	:	0x00 (no information)
CA_system_id	:	See Volume 7 of this document.

- As with the automatic displayed messages described in Section 4.13, use moderate colors for characters or frame so that they do not interfere program viewing.
- Specification of ON/OFF control of the display and other display specifications for 4.13 Automatic Displayed Message should be also applied.
- If the program video can be displayed for free programs, this error message should be superimposed on the

view screen.

4.19.2 Conditions of fixed format when IC cards are not inserted for sending side

Same as Part 1.

4.19.3 Others

Same as Part 1.

4.20 System Test

4.20.1 IC card test

Same as Part 1.

4.20.2 Telephone line connection test

Same as Part 1.

4.21 IRD Data Transmission

Same as Part 1.

4.22 CA Alternative Service

4.22.1 Function overview

Same as Part 1.

4.22.2 Basic operation

- This function is a required function for CAS in broadband CS digital broadcasting.
- The flow of the CA alternative service process when the link destination service is a service with supplemental data broadcasting is shown below. Note that the flow after moving the link destination service ((6)(7)(8)) is shown as an example.

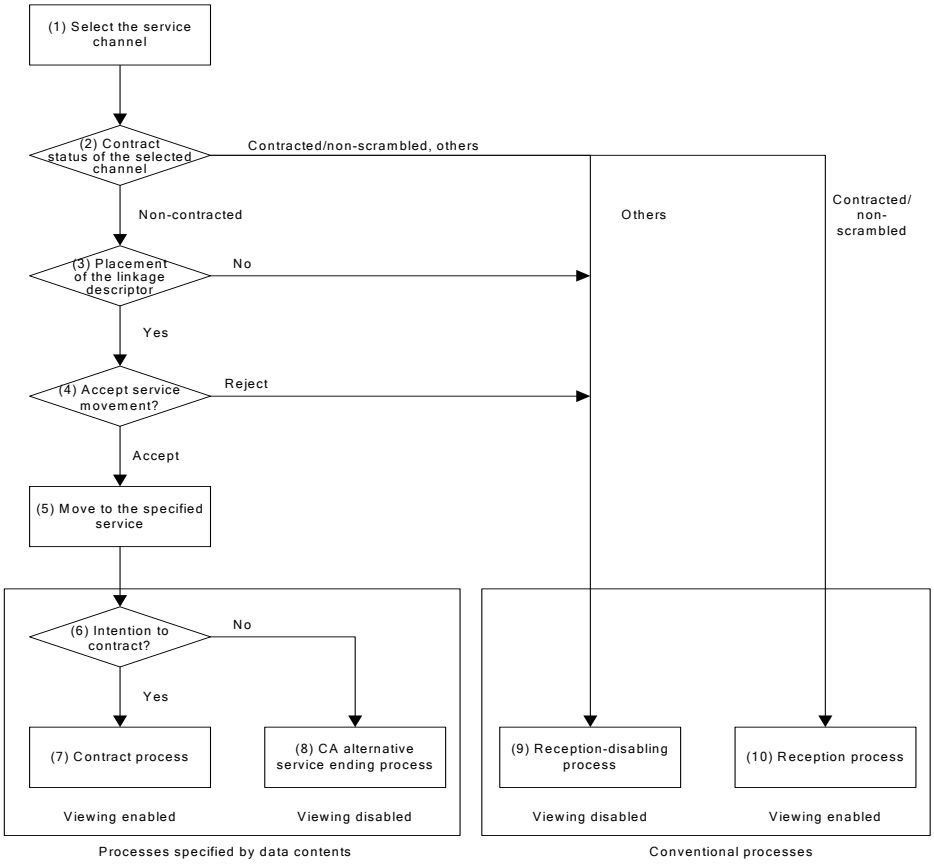


Figure 4.22-1 Example of flow of the CA alternative service process

(1) The viewer selects the non-free channel (service) delivered by the broadcaster.

(2) As with the typical channel-selection operation, the ECM confirms the contract status.

1) If no contract is made for the channel, the CA alternative service process is performed (from Step (3)).

No contract means that the received program is scrambled and the return code from the IC card in response to the ECM reception command applies one of the following in the Table below.

Table 4.22-1 Return code for no-contract status

Return code	Detailed status
A103	No-contract (no Kw)
8901	No-contract (Out of the scope of the contract; tier)
8902	No-contract (Expired; tier)
8301	No-contract (Out of the scope of the contract; Deferred payment PPV)
8302	No-contract (Expired; Deferred payment PPV)
8501	No-contract (Out of the scope of the contract; Prepaid PPV)
8502	No-contract (Expired; Prepaid PPV)

If no IC card is installed, if the installed IC card is invalid or unusable, or if there is a mismatch between the CA_system_id described in the PMT of the corresponding program and the CA_system_id acquired in the response from the IC card, regular error handling should be carried out without treating it as a non-contract case.

2) In case of contracted/non-scramble and in other cases, conventional reception process ((10)) of reception-disabling process ((9)) is performed.

(3) Confirm whether the linkage descriptor is placed in the SDT or not.

1) If the linkage descriptor is placed, confirmation process of service transfer is performed ((4)).

2) If the linkage descriptor is not placed, conventional reception-disabling process is performed ((9)).

Note: Linkage descriptor "linkage_type=0x03" represents the CA alternative service.

(4) A movement confirmation message that is described in the linkage descriptor and is specific to the broadcaster (hereafter referred to as movement confirmation message) or a message stored in the receiver is displayed for the viewer to accept and confirm to move to the link destination service. The movement confirmation message is described in private_data_byte of the linkage descriptor. If there is no description in private_data_byte in the linkage descriptor of the CA alternative service, a stored message (“Subscription/registration is required to view this program. Details are found in the Information channel”) is displayed.

1) If the viewer accepts to move to the link destination service, service transfer process ((5)) is performed.

2) If the viewer rejects to move to the link destination service, conventional reception-disabling process ((9)) is performed.

Note:

- f an option to exit this screen (reject movement) is to be provided, the regular non-contract process shall be performed.
- If an option to exit this screen (reject movement) is not to be provided, staying at that screen is allowed. (The viewer should be able to exit that screen by selecting a channel.)

3) If more than one movement confirmation message number (hereafter referred to as a message number) is used in the SDT of the receiving TS due to the specification of the transmitting side of the CA alternative service, at least one message body is transmitted in that TS while the identical

message body can be omitted. In this case, the message should be displayed by referencing the body of the same message number. As an exception handling, if the message body is not defined in the same TS, the stored message should be displayed.

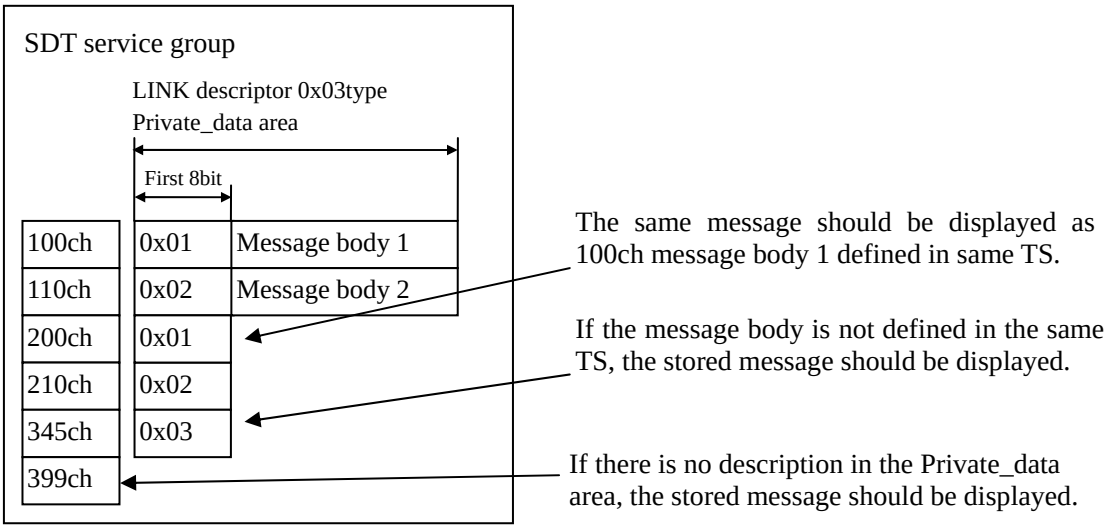
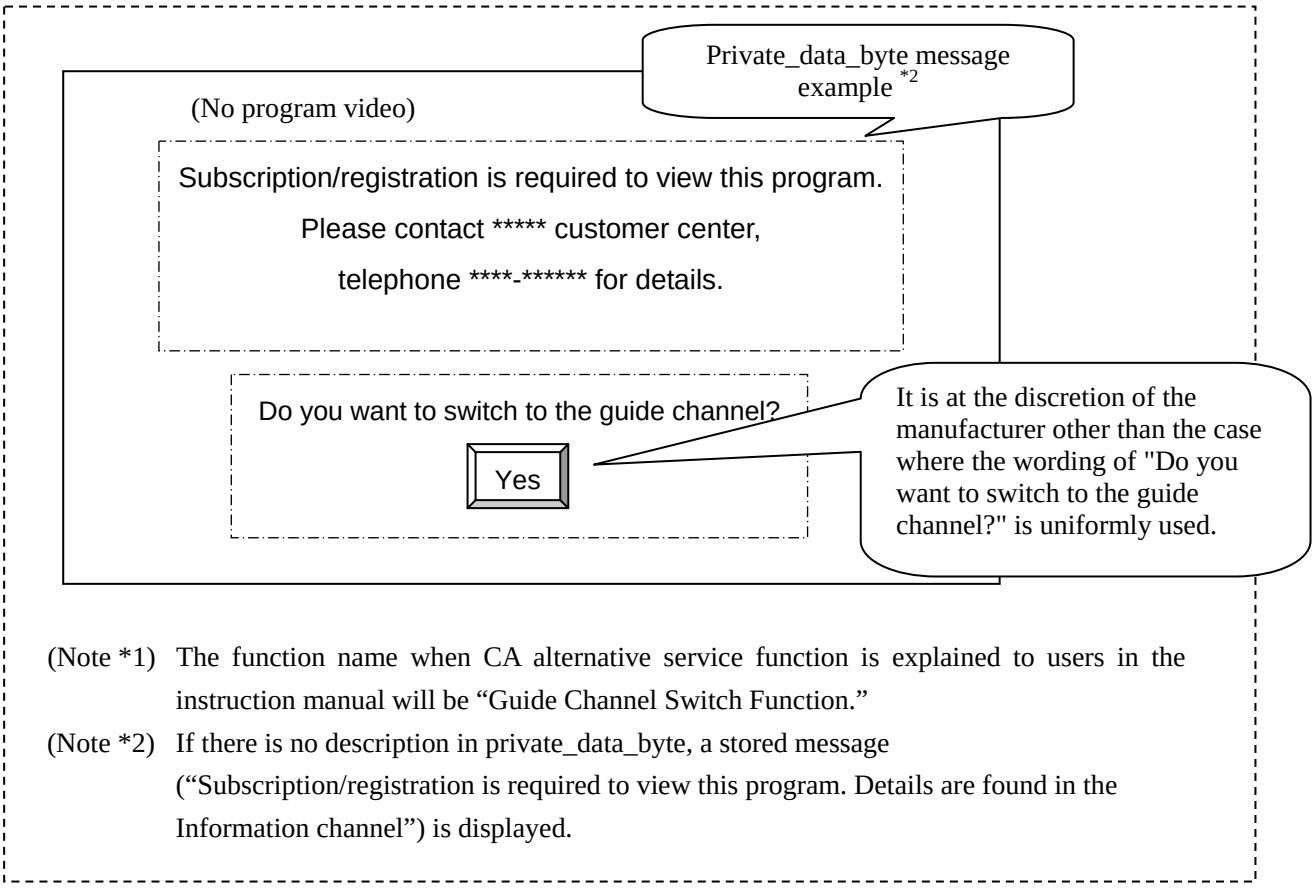


Figure 4.22-2 Example of operation of the CA alternative service and receiver process

4) The movement confirmation message should be up to 80 characters and 160 bytes. It should be assumed that a maximum of 24 characters per row and up to 6 rows (including line feed) are displayed.

5) If the linkage descriptor is placed, a movement confirmation screen as shown in the example below should be displayed other than the message that is described in private_data area of the linkage descriptor. The text displayed on this screen should be stored in the receiver in advance, and it should be read, “Do you want to switch to the guide channel?” Display of the frame and others should be optional by the receiver manufacturers.

An example of a movement confirmation screen is shown below.



(Note *1) The function name when CA alternative service function is explained to users in the instruction manual will be “Guide Channel Switch Function.”

(Note *2) If there is no description in private_data_byte, a stored message (“Subscription/registration is required to view this program. Details are found in the Information channel”) is displayed.

Figure 4.22-3 Example of movement confirmation screen to the CA alternative service*1

(5) Obtain the service information of the link destination from the linkage descriptor of the SDT and move to that service.

The viewer should be moved to the link destination service according to original_network_id/transport_stream_id/service_id.

<Examples of processes specified by data contents (6)(7)(8)>

(6) Confirm the intention of the viewer to contract in the program of the link destination service. Method of confirmation may vary depending on the non-free broadcasting companies.

1) When the viewer intends to contract: Contract process is performed ((7)).

2) If the viewer does not intend to contract: Closing process of the CA alternative service ending process ((8)).

(7) Contract process with the viewer is performed. The method of contract process may vary by the non-free broadcasting companies, such as online processing using the data broadcasting or offline processing by sending an agreement documents by mail. After the process is completed, the viewer shall not return to the link source service.

(8) Ending process of the CA alternative service is performed. After the process is completed, the viewer shall not return to the link source service.

<Conventional processes (9)(10)>

(9) As with the typical reception-disabling operation, reception-disabling process is performed.

(10) As with the typical reception operation, the channel selection service is received.

- The receiver should display the movement confirmation screen by starting the CA alternative service when the "viewer selects the non-contract service channel directly or with EPG or up-down keys. However, the CA alternative service should not be started if the following conditions are met.
  1) The viewer has already contracted with the non-free broadcasting company. (Case other than non-contract case described in (2) above.)
  2) The service channel selected by the viewer is operated in non-scramble.
  3) The service type (service_type) of the link destination service is not supported by the receiver.
  4) The link is specified to the service that is not the target channel of the receiver (for example, services within the network that cannot be received by the receiver).
- The CA alternative service should not be started for the services at the reservation setting such as when the viewer attempts to reserve the non-free broadcasting service that is not subscribed.
- Because the SDT has longer transmission cycle than PMT, it is expected that it takes longer time to receive the SDT to check the linkage descriptor and then display the movement confirmation screen. Therefore, after this service channel is selected, the receiver may be allowed to display the non-contract message stored in the receiver for a moment and then immediately switch to the movement confirmation screen. To avoid such operation each time when selecting the channel, it is recommended that the receiver should cache the SDT in RAM and display the movement confirmation screen immediately after this service channel is selected.
- For a guideline of caching, the number of types of the CA alternative message that are concurrently sent should be up to 20 in the broadband CS digital broadcasting, and CA alternative message numbers to be used should be 1 to 20 (0x01 to 0x14). As an exception handling, if the CA alternative message number other than these is sent, the receiver should regard it as invalid and display the stored message. Considering the consistency with the version 2.0 of this document, BS and broadband CS digital-broadcasting dual-purpose receivers that support only the CA alternative service for the broadband CS broadcasting do not need to handle the CA alternative message number 21 to 40 (0x15 to 0x28) as invalid even if these numbers are transmit via the broadband CS. For the dual-purpose receivers that support also the CA alternative service for the BS digital broadcasting, it is recommended that they process the message numbers 1 to 20 transmitted via the BS and numbers 21 to 40 transmitted via the broadband CS as invalid.

- After the ending process following the movement to the link destination service due to the CA alternative service ((7) or (8) above), the viewer should not return to the link source service but remain in the status with the link destination service selected. In addition, if the link destination service is a video service or audio service without data components, the viewer should not return to the link source service but remain in the status with the link destination service selected. The viewer should be able to move to another channel by selecting it.
- If the display condition of the movement confirmation screen is met and the screen is displayed, it does not need to disappear until the user performs the confirmation operation. Even if the display condition changes and becomes unsatisfied while the screen is being displayed, it does not need to automatically disappear, but may continue to be displayed. In this case, however, the link condition is still valid, and should allow the user to move to the link destination when the user accepts the movement.
- If the link destination service is the service with the supplemental data, the link source service should be obtained with the linkage descriptor on the data contents and link type should be obtained with the linkage descriptor when a link is established. For details of these DOM APIs to the BML document, see ARIB STD-B24.

4.22.3 Related standards

The same as Part 1.

4.23 Scramble and Display Priorities of Subtitles and Captions

4.23.1 Subtitle

Same as Part 1.

4.23.2 Captions

Same as Part 1.

4.24 Effective conditional access system (Consistency confirmation of CA_system_id between IC cards and broadcast waves)

Same as Part 1.

5 Operation Information

5.1 Conditional Access Broadcasting

Same as Part 1.

5.2 Chargeable Units (Chargeable ES)

Same as Part 1.

5.3 Non-scramble/Scramble

5.3.1 Summary

Same as Part 1.

5.3.2 Operation of subtitles and captions

Same as Part 1.

5.4 Free Program/Pay Program

5.4.1 Definitions of a free program/pay program

- A program with “free_CA_mode” value of “0” in the SDT or EIT should be defined as a free program, while a program with “free_CA_mode” value of “1” as a pay program.
- A program whose group of default ES are non-chargeable is called a free program. A program whose group of default ES are chargeable is called a pay program. However, ES other than the group of default ES may be chargeable in a free program.
- A group of default ES is defined for each service type.

  Example: For digital TV service

  Group of default ES = Default video ES and default audio ES

Table 5.4-1 Groups of default ES in conditional access broadcasting

	service_type	Group of default ES
0x01	Digital TV service	Video, audio
0x02	Digital audio service	Audio
0xc0	Data service	Data (entry component)
0xA1	Provisional image service	Video, audio
0xA2	Provisional audio service	Audio
0xA3	Provisional data service	Data (entry component)
0xA5	Promotion image service	Video, audio
0xA6	Promotion audio service	Audio
0xA7	Promotion data service	Data (entry component)
0xA8	Preliminary accumulation data service	Data
0xA9	Accumulation only data service	Data
0xAA	Bookmark list service	Data (entry component)

5.4.2 Operations

Same as Part 1.

5.4.2.1 Free program

Same as Part 1.

5.4.2.2 Pay program

Same as Part 1.

5.4.3 Protected free program

Same as Part 1.

5.4.3.1 Definition

Same as Part 1.

5.4.3.2 Operations

Same as Part 1.

5.4.4 Operable combinations of pay, free, scrambled, and non-scrambled programs

Same as Part 1.

5.5 Setup of Parental Rate

Same as Part 1.

5.6 Conditional Access System Descriptor

5.6.1 Function

Same as Part 1.

5.6.2 Data structure

Same as Part 1.

5.6.3 Operations

- When the same CA_system_id is used for the conditional access system descriptors in the CAT, it is described only once.

- The number of conditional access system descriptors for CA_system_id to transmit EMMs in the relevant TS is described in the CAT.
- The number of conditional access system descriptors for CA_system_id used by relevant programs is described in the PMT.
- When a component of a program is chargeable, a valid ECM (ECM_PID ≠ 0x1FFF) should be specified using a conditional access system descriptor described in the PMT. The placement of the conditional access system descriptor is as follows:
  1) When the conditional access system descriptor is placed in the first loop of the PMT, the relevant ECM is used for all components in the program.
  2) When the conditional access system descriptor is placed in the second loop of the PMT, the relevant ECM is used only for the relevant component.
  3) When the conditional access system descriptor is placed in the first and second loops of the PMT, the ECM in the second loop is valid.
  4) When multiple conditional access system descriptors are described, the number of conditional access system descriptors described in the first and second loops and the described CA_system_id are the same.
- The conditional access PID can be set to 0x1FFF.
  - When the conditional access PID is set to 0x1FFF in the PMT, it means that the relevant ES is not scrambled (not chargeable).
  - When the conditional access PID is set to 0x1FFF in the CAT, it is ignored by the receiver units. (Exceptional guideline)
- Pay/free programs are distinguished using free_CA_mode.
  1) Free program : free_CA_mode=0
  2) Pay program : free_CA_mode=1

  Note: The conditional access system descriptor (ECM_PID=0x1FFF) is applied to the first loop of the PMT only if a parental rate is set for a free program.
  For pay programs, ECM_PID=0x1FFF is applied to the second loop only for non-chargeable components other than those in the group of default ES.

- The first byte of the data described in the private_data_byte area of the conditional access system descriptor is as follows:
  (The second byte and subsequent bytes will not be used at the moment.)
  A) When it is described in the PMT: Parental rate
  Definition of parental rate values is described as follows:

0x00	No specification.
0x01 to 0x11	Limited age + 3
0x12 to 0xFF	Specified by the broadcaster (Not used at the moment.)

B) When it is described in the CAT: EMM transmission format identification

0x00	Undefined
0x01	TypeA
0x02	TypeB
0x03 to 0xFF	Reserved for future use

- The parental rate is valid only if the conditional access system descriptor is described in the first loop of the PMT. (Prohibition of parental rate definition for each stream)
- The receiver units ignore the first one byte (parental rate value) of the data area of the conditional access system descriptor described in the second loop of the PMT.
- Parental rate should be used only by the non-free broadcasting companies. This is because only the viewer that subscribed in the non-free broadcasting service can send the EMM for deletion when deleting the security code with the EMM.

5.7 Transmission of CAT

5.7.1 TS/PID to be transmitted

Same as Part 1.

5.7.2 Data structure

Same as Part 1.

5.7.3 Descriptors to be transmitted and their structures

Same as Part 1.

5.7.4 Transmission interval

Same as Part 1.

5.7.5 Update interval

Same as Part 1.

5.8 ECM

5.8.1 ECM identification

Same as Part 1.

5.8.2 ECM data structure

Same as Part 1.

5.8.2.1 Section format

Same as Part 1.

5.8.2.2 ECM main body

Same as Part 1.

5.8.3 ECM applications

Same as Part 1.

5.8.4 Change of ECM application

Same as Part 1.

5.8.4.1 Start of scrambling

Same as Part 1.

5.8.4.2 End of scrambling

Same as Part 1.

5.8.4.3 Change in the relationship between ES and ECM that transmit broadcasting program elements

Same as Part 1.

5.8.5 ECM update/re-transmission

Same as Part 1.

5.8.5.1 Scramble key change

Same as Part 1.

5.8.5.2 Update/re-transmission cycle

Same as Part 1.

5.8.5.3 ECM updates and scramble key change 1

Same as Part 1.

5.8.5.4 ECM updates and scramble key change 2

Same as Part 1.

5.8.6 Others

Same as Part 1.

5.8.6.1 ECM and scramble

Same as Part 1.

5.8.6.2 ECM suspension

Same as Part 1.

5.8.6.3 ECM and seamless transmission

Same as Part 1.

5.9 EMM

5.9.1 EMM transmission specifications

5.9.1.1 EMM transmission specifications in BS digital broadcasting

- The header structure of an EMM section should conform to the Ministry of Internal Affairs and Communications ordinance and announcement #37, 2003.
- For the composition of the EMM main unit in the EMM section, see 3.2.4 EMM in Part 1 of ARIB STD-B25.
- EMM sections should not be transmitted using multi-section transmission.
- The transmission rate of EMM should be as follows.

  The transmission interval should be specified that applies to both EMM sections and EMM individual message sections.

  The transmission interval should conform to 5.9.3 EMM transmission interval in this document.
- The receiver unit shall not refer to the version number of the EMM section.
- The transmission order of the EMM should conform to 5.9.4 EMM transmission order in this document.

5.9.1.2 EMM transmission specifications in broadband CS digital broadcasting

- Two types of EMM transmission method are defined in broadband CS digital broadcasting.
- Type A transmission method is also used in BS digital broadcasting while Type B transmission method is used only in broadband CS digital broadcasting.

(1) Identification measures with the transmission format

- Type A and Type B of transmission formats are described in the first place byte of the private_data_byte area for the conditional access system descriptor in the CAT.

Table 5-9-1 The first place byte of private_data_byte for the conditional access system descriptor in the CAT

Value	Meaning
0x00	Undefined
0x01	Type A
0x02	Type B
0x03 to FF	Reserved for future use

- The identification information for EMM transmission format shall always be described in the first place byte of private_data_byte of the conditional access system descriptor in the CAT in broadband CS digital broadcasting.
- While the identification information for EMM transmission format described in the first place byte of private_data_byte of the conditional access system descriptor in the CAT is not used in BS digital broadcasting, the receiver unit may be able to regard this case as Type A. In broadband CS digital broadcasting, however, if the identification information value for a valid EMM transmission format is not described in the first byte of private_data_byte of the conditional access system descriptor in the CAT, the EMM acquisition in the receiver unit cannot be guaranteed and it may not be acquired at all due to the exception handling.

(2) Type A transmission specifications

- Type A shall always be described in the first byte of the private_data_byte area of the conditional access system descriptor in the CAT.
- Transmission specifications other than this are the same as described in 5.9.1.1 EMM transmission specifications in BS digital broadcasting in this document.

(3) Type B transmission specifications

- Type B shall always be described in the first byte of the private_data_byte area of the conditional access system descriptor in the CAT.
- Only one EMM main body, or only the information of one card ID, is allowed in the single EMM section.

Only one section header, one EMM main body, and the section CRC are included in a section.

- Multiple EMM sections are allowed to be set in one TS packet.
  The information for EMM filtering (total of 14 bytes, 8 bytes of section header and 6 bytes of card ID) shall not extend over multiple TS packets.
- In the case of multi-section transmission, the maximum number of sections embedded in one TS packet shall be 10 in accordance with Part 1 Volume 4 (multi-section transmission) of this document.
- The specified transmission interval of one or more seconds for the EMM transmission for the same card ID shall be maintained. In other words, even if multiple EMM exist in one TS packet, a maximum of one EMM is guaranteed to be transmitted.
- Use of the group ID and global ID shall not be allowed.

5.9.2 EMM message transmission specifications

5.9.2.1 EMM message transmission specifications in BS digital broadcasting

- For the composition of the EMM individual message main body in the EMM message section, see 3.2.5.1.2 EMM individual message in Part 1 of ARIB STD-B25.
- For the composition of the EMM common message main body in the EMM message section, see Part 1 of ARIB STD-B25.
- EMM messages shall not be transmitted by using multi-section transmission.
- The individual message transmission interval should conform to 5.9.3 EMM transmission interval in this document.
- The common message transmission interval should conform to 5.9.3 EMM transmission interval in this document.
- When the main message body area of EMM common message is 0 byte and when the automatic display deletion indication is “0x02”, message and the frame for the message shall not be displayed. (Emergency handling. In this case, the receiver unit shall not display the message.)
- The receiver units shall refer to version number of the appropriate EMM message section and prepare for the update of EMM common message contents or the deletion of the display while the message is on the screen.
- The receiver units shall not refer to the version number in the individual message section of the EMM.
- The transmission order for EMM individual message should conform to 5.9.4 EMM transmission order in this document.

5.9.2.2 EMM message transmission specifications in broadband CS digital broadcasting

(1) Type A transmission specifications

- The contents are the same as of 5.9.2.1 EMM Message transmission specifications in BS digital broadcasting.

(2) Type B transmission specifications

- Only one main body of the EMM individual message, or only the information of one card ID, is allowed in the single EMM section. Only one section header, one main body of EMM individual message, and the section CRC are included in a section.
- Multiple EMM individual message sections are allowed to be set in one TS packet.
- The information for EMM individual message filtering (total of 14 bytes, 8 bytes of section header and 6 bytes of card ID) shall not extend over multiple TS packets.
- In the case of multi-section transmission, the maximum number of sections embedded in one TS packet shall be 10 in accordance with Part 1 Volume 4 (multi-section transmission) of this document.
- The specified transmission interval of one or more seconds for the EMM individual message sections for the same card ID shall be maintained. In other words, even if multiple EMM individual message sections exist in one TS packet, a maximum of one EMM is guaranteed to be transmitted.
- Use of the group ID and global ID shall not be allowed.

5.9.3 EMM transmission interval

5.9.3.1 EMM transmission interval in BS digital broadcasting

5.9.3.1.1 Transmission interval for EMM sections and EMM individual message sections

- The transmission interval at the TS packet level for EMM sections and EMM individual message sections should be separately specified for the program TS and dedicated TS, respectively. Transmission interval at the TS packet level for EMM sections and EMM individual message sections shall be defined basically in accordance with Volume 4. (This means that the EMM transmission interval is not defined with the intervals of each EMM section but with the transmission density of the EMM section in accordance with the operation rules of PSI/SI.)

(1) For program TS

When EMM sections and EMM message sections are transmitted, TS packets for the appropriate PID should be transmitted in the range of 1.28 KB $\pm$ 100% per 32 ms. TS packets with the same PID that carry EMM sections and EMM message sections should be transmitted at 320 Kbit or less per any one second.

(In the above 320 Kbit, the data amount for one EMM section and EMM message section shall be deemed to be 4 KB.)

(2) For dedicated TS (See A-5 Dedicated TS for details.)

When EMM sections and EMM message sections are transmitted, TS packets for the appropriate PID should be transmitted in the range of 5.2 KB ± 100% per 32 ms. TS packets with the same PID that carry EMM sections and EMM message sections should be transmitted at 1.3 Mbit or less per any one second.

(In the above 1.3 Mbit, the data amount for one EMM section and EMM message section shall be deemed to be 4 KB.)

5.9.3.1.2 Transmission interval for EMM common message sections

- The transmission interval of the EMM common message section with a specific fixed format number (Table ID Extension) shall be up to one section per 200 ms.

5.9.3.2 EMM transmission interval in broadband CS digital broadcasting

5.9.3.2.1 Type A transmission specifications

5.9.3.2.1.1 Transmission interval for EMM sections and EMM individual message sections

- The transmission interval at the TS packet level for EMM sections and EMM individual message sections should be separately specified for the program TS and dedicated TS, respectively. Transmission interval at the TS packet level for EMM sections and EMM individual message sections shall be defined basically in accordance with Part 1 Volume 4 of this document. (This means that the EMM transmission interval is not defined with the intervals of each EMM section but with the transmission density of the EMM section in accordance with the operation rules of PSI/SI.)

(1) For program TS

When EMM sections and EMM message sections are transmitted, TS packets for the appropriate PID should be transmitted in the range of 1.28 KB ± 100% per 32 ms. TS packets with the same PID that carry EMM sections and EMM message sections should be transmitted at 320 Kbit or less per any one second.

(In the above 320 Kbit, the data amount for one EMM section and EMM message section shall be deemed to be 4 KB.)

(2) For dedicated TS (See A-5 Dedicated TS in Part 1 Volume 5 of this document for details.)

When EMM sections and EMM message sections are transmitted, TS packets for the appropriate PID should be transmitted in the range of 5.2 KB ± 100% per 32 ms. TS packets with the same PID that carry EMM sections and EMM message sections should be transmitted at 1.3 Mbit or less per any one second.

(In the above 1.3 Mbit, the data amount for one EMM section and EMM message section shall be deemed to be 4 KB.)

5.9.3.2.2 Type B transmission specifications

5.9.3.2.2.1 Transmission interval for EMM sections and EMM individual message sections

- When EMM sections and EMM individual message sections are transmitted, TS packets for the appropriate PID should be transmitted in the range of 8.0 KB ± 100% per 32 ms, irrespective of whether the transmission is via the program TS or dedicated TS (specific transponder). TS packets with the same PID that carry EMM sections and EMM message sections should be transmitted at 2.0 Mbit or less per any one second. (In the above 2.0 Mbit, the data amount for one EMM section and EMM individual message section shall be deemed to be 4 KB.)

5.9.3.2.3 Transmission interval for EMM common message sections

- The transmission interval of the EMM common message section with a specific fixed format number (Table ID Extension) shall be up to one section per 200 ms.

5.9.4 EMM transmission order

5.9.4.1 EMM transmission order in BS digital broadcasting

- EMM and EMM individual messages shall be loaded with plurality of information in one section for transmission.

  In order to facilitate the filtering process with the receiver units, the following operation restrictions shall be applied to the order of EMM placement loaded in the same section. These restrictions are also applied to EMM individual messages.

  1) The EMM with the smallest card ID number included in the section shall be allocated in the first place.
  2) The EMM with the largest card ID number shall be allocated in the second place.
  3) The remaining EMMs are allocated in the third and subsequent places by sorting them in the order of card IDs (ascending order).

  If there are n pieces of EMMs in one section, they are placed in the order of EMM_1, EMM_2, ... EMM_n, from the smallest card ID number, as shown below.

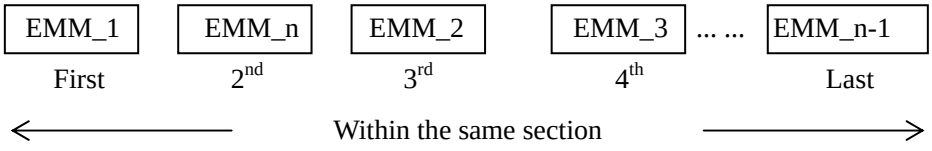


Figure 5.9-1 Transmission order of EMMs in a section

- The receiver units can determine whether the EMM destined to them would be included in that section or not by only examining the first two EMMs. In addition, even if there might be EMMs destined to that receiver unit in the section, the receiver unit can determine that the EMM destined to it is not included at the time when, by examining the ID number from the beginning, the examined ID number of the EMM exceeds the ID number of that receiver unit. The receiver unit can then discard the entire section when it determines that the EMM destined to it is not included in that section, without having to compare all EMMs (to the last EMM) in the section.

5.9.4.2 EMM transmission order in broadband CS digital broadcasting

(1) Transmission order for the Type A
  - The contents are the same as of EMM transmission order in BS digital broadcasting described in this document.

(2) Transmission order for the Type B
  - In broadband CS broadcasting, only one EMM and one EMM individual message is included in a section.

5.10 Message Codes for EMM Messages

5.10.1 Format number

Same as Part 1.

5.10.2 Message code main body format of EMM common message in format number 0x01

Same as Part 1.

5.10.3 Differential data format for EMM individual messages in the difference format number 0x01

Same as Part 1.

5.10.4 Example of using the difference information

Same as Part 1.

5.10.5 Character codes

Same as Part 1.

5.10.6 Recommended display position for the automatic display message

Same as Part 1.

5.11 CA Contract Information Descriptor

Same as Part 1.

5.12 Message ID

5.12.1 Operations

5.12.1.1 In BS digital broadcasting

- Reusing of message IDs is specified.
- Messages that can be concurrently transmitted by the broadcaster (number of mails) N messages *
  Message ID reusing period by the broadcaster M days or more
  Transmission period of one message by the broadcaster L days or less

  * It is assumed that transmission of messages (mails) ends sequentially from the oldest one (i.e. the message with the oldest transmission start time).

N = 4, M = 30, L = 14

5.12.1.2 In broadband CS digital broadcasting

- Reusing of message IDs is specified.
- Messages that can be concurrently transmitted by the broadcaster (number of mails) N messages *
  Message ID reusing period by the broadcaster M days or more
  Transmission period of one message by the broadcaster L days or less

  * It is assumed that transmission of messages (mails) ends sequentially from the oldest one (i.e. the message with the oldest transmission start time).

N = 7, M = 30, L = 14

5.12.2 Transmission operation example

See Part 1. The same operation example as described in Part 1 is applied to broadband CS digital broadcasting except for the description of “N = 4”, which should be changed to “N = 7.”

5.13 Recording Control Response of IC Cards

Same as Part 1.

5.14 CA Alternative Service

5.14.1 Operation unit

Same as Part 1.

5.14.2 Link destination service

- Since the programs have to be able to be viewed by the link destination service, the link destination service must be operated without scramble regardless of whether there is a contract or not with non-free broadcasting companies.
- The data components must be included in the link destination service when the CA alternative service linked with data broadcasting is provided, thus allowing to transmit data contents for the CA alternative service. However, the link destination service may be a video service or an audio service without data components.
- The link destination service can exit not only in the same TS but also in another TS or on another network. The link destination service is also assumed to be operated in such a manner that it moves from the TS in broadband CS digital broadcasting (PPV channel (when the viewer is not subscribed)) to the TS in BS digital broadcasting (non-scrambled data broadcasting). For operation of moving a link destination service from TS of BS digital broadcasting to TS of CS broadband digital broadcasting, see Part 1 Volume 5.

5.14.3 Linkage descriptor transmission operation

- When the CA alternative service is used, the linkage descriptor should be placed in the SDT and transmitted. Link destination service information (including original_network_id, transport_stream_id, and service_id) should be described in the linkage descriptor.
- The linkage descriptor can be placed in the SDT of the non-scrambled service (when the fixed linkage descriptors are used in the broadcasting service that includes both the scrambled and non-scrambled programs).

  In this case, the link operation is not generated because viewing is possible in a non-scrambled broadcasting.
- The CA alternative service linkage descriptor should not be placed again in the link destination service. (Because link operation may loop.)
- The first 8 bytes of private_data_byte for the linkage descriptor should be a message number. The main body of the message should be described in the second and subsequent bytes.
- The number of characters and bytes that can be described in the movement confirmation message is up to 80 characters and 160 bytes (excluding an 8-bit message number).
- For a display purpose including a frame on the screen of the receiver unit, a maximum number of characters per line and maximum number of lines displayed on the screen should be 24 double-byte characters and 6 lines (including line feed).
- Characters and control codes that can be used in the movement confirmation message are those defined in “4 Encoding of Text Strings” in Part 1 Volume 4 of this document.
- When the same message number is used for multiple service_ids in the same TS, private_data_byte can

contain only an 8-bit message number, thus skipping the transmission of message contents.

- The main body of the message with a message number that is described in the same TS should be always transmitted in that TS.
- The number of types of the movement confirmation message that are concurrently sent should be up to 20 in the broadband CS digital broadcasting, and CA alternative message numbers to be used should be 1 to 20 (0x01 to 0x14). This is specified as a guideline for RAM caching in the receiver unit.
- Caller ID management for the CA alternative message number is described in Appendix B-1.
- When the message stored in the receiver unit is displayed, nothing should be described in the privete_data_byte area.
- For operation details of linkage descriptors, see Part 2 Volume 4 of this document.

5.15 CA Service Descriptor

5.15.1 Operations

Same as Part 1.

5.15.2 Use of the delay time

Same as Part 1.

A Description (Supplemental Description of Main Contents)

A-1 Reception and Update of EMM

Same as Part 1.

A-2 History of developing EMM message format

Same as Part 1.

A-3 Re-transmission Cycle and Update Cycle of ECM

A-3-1 Re-transmission cycle

Same as Part 1.

A-3-2 Update cycle

Same as Part 1.

A-4 PPV Recording Purchase and Copy Protection

Same as Part 1.

A-5 Dedicated TS

A-5-1 Overview

Same as Part 1.

A-5-2 What is a dedicated TS

Same as Part 1.

A-6 Basic Concept of Required and Optional Functions

The following table shows new functions that have been added in broadband CS digital broadcasting that supports “CA alternative service” and “EMM transmission format identification.”

Table A-6-1 Classification of required and optional functions on CAS receivers

No.	Service using CAS	Specifications of receivers	Required or optional
1	Basic	Low-speed CA I/F	Required
		ID number display	Required
		Error notification (Card response)	Required
		Power-on control (including control due to NIT specification)	Required
		De-scrambler	Required
		IC card test	Required
		CA alternative service	Required *2
		EMM transmission format identification	Required
		Identification of multiple CAS operations	Required *5
2	Pay broadcasting: Flat/Tier	Contract viewing processing	Required
		Parental control	Required
		Setting and deletion of security code	Required
		Pay broadcasting reservation	Optional *1
3	Pay broadcasting: PPV	PPV viewing process (including ES-specific billing)	Optional*6
		Telephone modem	(Required) *4
		Recording purchase	Optional *6
		Power-on call control	Optional *6
		Viewing information upload	Optional *6
		Parental control	Optional *6
		Setting and deletion of security code	Optional *6
		PPV program reservation (pay broadcasting reservation)	Optional
		PPV monthly purchase upper limit control	Optional
		PPV one program upper limit control	Optional
		PPV purchase record and display	Optional
		Retry over notification display function	Optional
		User call request function	Optional
		Viewing history upload date and time notification	Optional
		Telephone line connection test	Optional
4	EMM message service	Automatic displayed messages	Required
		IC card not-inserted message (using a automatic displayed message when non-scrambled broadcasting is received)	Required
		Mail	Required
		Automatic displayed message when accumulated data is played using a receiver unit with accumulation function	Required

5	Data encryption for interactive service	IRD data transmission	Do not incorporate *3
6	Protected free program	Normal viewing	Required
		Programming	Optional *1
		Error display	Required

*1: When a receiver provides a program reservation function, a pay broadcasting reservation function must also be provided in principle.

*2: It is recommended that this function, required by the CS block of a BS and broadband CS dual-purpose receiver, shall operate likewise in the BS block.

*3: IRD data transmission based on the encryption and decryption processing using the IC card should not be carried out.

*4: Modems are required when implementing a data broadcasting interactive service, but optional for mobile receivers having the primary purpose of installation on automobiles and other movable bodies, and for portable TV sets Note) having the primary purpose of compact, light weight and portable use. However, the receivers shall have the function to display an appropriate message showing no support of the broadcasting contents if unsupported contents are received. Furthermore, the users should be informed of the non-support through various measures including the catalog and instruction manual of the receiver.

Note) The portable TV set is a receiver that has a 14" or less-inch built-in display panel and that is driven by the DC power supply (such as an AC adapter).

*5: The identification of multiple CAS operations is applicable to receivers introduced to the market on September 24, 2006 onward.

*6: This PPV function shall be optional and not be used from September, 2007 onward.

Note that the test function to validate the PPV function shall be removed accordingly. This function shall be optional, not be removed, because removal of this function may cause malfunction of the receiver unit. The decision of whether to remove this function or retain as an optional function is left up to the receiver manufacturers for their design.

A-7 Card ID Display

Same as Part 1.

A-8 Specifications of Conditional Access System of Broadband CS Digital Broadcasting

A-8-1 Operation of multiple conditional access systems

Same as Part 1.

A-8-2 Concept of conforming to STD-B25 Part 1 (Assumption)

Same as Part 1.

B Appendix

B-1 Caller ID Management for CA Alternative Message Number

- In broadband CS digital broadcasting, 20 types of CA alternative message numbers from 1 to 20 (0x01 to 0x14) are used and up to two types are assigned to each broadcaster for a while in principle.
- Call ID should be assigned in ascending order and with no duplex.
- Operations on processing by the receiver units should conform to 4.22 of this volume.
- Table B-1-1 shows a list of CA alternative message number assignment in broadband CS digital broadcasting.
- If a new assignment is made, it should be added in Table B-1-1.

Table B-1-1 CA alternative message number assignment list

Broadcaster name	CA alternative message number
SKY Perfect Communications Inc.	0x01
SKY Perfect Communications Inc.	0x02
SKY Perfect Communications Inc.	0x03
SKY Perfect Communications Inc.	0x04
WOWOW Inc.	0x05
WOWOW Inc.	0x06

B-2 Contact Information for Inquiries about IC Cards

Same as Part 1.

(This page is intentionally left blank.)

Volume 6

Broadband CS Digital Broadcast –
Operation Rules for Interactive Communication

Contents

(This page is intentionally left blank.)

1 Introduction

1.1 Preface

The interactive data broadcasting service in broadband CS digital broadcasting is provided according to the Ministry of Internal Affairs and Communications ordinance and announcements and the standards in “Receiver for Digital Broadcasting” (ARIB STD-B21) and “Data Coding and Transmission Specification for Digital Broadcasting” (ARIB STD-B24) defined by Association of Radio Industries and Businesses (hereinafter referred to as ARIB). However, this operation rule is stipulated because it is necessary to separately define detailed operations for providing interactive data broadcasting service in the broadband CS digital broadcasting.

1.2 Purpose

This volume “Broadband CS Digital Broadcasting - Operation Rule for Interactive Communication” is stipulated in order to spread and expand the interactive data broadcasting service by specifying the compliance rules to provide the higher quality interactive data broadcasting service to the viewer as well as to facilitate the broadcasting companies to provide such service smoothly.

1.3 Scope

This standard document is applied to the interactive data broadcasting service in the broadband CS digital broadcasting. It is necessary for the receivers that support interactive data broadcasting services to implement the rule A in this volume as required function. Rule B is a optional specification.

2 Related Documents

The contents of this document define operations concerning the interactive communication for the broadband CS digital broadcasting in the principles specified in the following standards.

(1) ARIB STD-B21 “Receiver for Digital Broadcasting”

(2) ARIB STD-B24 “Data Coding and Transmission Specification for Digital Broadcasting”

3 Definition of Terms and Abbreviations

The following definitions and terms are used for this standard.

ADSL	Asymmetric Digital Subscriber Line. High-speed data transmission technology using the existing telephone lines.
ARIB	Association of Radio Industries and Businesses. This institution standardizes and regulates technologies related to the use of radio waves in Japan. Broadcasting companies, telecommunications carriers, and manufacturers belong to this association.
AT Command	Command that controls a modem.
BASIC Procedure	Communication procedure (BASIC procedure) that has been developed for host computers and terminals whose data transmission procedure is basic and only the required functions are equipped.
CAS	Conditional Access System. CAS is defined as a system that controls reception of services (organization channels) and events (programs). It is indispensable for pay broadcasting programs.
CATV	Cable and Tele-communication Television System. A system that distributes television signal to each household through the transmission paths such as coaxial cables. This can be used for the interactive transmission path.
CBC Mode	Cipher Block Chaining Mode. IV (default) value generated by the exclusive conjunction of encrypted text and the next entry in the CBC mode (cipher block chaining mode) algorithm.
Closed Network Providers	Providers that administer closed network that is not connected to Internet.
CRC	Cyclic Redundancy Check. Cyclic-type error detecting code to verify the accuracy of data.
DNS	Domain Name Service [RFC1034, RFC1035]. Protocol used in the service for mapping the IP address with host name on the network.
DSU	Digital Service Unit. Unit for interfacing digital net and digital communication terminal.
Ethernet	One of the LAN communication method.
FEC	Forward Error Correction.
FTP	File Transfer Protocol [RFC959]. Protocol used for file sharing or transfer between the two hosts on TCP/IP.
FTTH	Fiber To The Home. Service that provides transmission path of communication to the user house by fiber optics.
HDLC Procedure	High level Data Link Control. A highly trusted transmission control procedure used mainly for LAN or communication between PCs on Internet.
HTTP	Hypertext Transfer Protocol [RFC1945]. Application layer protocol used to transmit World Wide Web data.
ICMP	Internet Control Message Protocol [RFC792]. Protocol for message transmission such as notification of errors during the transfer process of protocol data or checking the behavior.
IEC	International Electrotechnical Commission.
IP	Internet Protocol [RFC791]. Used to define addressing mechanism of Internet and network layer protocol as well as to process data delivery.
IPCP	IP Control Protocol [RFC1332]. Protocol used to make various settings required for using IP in the PPP network layer protocol phase.
IPv4	Protocol as international standard used in the infrastructure of current LAN and Internet.

IPv6	Successor protocol of IPv4. Protocol with added security functions and extended address part.
ISDN	Integrated Services Digital Network.
ISO	International Organization for Standardization.
ISP	Internet Service Provider. Business entity that provides various content services on Internet.
ISP Connection Information	Information on ISP access point telephone number and authentication protocol to be configured by viewers and stored in the receiver.
MAC	Message Authentication Code. Code that verifies messages have been transmitted to the designated party without tampering and any errors.
MNP4	Error correction method for modem transmission.
MSB	Most Significant Bit.
M-sequence	Digit sequence with relatively long cycle, which is used to generate a simple pseudo-random number.
NNTP	Network News Transfer Protocol [RFC977]. Protocol on application layer used to distribute, post, and acquire NetNews on Internet.
PDC	Personal Digital Cellular. Digital automobile: cellular phone system. It supports data transfer at 9600 bps.
PDC-P	Personal Digital Cellular Packet. Communication by packet switching in PDC method. It supports data transfer of 9600 bps to 28800 bps.
PHS	Personal Handy-phone System.
PIAFS	PHS Internet Access Forum Standard. Data transmission protocol using PHS for data transmission method at 32 kpbs and 64 kpbs.
PIN	Personal Identification Number. Identify and recognize an individual using the secret number assigned in advance to obtain access right to a certain system.
PKCS	Public Key Cryptography Standard. Cryptographic system featuring public key cryptography, others include common key cryptography, hash function, pseudo-random number function.
PN Signal	Pseudo Noise. Signal that is characterized as a random occurrence of 1 and 0. It is used to diffuse energy in the digital signal. M-sequence is more common.
POP3	Post Office Protocol version 3 [RFC1939]. Protocol used to list, retrieve, and delete e-mails from a spool of mail server.
PPP	Point to Point Protocol [RFC1661]. Protocol that enables a transfer of multiple protocols on the link. It is used for dial-up connection.
PPP in HDLC-like Flaming	Frame configuration to pile up as higher protocol of ppp. Configuration method of header and footer as frame configuration used in the HDLC procedure.
PSTN	Public Switched Telephone Network.
reserved	Undefined. It indicates that it might be defined by ISO for the extension in the future concerning the definition of coded bit stream. All bits that are not defined by ARIB standard are set to “1.”
reserved_future_use	Undefined. It indicates that it might be defined by ARIB standard for the extension in the future concerning the definition of coded bit stream. All bits that are not defined separately are set to “1.”
rpchof	remainder polynomial coefficients, highest order first.
RSA Cipher	Public key cryptography that is most prevalent today. It has encrypting/decrypting processing function and signature/authentication function.
SMTP	Simple Mail Transfer Protocol [RFC821]. Protocol used for the transit and delivery of e-mail.

SSL	Secure Socket Layer. Security protocol of socket level. It is positioned between the TCP layer and application layer and provides encrypting/decrypting and authentication.
STD	Standard.
TA	Terminal Adapter. Equipment used for the protocol conversion so that the analog communication terminal can be connected to ISDN.
TCP	Transmission Control Protocol [RFC793]. It provides reliable transfer of connection type with correction, detection of error and protocol at transport layer that conforms to the end-to-end principle.
TCP/IP Application Setting Information	Information concerning the application protocol used on the TCP/IP protocol, which is set by viewers and will be stored in the receiver.
Telnet	[RFC854, RFC855]. Protocol that provides virtual terminal that enables an operation of remote server on the TCP/IP network from the terminal.
time stamp	It enables recycling or detection of transmission data by adding transmission time or random number to the critical transmission data.
TLS	Transport Layer Security. Security protocol that is standardized based on SSL. It is mainly related to the modification of hash processing.
UDP	User Datagram Protocol [RFC768]. Transport layer protocol between the two hosts. It does not have a function to confirm delivery, but it minimizes the protocol overhead. Connection-less type communication, which is appropriate for the higher transmission efficiency.
uimsbf	Unsigned integer, most significant bit first.
UTC	Universal Time Coordinated. Universal time system used as an international standard by common consents.
V.22bis	This is a modulation method of full duplex modem for telephone with up to 2400bps, which is defined by the ITU-T recommendation.
V.34	This is a modulation method of full duplex modem for telephone with up to 33.6 kpbs, which is defined by the ITU-T recommendation.
V.42 bis	This is an error correction method and data compression method between modems, which is defined by the ITU-T recommendation.
V.90	Standard specification of 56 Kbps analog modem defined by the ITU-T recommendation.
X.28	Communication procedure that converts the transmission method of non-packet receiver with modem to be able to connect with packet switching network.
Access Point	Communication facility where calls from receivers are accepted.
Application Information	Information such as telephone number of access point specified by broadcaster or circuit class.
Echo Back	It indicates a text or behavior when a modem or communication partner send back the same message received so that the sending side can verify the transmission text.
Card ID	Number or symbol that has been uniquely pre-assigned to the cards to be equipped with receivers.
Cut-through Call	In the mass calls reception service of network service, it indicates a call when connecting one of the call requests from receiver to the designated center.
Cut Call	In the mass calls reception service of network service, it indicates a call when the communication from receiver is cut-off at the switchboard of call origin.
Code Independent Mode	It is an extended method in BASIC procedure, which supports a transmission of binary data.
Copy Control	Control of copy generation. It is used when restricting a copy of programs or copyright materials for the recording devices connected to broadcasting receivers.

Service Code (SC)	Service classification code for the network service provided by communication providers, which is identified by a code such as 00XY.
Security Level	It is an indicator that defines or manages the level of security in stages depending on the secrecy required for the data to be handled.
Security Communication Related Information	Information concerning the security type implemented with the receiver or root CA certificate, which will be stored in the receiver.
Session Key	Key used for only one session (disposable) from the perspective of security level maintenance.
Center	Facility equipped with necessary hosts to provide interactive transmission service.
Time Stamp	time stamp
Tamper Resistant	Physical cover used to prevent people who handle the equipment from reading the internal data or analyzing the system.
Debit	Settlement where the charge is transferred between the bank account of user and affiliated store at the time of usage. Immediate settlement.
Data Transmission Function	Function to execute data transfer between receiver and center. It is a command described in BML contents.
Token	Electronic voting card used for computerized ballot.
Traffic	Communication traffic added to exchange plant or lines such as public network.
Negotiation	This process is taken place at beginning of the transmission to search for the multiple modulation system, common system or function for the both modems if both modems support forward error correction and re-transmission.
Network Service	Value-added service such as data collection or data processing on the network between receiver and center.
Network Representative Accounting	Accounting service that communication provider claims to users instead of information provider with information fee accounting.
Vernam Cipher	Cryptography where the exclusive OR of random number sequence and message common to sending side and receiving side is transmitted as cipher and the receiving side decrypts the cipher and random number sequence received by removing the exclusive OR from them. If genuine random number is used, it is the safe encryption method from the perspective of information-theoretical approach.
Hash Function (Message Digest)	Mathematical function that maps a large (in some cases, a huge) area into a small range. The well-founded function needs to be one-way and collision free at the same time.
Value	Information related to cost or amount used for the prepaid system.
Parental Rate	Viewing restriction based on the age. Recommended minimum age of viewers.
Prepaid ID	Identifier that relates to each user of their corresponding prepaid card for network-based prepaid settlement.
Basic procedure (Code Independent Mode)	This is a communication procedure, which has been developed for host computers and terminals whose data transmission procedure is basic. The communication procedure, which minimizes errors in data transmission is installed.
Host	Access point equipment or server equipment required for interactive transmission service.
Mass Calling Service	It is one of the network services, which includes mass calls reception service.
Master Key	It is used in contradistinction to session key. Key used to share session key.
Message Digest	To digest the data of arbitrary length into a certain length or the data digested.

Message Authorization Code	MAC
Mall	Electronic store or its collective entity.
Log Collection Accounting	Accounting method where the data broadcasting usage fee is recorded per subscriber and close out at a later date.
One-way	Characteristics in a mathematical operation that the inverse operation is impossible or extremely difficult.
Circuit Class	It indicates a type of communication line such as PSTN, mobile phone line, PHS, etc.
Diffusion	In a digital signal, if a certain pattern continues, such as 1 or 0 sequentially appears, it will result in the interference by a generation of emission line spectrum, or it might disable clock playback at the receiver. In order to avoid this problem, be sure to keep the signal random by adding the known PN signal.
Administrative Server	Server equipped with a function that controls personal information collectively and returns the personal information per inquiry from host in the administrative method of personal information.
Simple Cipher	Simplified version of cipher used when preventing from being decrypted by third party is not a requirement.
Simple Authentication	Authentication method used when it does not require high security level in authenticating client, which can be realized with common key cryptography.
Known Plaintext Attack	Attack model for the cryptographic algorithm where the attacker enters the known plaintext to create cryptogram, then reveal the cryptographic key from the plaintext and cryptogram.
Pseudo-random Number	Generally speaking, it is difficult to create the genuine random number, thus it will often be substituted by the digit sequence with periodicity with sufficient interval and uniformity (variation).
Common Key Cryptography	It is also referred to as private-key cryptography/symmetrical cryptography. The sender encrypts the text and the receiver decrypts the message using the common key secretly shared by the sender and receiver. It is necessary to share the common key in advance by some procedure.
Commonly Shared Information	Information related to priority circuit class or external line acquisition number, which is configured by the viewer and stored in the receiver.
Verifier	Person who verifies the signatory and its content to be accurate.
Strict Authentication	Authentication method using the public key cryptography.
Excuses	Sender themselves denies the communication contents after they have been transmitted.
Personal Information	Personal attribute to identify the individual. In addition to name and address, it could include bank account number or credit card number.
Call	Units of telephone communication.
Fixed-priority Connection	By registering the communication provider as the regional communication provider, users can always connect to the designated communication provider using the option for priority connection without having to dial the identification number (such as 00XY) of the provider.
Fixed IP Connection Information	Information that is set depending on the viewer and that is saved in the receiver units with information in a fixed format to allocate IP addresses, etc.
Public Key Cryptography	It is also referred to as asymmetrical cryptography. The key for encryption (public key) and key for decryption (private key) differ. By disclosing the public key and keep the private key secret, it enables the encrypted communication even without the shared secret information. Some of the public key cryptography (RSA cipher) has a signature function.
Participation Rate	Value in which the number of users of certain interactive data broadcasting service program are divided by the number of viewers.

Collection Network	Network that collects data from many receiver units.
Receiver Setting Information	Collective term of information to be set or retained in the receiver unit, which consist of communication related information, communication device information, security communication related information, commonly shared information, ISP connection information, fixed IP connection information, connection mode information, and TCP/IP application setting information.
Audience configuration information	Collective term of information to be determined per viewer, which consist of commonly shared information, ISP connection information, fixed IP connection information, connection mode information, and TCP/IP application setting information.
Signature	Using the characteristics of public key cryptography algorithm, which can be only generated by the person who possesses the private key, the operational result is an electronic signature.
Collision Free	It is a characteristic required for the hash function, which can be referred as an adequate possibility of generating the different results for the 2 arbitrary inputs.
Certificates	It is required for the verification of authentication and signature using the public key cryptography. It is electronically issued by a trusted third party.
Connection Mode Information	It is a protocol related to the acquisition of IP address at the time of Ethernet connection, which is configured by viewers and will be stored in the receiver unit.
Going-up Circuit	This is a line, which connects from the receiver to the center equipment using a modem or other equipment.
Information Fee Accounting	Concerning the information service such as telephone service conducted through the telephone lines, it indicates an accounting when communication provider takes care of the fee payable by the user (such as information fee) on behalf of information provider.
Client Authentication	Only when it is necessary to verify the client to be communicated, it authenticates the client using the security functions.
Mass Calls Reception Service	Service that can receive the large volume of calls in the short period by using switchboard function.
Call Accounting	Accounting system where the called party is responsible for the cost of a call.
Communication Provider	Type 1 carrier and type 2 carrier who provide electronic communication service.
Provider Identification Number	Number to identify the provider assigned per communication provider among the telephone number. (For example, 00XY)
Communication Related Information	Information on the protocol or circuit class implemented with the receiver unit, which will be stored in the receiver unit.
Communication Device Information	Information to be defined between the network terminating equipment to be implemented at the access point and that to be implemented with the receiver unit, which will be stored in the receiver unit.
Transmission Mode	Indication by the difference of modulation system and forward error correction method.
Special Number	Short digit number of telephone number, which starts from 1. 1XY number.
Call Request	To initiate a call.
Call Function	Function to make a call request to the center, which is a command described in BML contents.
Call Request (Origination) Control	Restrict the receiver units that can originate a call from the receiver side in order to avoid congestion at the access point.
Call Delay	Delay the call at the receiver side for the specified time period in order to avoid the congestion at the access point.

Plaintext	It indicates a data prior to encryption.
Identity Verification	Method to verify if the person (identity) who has the authority to access the receiver unit or IC card. It uses password (phrase) or PIN.
Non-procedure (TTY Procedure)	Communication being conducted without defining the procedure beyond the physical layer such as re-transmission. The most simple communication method, which started from the text communication between the remote host and tele-terminal.
Priority Network	If more than one circuit class (such as PSTN or mobile phone) is available in the receiver unit, it is the circuit class to be selected by the viewer.
Reservation Confirmation Number	Reservation control number to be issued for administering each reservation in case of cancellation, modification, issue, and inquiry, etc., when a user makes a reservation of purchasing a ticket on the network.
Congestion	Phenomenon where calls cannot be connected due to the concentration of communication beyond the processing capacity per unit of time at the switchboard. This congestion state gets aggravated when people repeat the call as it fails and keep trying until it is connected.

4 System Configuration and Connection Pattern of Interactive Data Broadcasting Service (Information)

This chapter explains the communication system and connection pattern required for the realization of interactive service.

4.1 System configuration

Conceptual diagram of interactive data broadcasting service pattern is shown in Figure 4-1.

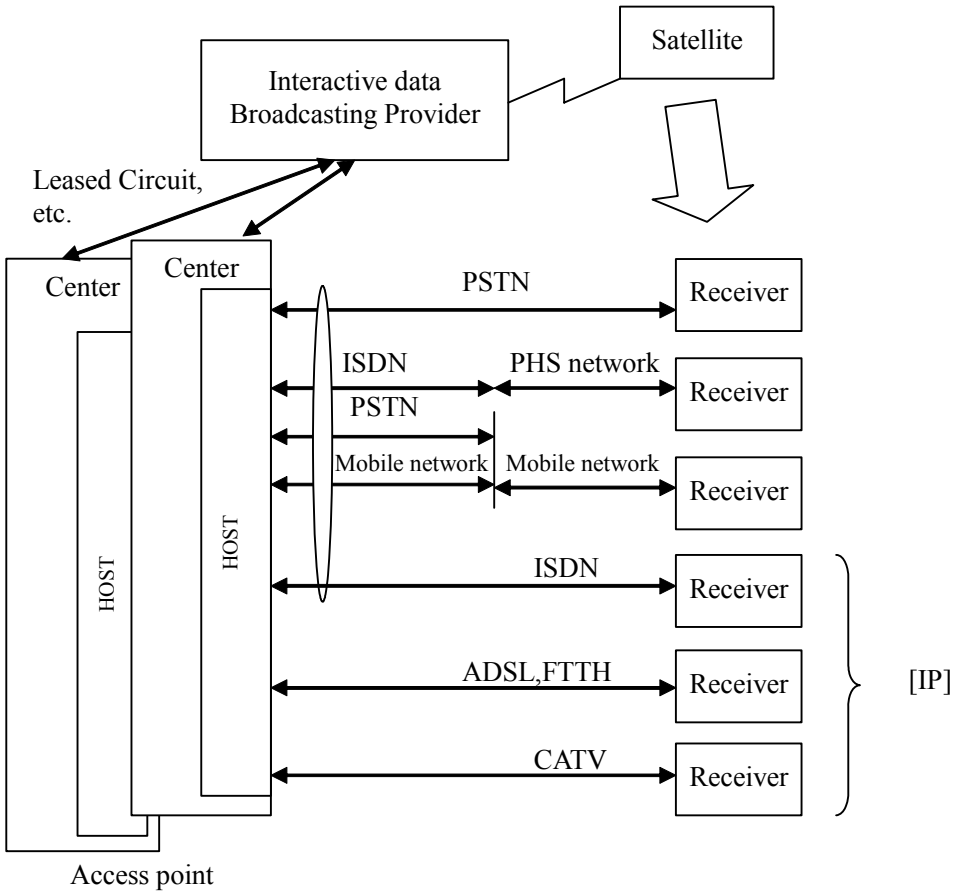


Figure 4-1 Conceptual diagram of interactive data broadcasting service pattern

4.2 Equipments related to the interactive data broadcasting service providers

Provider of interactive data broadcasting services will equip communication circuits, for example leased circuits, as a line to connect with the center as needed. Circuit class will be determined between both parties based on the service contents, data communication volume, securing reliability, etc.

4.3 Equipment related to hosts

Hosts in the center will equip one or more connection lines as needed from PSTN (PSTN, for mobile phone use), ISDN (for PHS use), mobile network (at the direct reception of mobile network), ADSL, FTTH, and CATV. The number of lines allocated at the access point as a connection point to the host will be determined considering the service contents and data communication volume. Additionally, communication line between the interactive data broadcasting service provider may be prepared as appropriate.

4.4 Function related to line connection of receiver unit

Receiver units connect to the PSTN, PHS network, mobile network, ISDN [IP], ADSL [IP], FTTH [IP], and CATV [IP] lines and have a function to communicate with the center.

4.5 Connection pattern

4.5.1 Direct connect

(1) Connect the receiver unit and center directly through the public network.

Advantage: Selecting an appropriate protocol can simplify the implementation.

Drawback: Center needs to secure the access point.

Figure 4-2 shows the connection pattern.

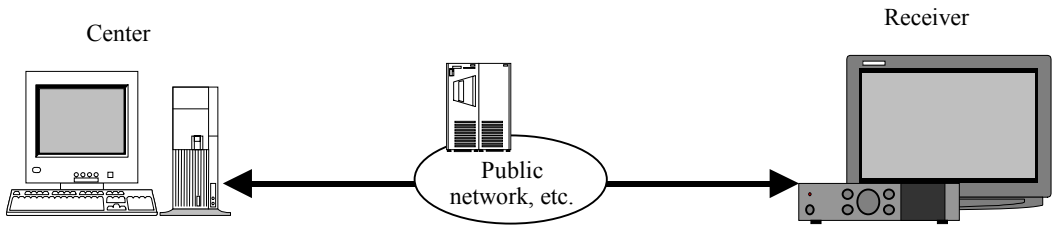


Figure 4-2 Direct connect

(2) Connect the receiver unit to the arbitrary center per application directly through the public network.

Advantage: Selecting an appropriate protocol can simplify the implementation.
Each center can share the access point.

Drawback: Since more than one center shares the same access point, there might be a situation where scheduling of access point is required.

Figure 4-3 shows the connection pattern.

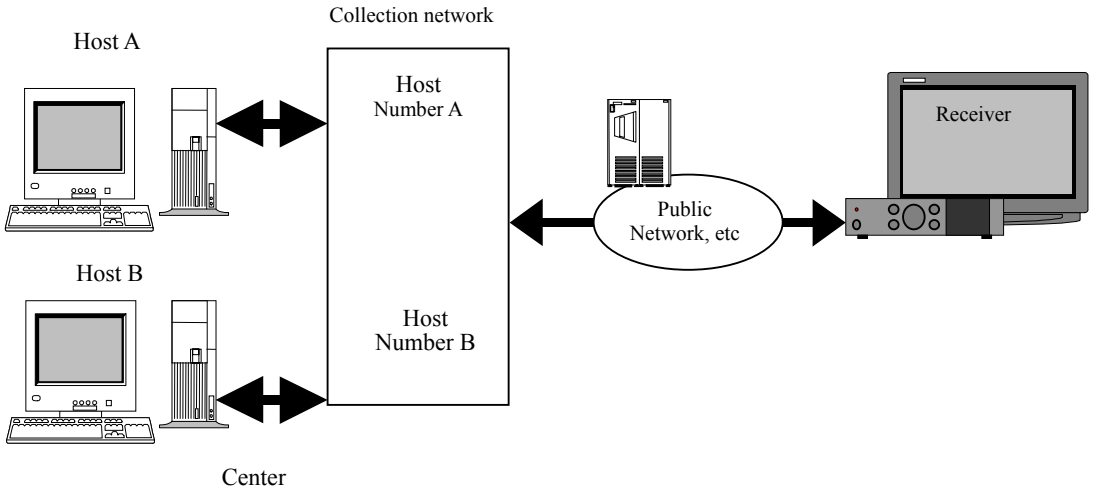


Figure 4-3 Direct connect using host numbers

4.5.2 Network service

(1) In the data communication between receiver unit and center, processing such as data collection is executed on the network. How the data is processed will vary depending on the service. To name a network service specifically related to broadcasting, it will be mass calling service. The most typical one in such service is mass calls reception service where the numbers of call-ins are summarized at call-in switchboard of the receiver and the processed result will be notified to the center sequentially.

Advantage: Simple implementation of the receiver unit. Processing such as data aggregation will be uncomplicated.

Drawback: Some services require contracts with communication providers in advance.

Figure 4-4 shows the connection pattern.

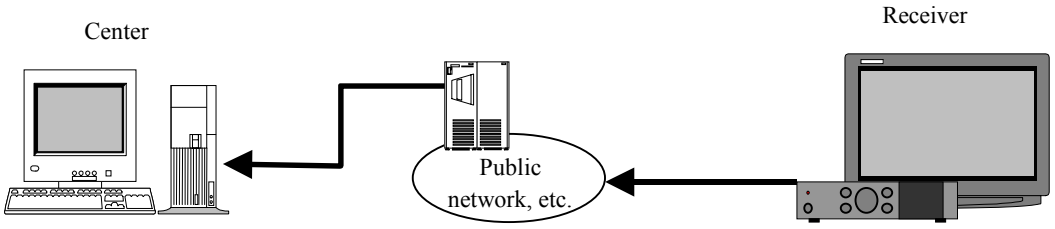


Figure4-4 Connection of mass calls reception service

4.5.3 Downward radio wave and going-up circuit

(1) In the interactive communication, upward signal such as a request will be transmitted through public lines while a response for the request will be delivered by radio wave.

Advantage: When satellite radio wave is used for transmitting the mass volume common data, it is possible to offer the service at a low price. A wide variety of new applications that have never existed in the conventional broadcasting and communication service may be realized. Each receiver uses the same uplink/downlink and shares a center, thus each receiver can communicate with the other.

Drawback: System is complex. In case a protocol for the uplink public lines and downlink satellite is required, a large-scale development is inevitable.

Figure 4-5 shows the connection pattern.

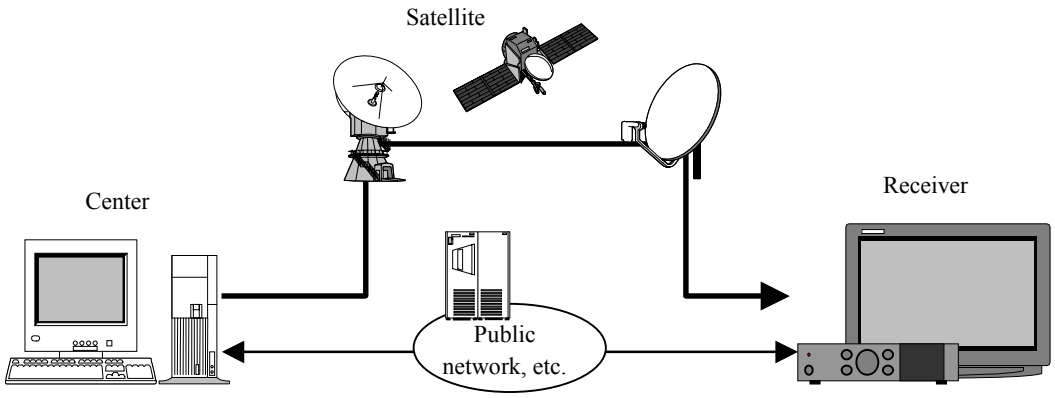


Figure 4-5 Connection using downward radio wave and going-up circuit

4.5.4 Internet connection [IP]

(1) The receiver unit is connected to the access point of Internet service providers (ISP) through the public network. From the ISP access point, it is connected to the center ISP through the Internet. Then, it will be connected to the center through a leased circuit.

Advantage: Existing access points across the country can be utilized.

Drawback: Implementation of TCP/IP, PPP, and ISP connection procedure is required for the receiver. ISP subscription is required for the viewers to receive the service from the center.

Figure 4-6 shows the connection pattern.

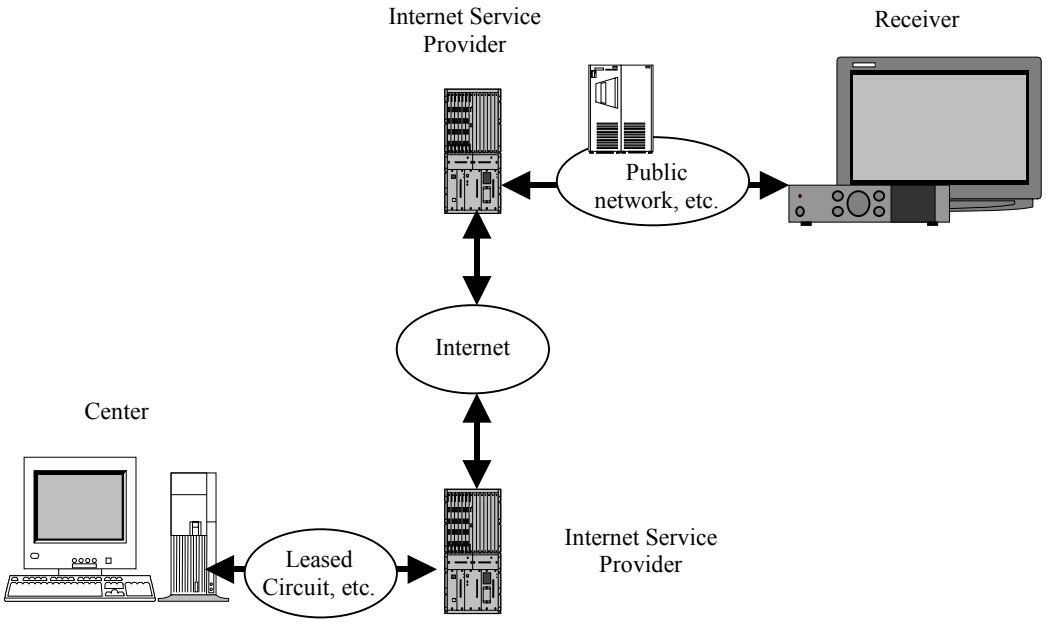


Figure4-6 Connection via the Internet

5 BASIC Type Communication Protocol

5.1 Interactive communication and transmission phase

Protocol for interactive transmission, which utilizes the public network such as PSTN and mobile network as well as PHS network, is divided into the 5 phases as shown in Table 5-1, and the communication protocol for each phase is defined at section 5.2.

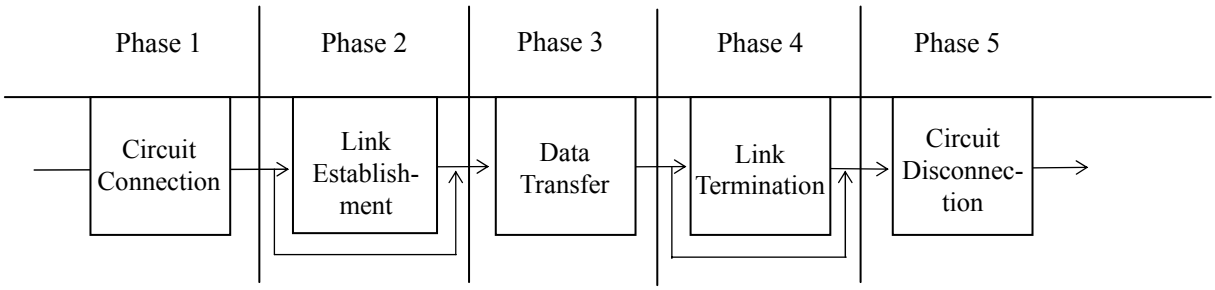


Figure 5-1 Transmission phase

5.2 Transmission phase and protocol stack

5.2.1 Circuit connection / disconnection phase

It is a phase where the receiver connects with or disconnects from the center through a public network. Circuit connection / disconnection will be mostly made by AT command for the modem.

5.2.2 Link establishment / termination phase

Link establishment phase is a stage where the receiver and data transfer link of the center is established after call has completed while termination phase is a stage where the link between the receiver and center is terminated after data transfer has completed.

Protocol stack in the phase of establishing / terminating link is listed in Table 5-1.

Table 5-1 Protocol stack in the phase of establishing / terminating link

Layer		Protocol stack
Data-link layer	Specification A	Procedure conforming to X.28 partially (See 5.3)
Physical layer		
Basic function (modem)	Specification A	V.22bis + MNP4
Mobile phone (Circuit switched data)	Specification B	PDC: 9600 bps*
PHS	Specification B	PIAFS: 32 kbps or greater

* For the basic function, it may be converted into V.22bis + MNP4 within the mobile network.

5.2.3 Protocol for data transfer phase

Data transfer phase can be defined as a phase where data communication is processed between the receiver and center after the link has established.

Protocol for BASIC type communication is shown in Table 5-2.

Table 5-2 Protocol stack for data transfer phase in BASIC type communication

Layer		Protocol stack
Application layer		To be selected according to the service
Data-link layer	Specification A	BASIC procedure code independent mode (For details, see section 5.3)
Physical layer		
Basic function (modem)	Specification A	V.22bis + MNP4
Mobile phone (Circuit switched data)	Specification B	PDC: 9600 bps*
PHS	Specification B	PIAFS: 32 kbps or greater

* For the basic function, it may be converted into V.22bis + MNP4 within the mobile network.

5.3 Detailed specification of BASIC protocol Specification A

This section defines the connection of receiver and collection network, as well as data transfer sequence, when the interactive service data is collected using the collection network that connects the receiver and the center.

Interactive data broadcasting service system is shown in Figure 5-2.

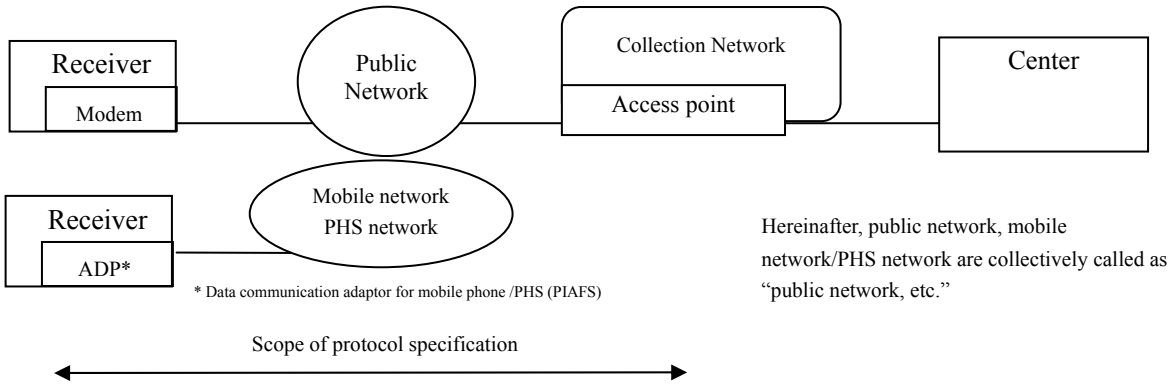


Figure 5-2 Interactive data broadcasting service system

5.3.1 Protocol condition

Protocol condition is shown in Table 5-3.

Table 5-3 Protocol condition

Item	Setup Condition
Transmission format	Alternate communication by ENQ and EOT
Delivery confirmation	Return an acknowledgement or negative acknowledgement for each telegram message sent
Resend control	Resend due to a negative acknowledgement or no response
Maximum text length for transmission	2048 bytes
No-communication monitoring	Monitoring by timer

5.3.2 Communication condition

Communication conditions for connection, data transfer, and modems are shown in Table 5-4.

Table 5-4 Communication condition of receiver

Item	Setup Condition	Remarks
Data length (text length)	8 bits	Communication condition at connection
Parity	None	
Stop bits	1 bit	
Transmission code system	JIS C6220 (8 units code)	
Local echo back	None (with remote echo back)	
Line feed control	Receiver -> Collection network: Send CR only Collection network -> Receiver: Send CR + LF	
Send delimiter code	CR (0D H) code	
Line feed code	LF (0A H) code	
Backspace code	BS (08 H) code	
LSB/MSB(bit)	LSB First	Communication condition at data transfer
Data transfer sequence	See section 5.3.4.	Communication condition for modem
Communication method	Asynchronous full duplex	
Communication speed	See section 5.2.3.	
Flow control	RS/CS	
MNP class	See section 5.2.3.	

5.3.3 Connection / disconnection sequence

For the receiver to connect with the center through collection network, it is necessary to connect to the collection network and send a host number command to identify the center.

(1) Connection sequence

<1> Normal sequence is shown in Figure 5-3.

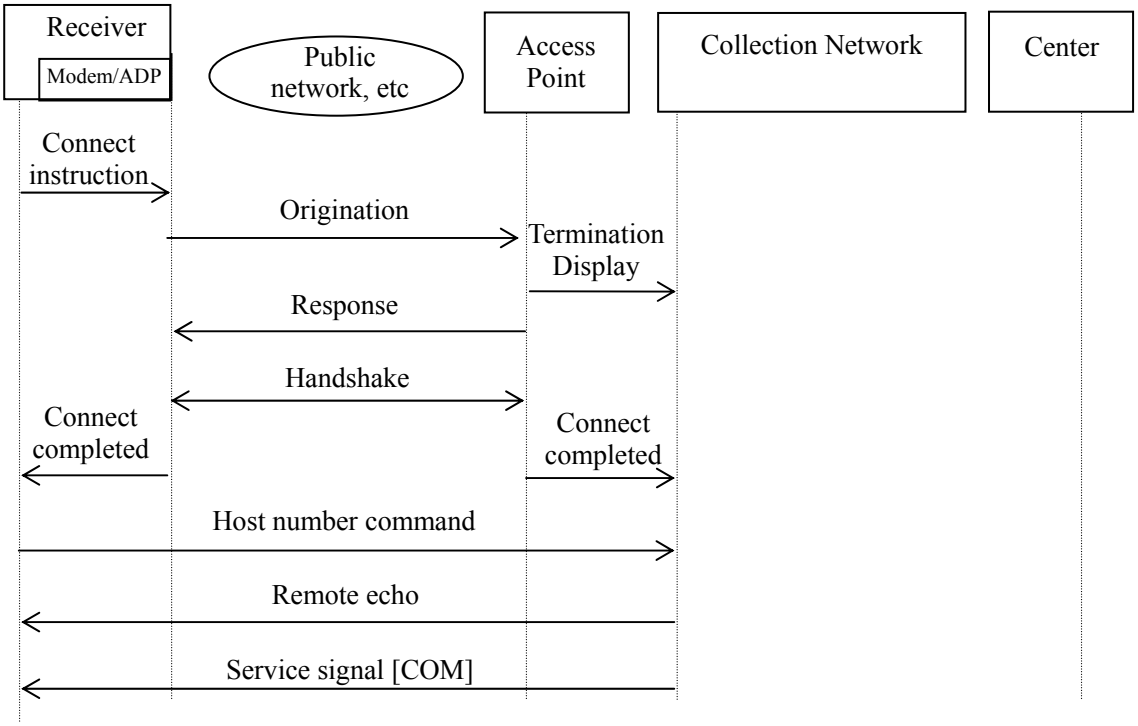


Figure 5-3 Normal sequence

<2> Abnormal sequence (host number command error) is shown in Figure 5-4.

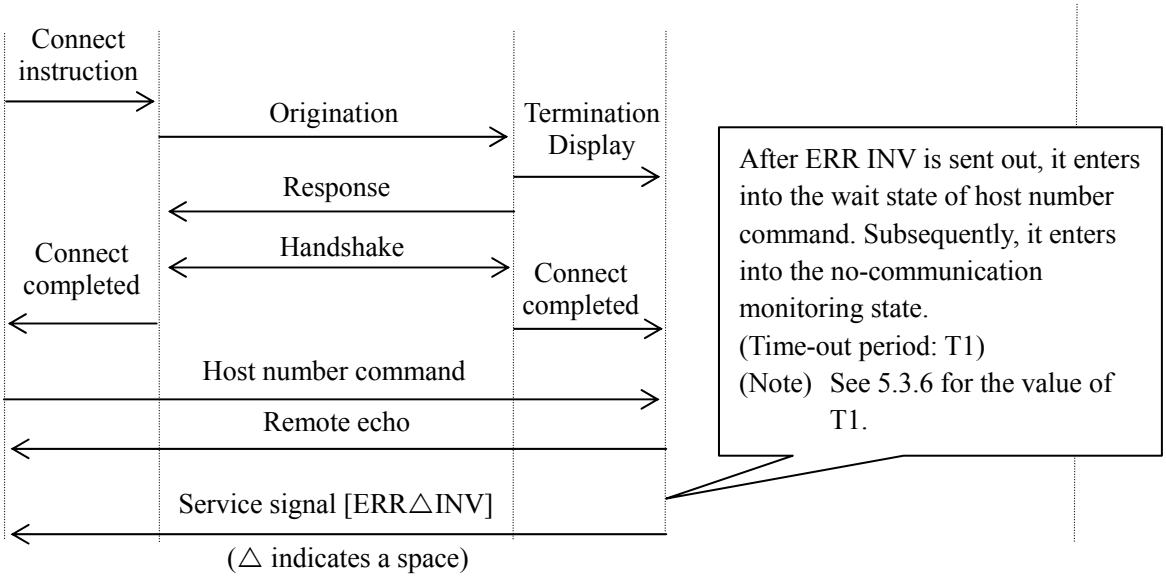


Figure 5-4 Abnormal sequence (host number command error)

<3> Abnormal sequence (center time-out during standby for host number command) is shown in Figure 5-5.

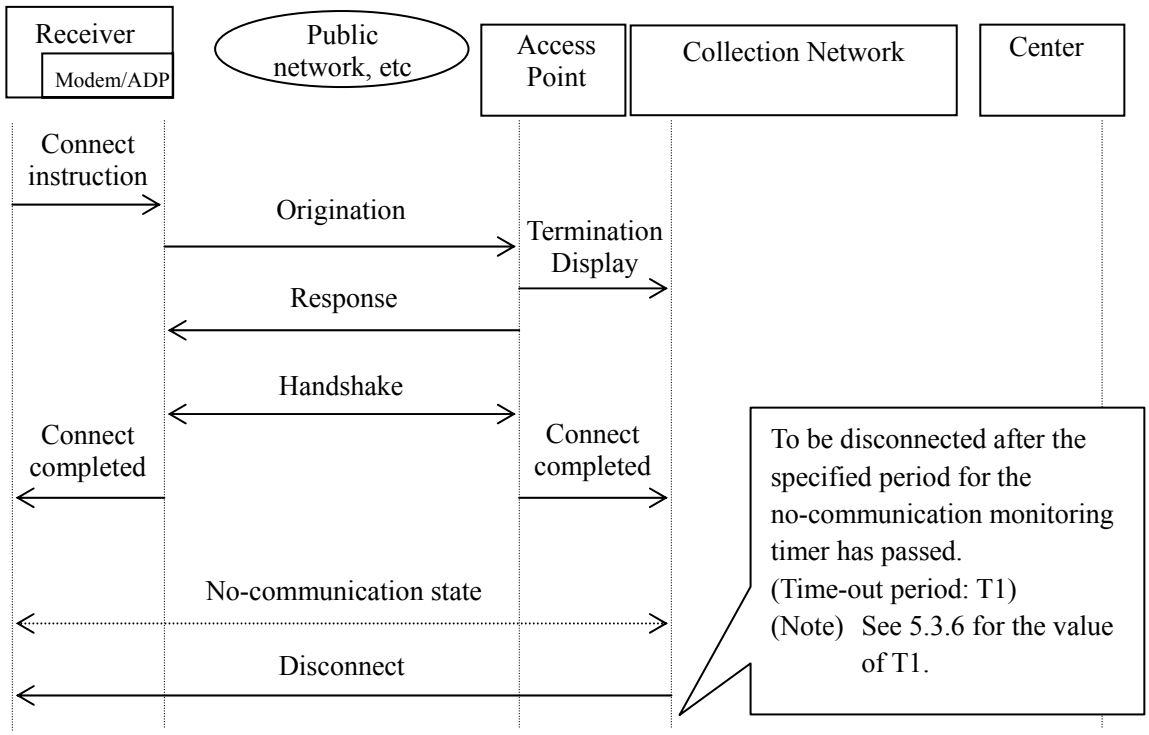


Figure 5-5 Abnormal sequence (center time-out at host number command standby)

<4> Abnormal sequence (call-in rejection by center) is shown in Figure 5-6.

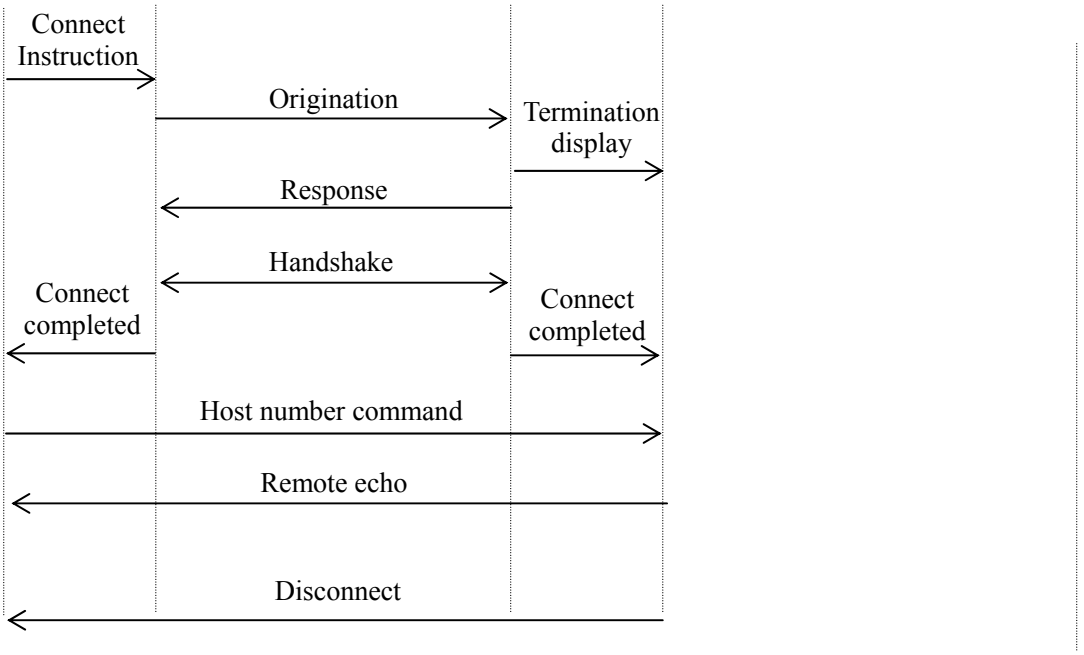


Figure 5-6 Abnormal sequence (call-in rejection by center)

<5> Abnormal sequence (remote echo error) is shown in Figure 5-7. See Table 5-6 Receiver behavior in the remote echo wait state.

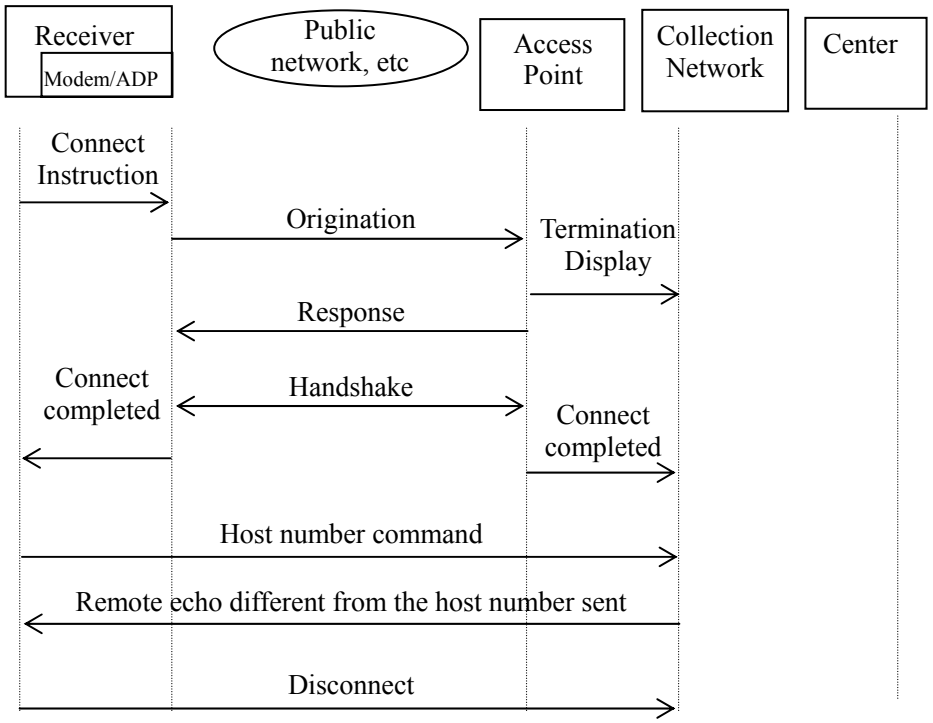


Figure 5-7 Abnormal sequence (remote echo error)

<6> Abnormal sequence (receiver time-out at remote echo standby) is shown in Figure 5-8. See Table 5-6 Receiver behavior in the remote echo wait state.

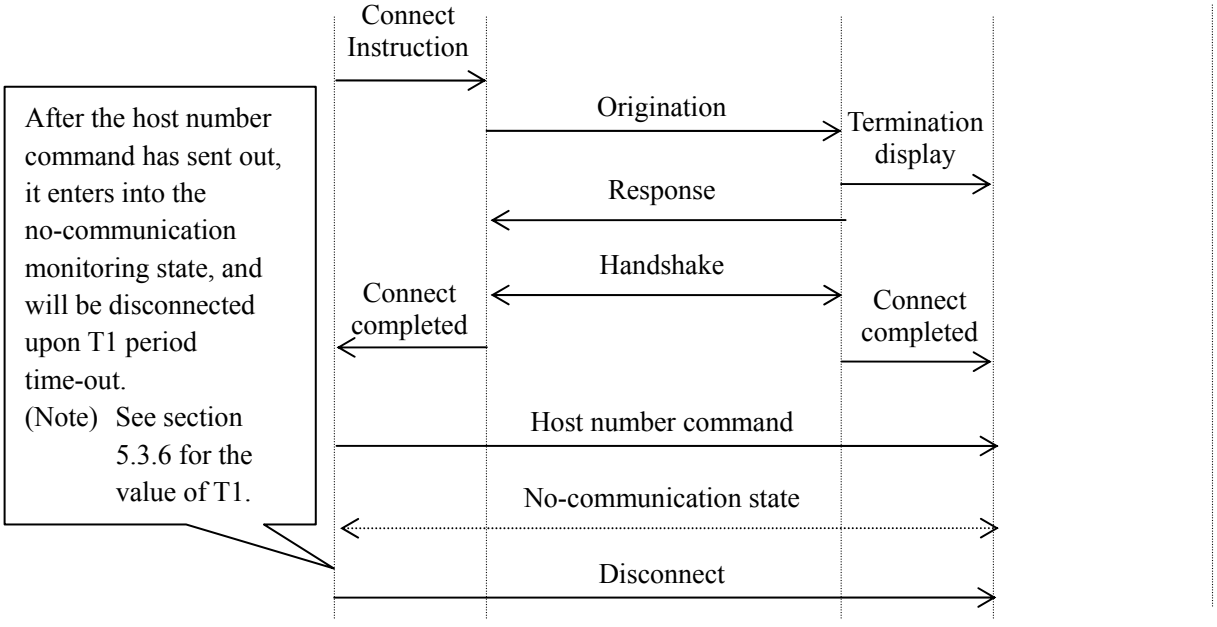


Figure 5-8 Abnormal sequence (receiver time-out at remote echo standby)

<7> Abnormal sequence (service signal error) is shown in Figure 5-9. See Table 5-7 Receiver behavior in the service signal wait state.

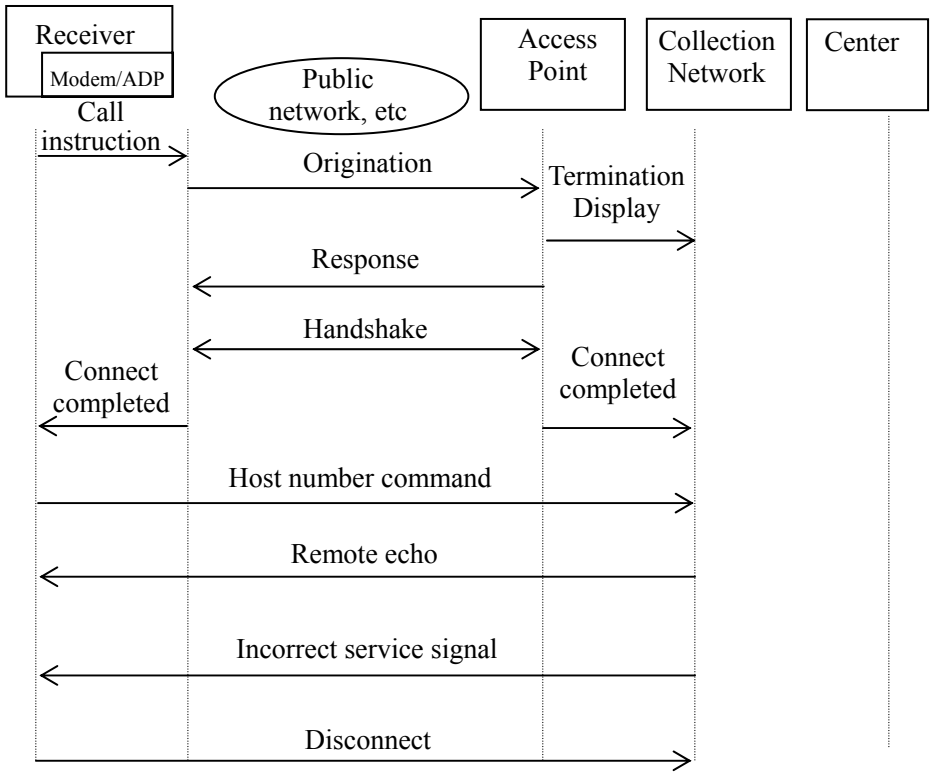


Figure 5-9 Abnormal sequence (service signal error)

<8> Abnormal sequence (receiver time-out at service signal standby) is shown in Figure 5-10. See Table 5-7 Receiver behavior in the service signal wait state.

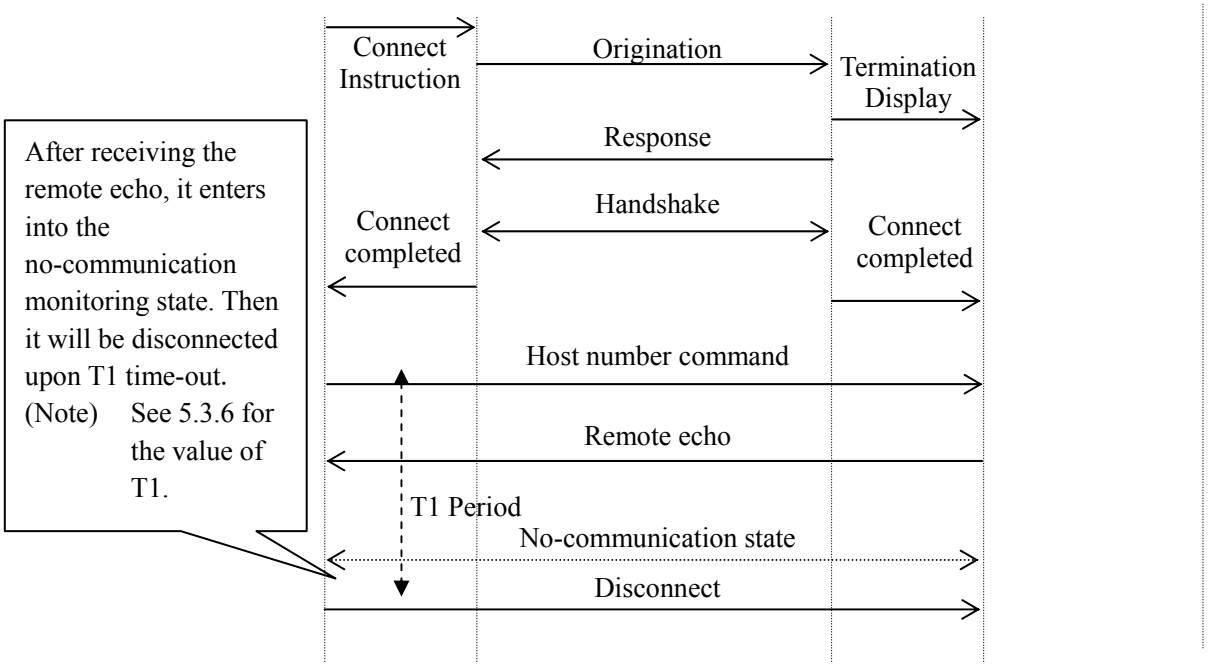


Figure 5-10 Abnormal sequence (receiver time-out at service signal standby)

(2) Disconnection sequence

<1> Disconnection sequence from receiver is shown in Figure 5-11.

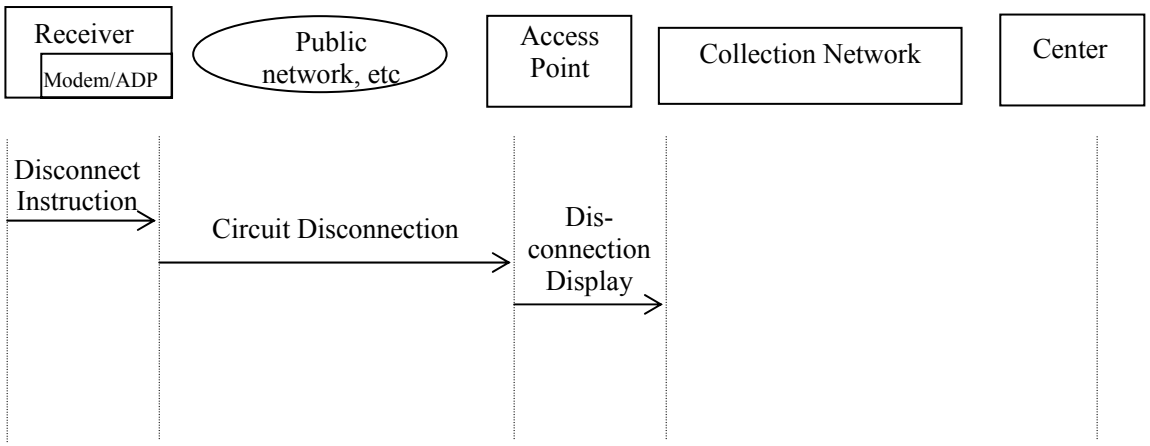


Figure 5-11 Disconnection sequence from receiver unit

<2> Disconnection sequence from center is shown in Figure 5-12.

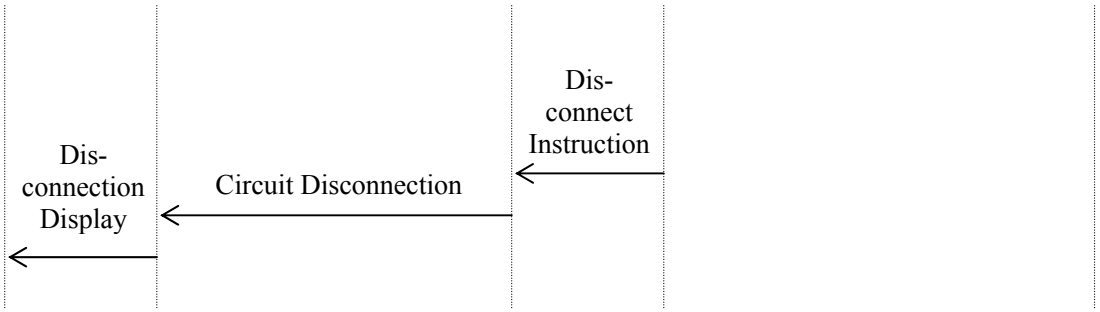


Figure 5-12 Disconnection sequence from center

(3) Host number command and service signal

Host number command and service signal format is shown in Table 5-5.

Table 5-5 Host number command and service signal format

Item		Format	Article
Host number command		$N_1N_2N_3N_4N_5N_6N_7N_8$ CR (Text for echo back) $N_1N_2N_3N_4N_5N_6N_7N_8$ CRLF	Echo back by 8-digit alphanumeric (JIS 8 units code: 0 to 9, A to Z, a to z).
Service signal	Connect completed	CR LF COM CR LF	CR: Send delimiter code LF: Line feed code
	Command error	CR LF ERR△INV CR LF	△ indicates a space.

(4) Receiver behavior after host number command has been sent

<1> Remote echo waiting state for the host number sent

The receiver transits to the waiting state of remote echo after the host number has been sent. Receiver behavior in the wait state of remote echo is shown in Table 5-6.

Table 5-6 Receiver behavior in the remote echo waiting sate

Receiving signal	BEHAVIOUR after receiving signal
Remote echo same as the host number sent Receive $N_1N_2N_3N_4N_5N_6N_7N_8$ CRLF (Go back from CRLF and compare the 8 characters from N_1 to N_8 and ignore after the 9th character.)	Transit to the service signal waiting state
Remote echo different from the host number sent Receive ■■■■ CRLF (For ■■■■, it is the code string of arbitrary length at 0 or greater, except $N_1N_2N_3N_4N_5N_6N_7N_8$)	Disconnect immediately
CRLF is not received during the specified time after the host number has sent out or re-sent (within the time-out period of T1 at the receiver) (Note 1)	Disconnect immediately

(Note 1) Start the no-communication monitoring timer of receiver after the host number command has been sent or re-sent.

(See section 5.3.6 for the value of T1)

<2> Service signal wait state

Receiver transits to the waiting state of service signal after receiving the remote echo $N_1N_2N_3N_4N_5N_6N_7N_8$ CRLF, which has the same host number that has been sent. Receiver behavior in the wait state of service signal is shown in Table 5-7.

Table 5-7 Receiver behavior in the wait state of service signal

Receiving signal	BEHAVIOUR after receiving signal
Correct service signal (Connect completed) (Note 1) Receive CRLF COM CRLF	Transit to data transfer sequence
Correct service signal (command error) (Note 1) Receive CRLF ERR∆INV CRLF (△ indicates a space)	Resend the host number command immediately Resend 3 times (Disconnect when receiving CRLF ERR∆INV CRLF 4times)
Incorrect service signal (Note 1) CRLF COM◇ CRLF ERR○ Receive CRLF□□□□CRLF (◇ is a code other than CR, ○ is a code other than space, □□□□ is a code string of arbitrary length, which is greater than 0 byte except COM and ERR△INV)	Disconnect immediately
Correct service signal is not received during the specified time after the host number has sent out or re-sent (within the time-out period of T1 at the receiver) (Note 2)	Disconnect immediately

(Note 1) Discard the data from the beginning of service signal wait state until the first CRLF is received.

(Note 2) Start the no-communication monitoring timer of receiver after the host number command has been sent or re-sent.
(See section 5.3.6 for the value of T1)

(5) Remote echo

Since the host sends an echo back to the receiver while the host number command is being sent out from the receiver, it is not necessary to implement a local echo back in the receiver.

The host receives the host number command from the receiver and sends an echo back. Then it sends out a service signal.

(6) Start timing of no-communication monitor timer at the host

The counting of no-communication monitoring time-out value T1 starts when a Connect is completed (end of modem negotiation), and the T1 is reset after the service signal CRLF ERR△INV CRLF is sent out.

5.3.4 Data transfer sequence

(1) Telegram sequence (Example)

An example of data transfer sequence between receiver and collection network is shown in Figure 5-13.

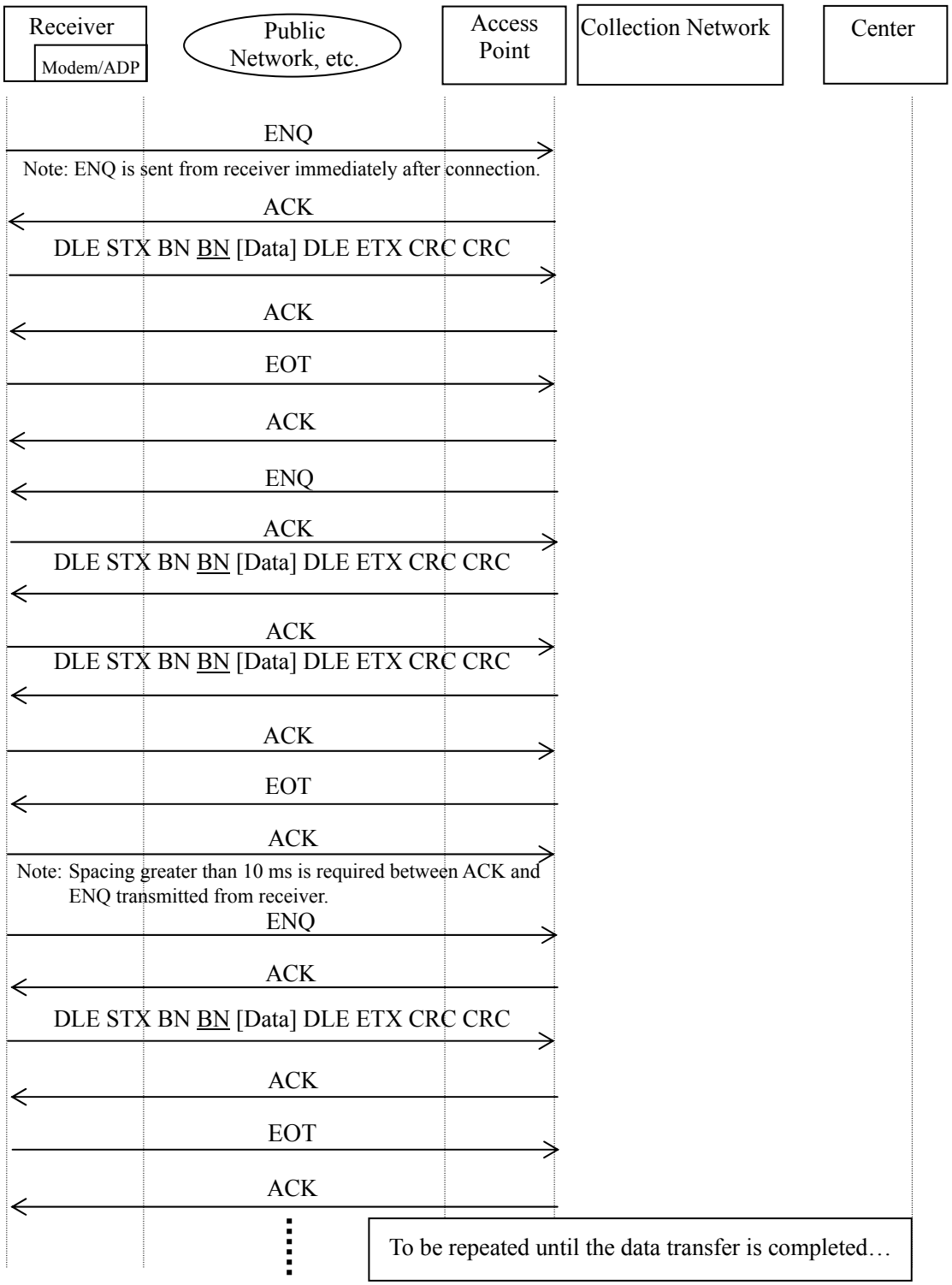
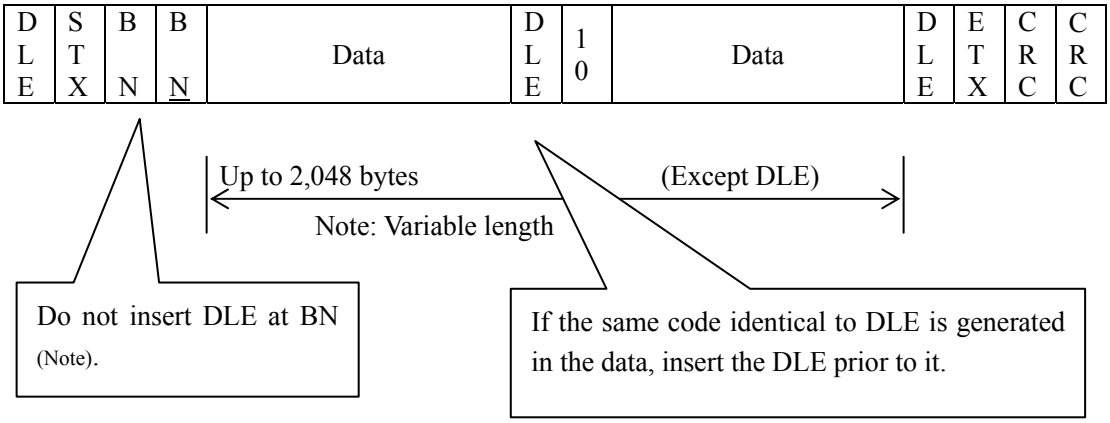


Figure 5-13 Example of data transfer sequence

(2) Telegram format

① Telegram format for transmission

The telegram format for transmission is shown in Figure 5-14.



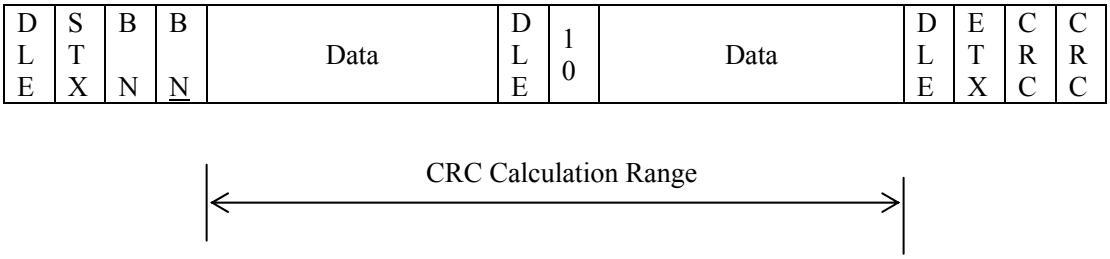
Note BN: Block number (0 to 255)

BN: Block number (BN) 1's complement.

Figure 5-14 Telegram format for transmission

② Calculation range of CRC

The calculation range of CRC is shown in Figure 5-15.



Note: Do not include DLE inserted in the data into the calculation.

Table 5-15 CRC calculation range

③ How to calculate CRC

Implement 16-bit CRC for the calculation method of CRC.

CRC-16 Sort the target data for calculation in the descending order from the least significant bit to the most significant bit. Multiply the polynomial sorted by X^{16}, and divide the result by generating polynomial $X^{16}+X^{15}+X^2+1$. The remainder of this result is CRC.

The remainder (16-bit) is arranged from the most significant to the least significant in the units of 8-bit in CRC-16. However, in BASIC type protocol, all bits need be re-arranged in descending order, in order to enhance the security, so that the least significant bit becomes the CRC's most significant bit, the most significant bit becomes the CRC's least significant bit.

[Calculation example]
Data to be computed: 10_H

Multiply X^3 by X^{16} after sorting X^3 in descending order,
and the remainder divided by $X^{16}+X^{15}+X^2+1$
is $X^{15}+X^5+X^4+X+1$ (8033_H).

When re-sorting 8033_H(1000 0000 0011 0011),
for the interactive service data collection protocol,
16-bit as the base unit,
which will be $CC01_H$(1100 1100 0000 0001)
after CRC being processed.

In the conventional CRC-16, it is $01CC_H$.

④ Block number

The block number (BN) starts from 01. In this case, block number 1's complement (BN) is FE (254). When sending texts sequentially from one side (between ENQ and EOT), block number is counted up by 1. Once the block number reaches to FF (255), the next block number becomes 00.

Figure 5-16 demonstrates the block number flow. Figure 5-17 shows an example of block number sequence.

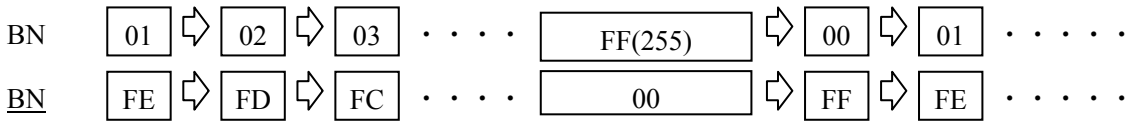


Figure 5-16 Block number flow

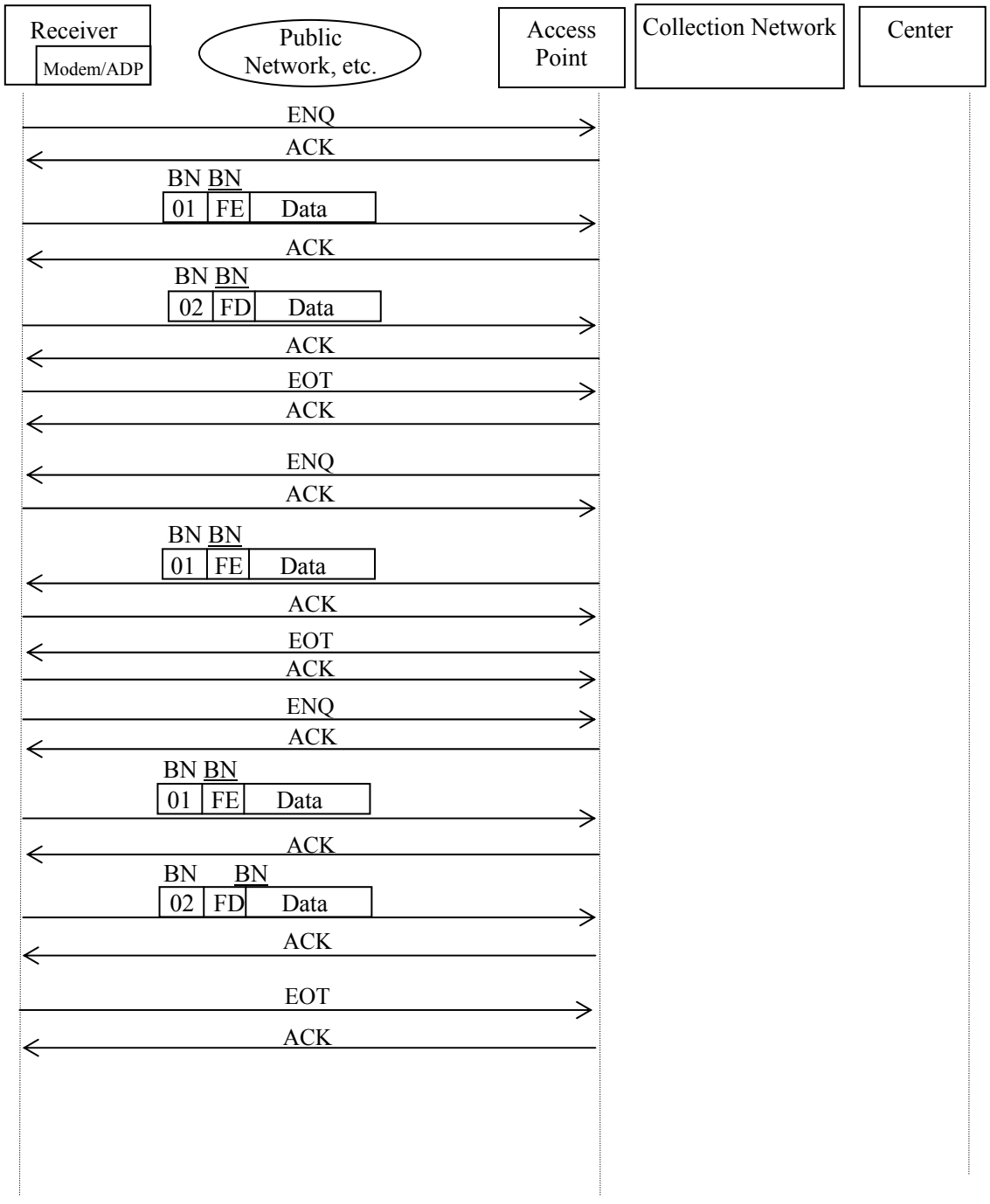


Table 5-17 Sequence example of block number

(3) Control code format

The control code format is listed in Table 5-8.

Table 5-8 Control code format

Control code	HEX code	Meaning	Comment
DLE STX	1002H	Start data	
DLE ETX	1003H	End data	
ENQ	05H	Line control	1 byte sending/receiving
ACK	06H	Acknowledgement	Same as above
NAK	15H	Negative acknowledgement	Same as above
EOT	04H	End of transmission	Same as above
DLE	10H	Transmission control	Insert before 10H in the data

5.3.5 State transition

(1) State transition table

The state transition is demonstrated in Table 5-9.

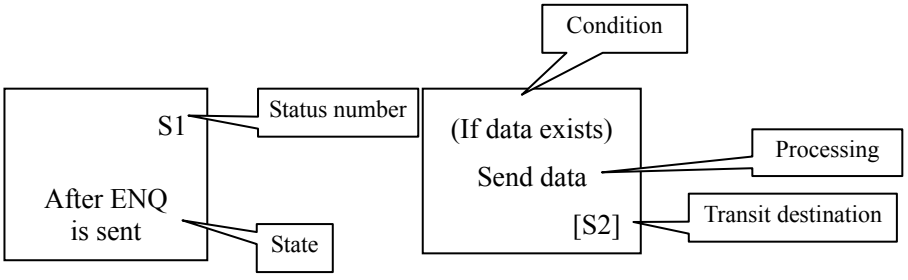
Table 5-9 State transition

State / Reception code	Data origin				Data destination	
	(*1)S0 Send ENQ [S1]	ACK standby			R1 ENQ standby	R2 Data standby
		S1 After ENQ is sent	S2 After data are sent	S3 After EOT is sent		
ENQ					Send ACK [R2]	
ACK		Send data [S2]	(If data exists) Send data [S2] (Else) Send EOT [S3]	[R1]		
NAK		Resend ENQ [S1]	Resend data [S2]	Resend EOT [S3]		
Data						(If OK) Send ACK [R2] (If NG) Send NAK (*2) [R2] Send ACK (*3) [R2] Disconnect (*4)
EOT						Send ACK [S0]
Time-out [T2]		Resend ENQ [S1]	Resend data [S2]	Resend EOT [S3]	Send NAK [R1]	Send NAK [R2]
Retry-out [C1]		Disconnect			Disconnect	

(*1) If the state is S0 and there is no data to be transmitted from the receiver, it is desirable to hold the ENQ transmission until the data to be sent are entered. In addition, if T2 time-out (ENQ standby) occurs at the center while it is on hold, NAK will be received but the receiver ignores this operation.

(*2) See 5.3.5 (2) ①, ③, ④, ⑤, ⑥ (*3) See 5.3.5 (2)② 1) (*4) See 5.3.5 (2)② 2)

Note: Ignore spaces



(2) Error during data reception

There are following patterns for the errors at data reception (state transition table R2-data reception-result: NG).

① If the relationship of BN and BN (1's complement) does not correspond, send NAK.

② If the relationship of BN and BN corresponds but it does not match with the expected value;

1) For the adjacent BN and BN, discard the corresponding data and send ACK.

2) Other than above: Disconnect

③ If CRC error occurs, send NAK.

④ If DLE STX does not exist, send NAK.

⑤ If DLE ETX does not exist, send NAK.

⑥ Other than above, if the data are not in the supported format, send NAK.

5.3.6 Time-out and retry-out value

The time-out and retry-out value in use of collection network is shown in Table 5-10.

Table 5-10 Time-out and retry-out value

Time-out value	T1	30 seconds
	T2	10 seconds
Retry-out value	C1	3 times

6 TCP / IP Communication Protocol [IP]

6.1 Interactive communication and transmission phase

Protocol for interactive transmission, which utilizes the public network such as PSTN, ISDN, mobile network, and/or PHS network, as well as in the constant connection pattern realized by ADSL, FITH, or CATV, is divided into the 5 phases as shown in Table 6-1, and the communication protocol for each phase is defined at section 6.2.

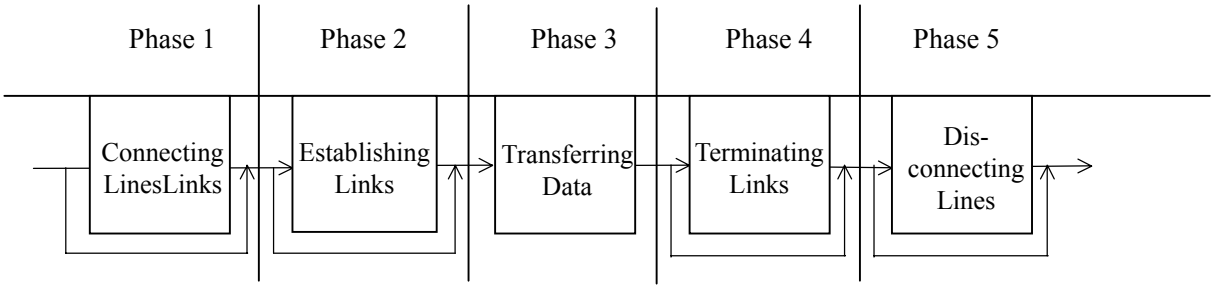


Figure 6-1 Transmission phase

6.2 Transmission phase and protocol stack

6.2.1 Circuit connection / disconnection phase

It is a phase where the receiver connects with or disconnects from the center through a public network. Circuit connection / disconnection will be mostly made by AT command for the modem. In the pattern where Ethernet is used, this phase is skipped.

6.2.2 Link establishment / link termination / data transfer interface

Link establishment phase is a stage where the receiver and data transfer link of the center is established after call has completed while termination phase is a stage where the link between the receiver and center is terminated after data transfer has completed. Data transfer phase can be defined as a phase where data communication is processed between the receiver and center after the link has been established. Note that the protocol required will vary according to the connection pattern.

Protocol stack in the phase of link establishment / termination / data transfer is listed in Table 6-1 through Table 6-6.

(1) Communication protocol for PSTN

The protocol stack for PSTN connection is shown in Table 6-1.

Table 6-1 Communication protocol for PSTN

Layer	Protocol stack
Application layer	Select from HTTP1.1(RFC2616), DNS(RFC1123) [IP Extension] Specification A, or HTTP1.0 (RFC1945), Telnet, FTP, NNTP, SMTP, POP3, etc Specification B depending on the service type.
Transport layer	TCP(RFC793) , UDP(RFC768)
Network layer	IP(RFC791)/ICMP(RFC792)
Data-link layer	PPP(RFC1661,1662)/IPCP(RFC1332) PAP(RFC1334)/CHAP(RFC1994), PPP Internet Protocol Control Protocol Extensions for Name Server Addresses(RFC1877), CCP(RFC1962) [IP Extension] Specification B
Physical layer	V.90 or faster, V.42bis

(2) Communication protocol for ISDN

a. ISDN-DSU-TA connection

The protocol stack for ISDN-DSU-TA connection is shown in Table 6-2.

Table 6-2 Communication protocol for ISDN-DSU-TA connection

Channel type	B channel	D channel	
Layer	Protocol stack	Protocol stack	
Application layer	Select from HTTP1.1(RFC2616), DNS(RFC1123) [IP Extension] Specification A, or HTTP1.0(RFC1945), Telnet, FTP, NNTP, SMTP, POP3, etc. of Specification B depending on the service type.	To be selected according to the service type	
Transport layer	TCP(RFC793) , UDP(RFC768)		
Network layer	IP(RFC791)/ICMP(RFC792)	TTC JT-Q.931	X.25 (Packet level) (*1)
Data-link layer	PPP(RFC1661,1662)/IPCP(RFC1332) PAP(RFC1334)/CHAP(RFC1994), PPP Internet Protocol Control Protocol Extensions for Name Server Addresses(RFC1877), CCP(RFC1962) [IP Extension] Specification B	TTC JT-Q.921	
Physical layer (*2)	RS-232C USB		

*1: Used in the Dch packet call control phase.

*2: Same standard as the physical interface implemented on TA.

b. ISDN-DSU- (TA built-in) connection

The protocol stack for ISDN-DSU- (TA built-in) connection is shown in Table 6-3.

Table 6-3 Protocol stack for ISDN-DSU-(TA built-in) connection

Channel type	B channel	D channel	
Layer	Protocol stack	Protocol stack	
Application layer	Select from HTTP1.1 (RFC2616), DNS (RFC1123) [IP Extension] Specification A, or HTTP1.0 (RFC1945), Telnet, FTP, NNTP, SMTP, POP3, etc. of Specification B depending on the service type.	To be selected according to the service type	
Transport layer	TCP(RFC793) , UDP(RFC768)		
Network layer	IP(RFC791)/ICMP(RFC792)	TTC JT-Q.931	X.25 (Packet level) (*1)
Data-link layer	PPP(RFC1661,1662)/IPCP(RFC1332) PAP(RFC1334)/CHAP(RFC1994), PPP Internet Protocol Control Protocol Extensions for Name Server Addresses (RFC1877), CCP(RFC1962) [IP Extension] Specification B	TTC JT-Q.921	
Physical layer	TTC JT-I.430		

*1: Used in the Dch packet call control phase.

(3) Communication protocol for Ethernet

Applicable when using ISDN, ADSL, FTTH, or CATV as a return circuit.

a. Direct connect to network terminator

The protocol stack when connecting to the network terminator directly is shown in Table 6-4.

Table 6-4 Protocol stack for the direct connection to network terminator

	Protocol stack
Application layer	Select from HTTP1.1 (RFC2616), DNS (RFC1123) [IP Extension] Specification A, or HTTP1.0 (RFC1945), Telnet, FTP, NNTP, SMTP, POP3, DHCP, etc. of Specification B depending on the service type.
Transport layer	TCP (RFC793), UDP (RFC768)
Network layer	IP (RFC791)/ICMP (RFC792)
Data-link layer	PPP(RFC1661,1662)/PPPoE(RFC2516) /IPCP(RFC1332) (*1) PAP (RFC1334)/CHAP(RFC1994), PPP Internet Protocol Control Protocol Extensions for Name Server Addresses (RFC1877), IEEE802.2/ARP(RFC826), CCP (RFC1962) [IP Extension] Specification B
Physical layer	IEEE802.3

*1: To use the constant connection service, PPP/PPPoE/IPCP is required

b. Router connection

The protocol stack for connection through router is shown in Table 6-5.

Table 6-5 Protocol stack for the connection through router

	Protocol stack
Application layer	Select from HTTP1.1(RFC2616), DNS(RFC1123) [IP Extension] Specification A, or HTTP1.0(RFC1945), Telnet, FTP, NNTP, SMTP, POP3, DHCP, etc. of Specification B depending on the service type.
Transport layer	TCP(RFC793) , UDP(RFC768)
Network layer	IP(RFC791)/ICMP(RFC792)
Data-link layer	IEEE802.2/ARP(RFC826)
Physical layer (*1)	IEEE802.3 (*2) IEEE802.11 (*3)

*1: Same standard as the physical interface implemented on dial-up router.

*2: 10BASE-T, 100BASE-TX

*3: Wireless LAN

(4) Data communication protocol using mobile phone / PHS (PIAFS)

The protocol stack when using mobile phone / PHS (PIAFS) is shown in Table 6-6.

Table 6-6 Protocol stack for mobile phone / PHS (PIAFS) use

Layer	Protocol stack			
Application layer	Select from HTTP1.1(RFC2616), DNS(RFC1123) [IP Extension] Specification A, or HTTP1.0 (RFC1945), Telnet, FTP, NNTP, SMTP, POP3, etc. Specification B depending on the service type.			
Transport layer	TCP(RFC793) , UDP(RFC768)			
Network layer	IP(RFC791)/ICMP(RFC792)			
Data-link layer	PPP(RFC1661,1662)/IPCP(RFC1332) PAP(RFC1334)/CHAP(RFC1994), PPP Internet Protocol Control Protocol Extensions for Name Server Addresses(RFC1877), LCP Extensions(RFC1570), CCP(RFC1962) [IP Extension] Specification B			
Physical layer (*1)	Mobile phone			PHS
	PDC CDMA Cellular System	PDC-P, etc. (*2) CDMA Cellular System	DS CDMA, MC CDMA	PIAFS

*1: Describe the communication method at DIRD for the physical layer.

Communication method between the mobile phone (PDC) / PHS (PIAFS) and the center may be converted into analog communication at the mobile network or at the center.

*2: Packet switching service of mobile phone

6.2.3 Implementation of physical layer protocol Specification A

Be sure to implement at least one of the protocols specified in 6.2.2 (1) through 6.2.2 (4) for the physical layer. Note that the implementation of multiple protocols is receiver-dependent.

7 Operation of Interactive Communication

7.1 Telephone number system and network

This section explains the possible network architecture and telephone number system at the commencing time of broadband CS digital broadcasting.

7.1.1 Example of network architecture

Figure 7-1 demonstrates an example of possible network architecture for the interactive data broadcasting service at the commencing time of broadband CS digital broadcasting.

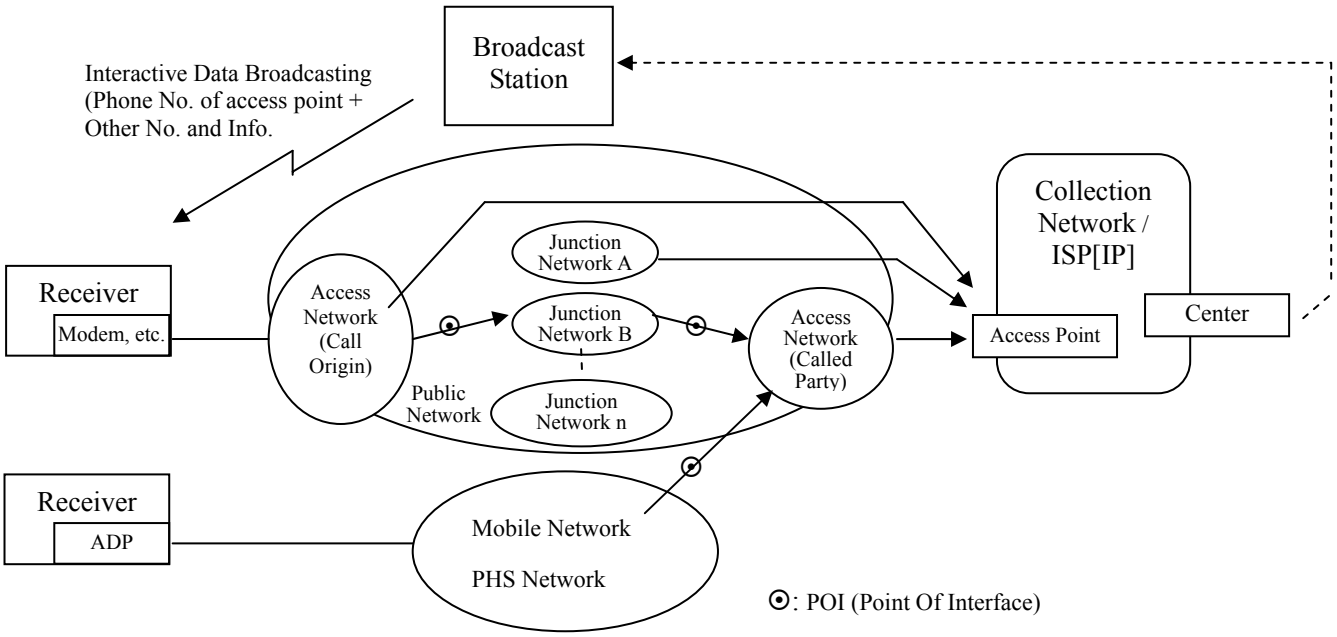


Figure 7-1 Example of network architecture for the interactive data broadcasting service

7.1.2 Phone number system

The telephone number system as of August 25, 1999 is shown in Table 7-1. Note that the telephone number system conforms to Article 82 of Telecommunication Number Rules issued by Ministry of Posts and Telecommunications, and is subject to change in the future.

Table 7-1 Phone number system

	Service ID number	Bill-to party	Example of number
Special number	1XY	–	184, 186
			122 (*1)
Communication provider identification number	00XY(*3)	Call origin	00XY+0ABCDEFGHJ(K)
Call billing charge number	0120 (Call billing function)	Called party	0120+DEFGHJ
	0800 (Call billing function)	Called party	0800+DEFGHJK
	00XY+SC	Called party	00XY+SC+******** (*2)
General number	0ABCDEFGHJ(K)	Call origin	0ABCDEFGHJ(K)
	00XY+SC	Call origin	00XY+SC+******** (*2)
Network service number	0180 (Mass calls reception function)	Call origin	0180+ DEFGHJ
	0990 (Information fee commissioned collection function)	Call origin	0990+ DEFGHJ
	0570 (Unified number function)	Call origin	0570+ DEFGHJ

(*1) Number used to cancel the fixed-priority connection (provider-specific customized option).

(*2) SC: Service Code. Identification code of network services offered by 00XY provider. To determine bill-to party, SC code is used for identification.

(*3) Communication provider identification number represented by 00XY includes 00X, 00XY, 002YZ, 002YZN1N2, and 0091N1N2.

7.1.3 Transmission order and digit length of special numbers and other applicable numbers

(1) [Caller ID notification number<3>] + [Fixed-priority connection cancel number<3>]
+ [Communication provider identification number<7>] + 0ABCDEFGHJ(K)<10>/<11>

(2) [Caller ID notification number <3>] + 0AB0DEFGHJ(K)<10>/<11>

(3) [Caller ID notification number<3>] + Communication provider identification number<7>
+ SC + ********<indefinite>

(Note) [ ] may not be needed. Inside of < >: Maximum digit length as of September 1999

7.1.4 Phone number required to initiate a call and its classification

To make a call request, in addition to the numbers explained in the previous section: special number and communication provider identification number; external line acquisition number is also required. For descriptive purposes, the phone numbers needed to make a call request is classified in Table 7-2. Based on this classification, the phone numbers required for a call request will be outlined as shown in Figure 7-2.

Figure 7-2　Category of phone numbers required for call request

Category name	Table category	Definition
External line acquisition number	External line transmission number from PBX, etc.	A unique number per terminal required to make a call request, for example, an external line acquisition number. This number is appended at the beginning of the phone number.
Special Number	Caller-ID notification number Fixed-priority connection cancel number	Number used to select an additional service function.
Communication Provider Identification number	Communication provider identification number	Number used to select a communication provider to be connected, which is appended to the general phone number.
Mandatory phone number*1 (Phone number)	General phone number Call billing charge number Number for network service	Phone number only to establish a connection by dialing.

*1　Unless otherwise specified, “phone number” indicates “mandatory phone number” in the following passages.

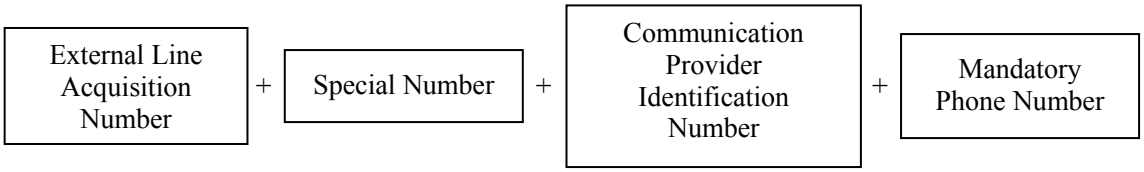


Figure 7-2　Phone number required for call request

7.2　Flow of phone number selection

The interactive data broadcasting application (hereinafter referred to as ‘application’) and/or receivers locate and identify the proper phone number and append a proper special number and communication provider ID number to make a call request in the order of phases shown below. Figure 7-3 outlines an overview of this process. Note that the processing from Phase I through Phase III is not applicable to the connection pattern that does not require dial-up (ADSL [IP], FTTH [IP], CATV [IP]).

- Phase I: Select access point phone number (application function)
  In this phase, the appropriate phone number is located and identified based on the corresponding security class and phone number related information in order to execute the application, by reading the communication related information stored in the receiver.
- Phase II: Append special number and communication provider identification number (receiver function)
  In this phase, a special number and a communication provider identification number are appended to the phone number identified at Phase I based on the viewer setting information.

- Phase III: Call request (receiver function)

  In this phase, a call request is made based on the processing described at Phase I and Phase II. Append an external line acquisition number, if configured. If necessary, send out a host number.

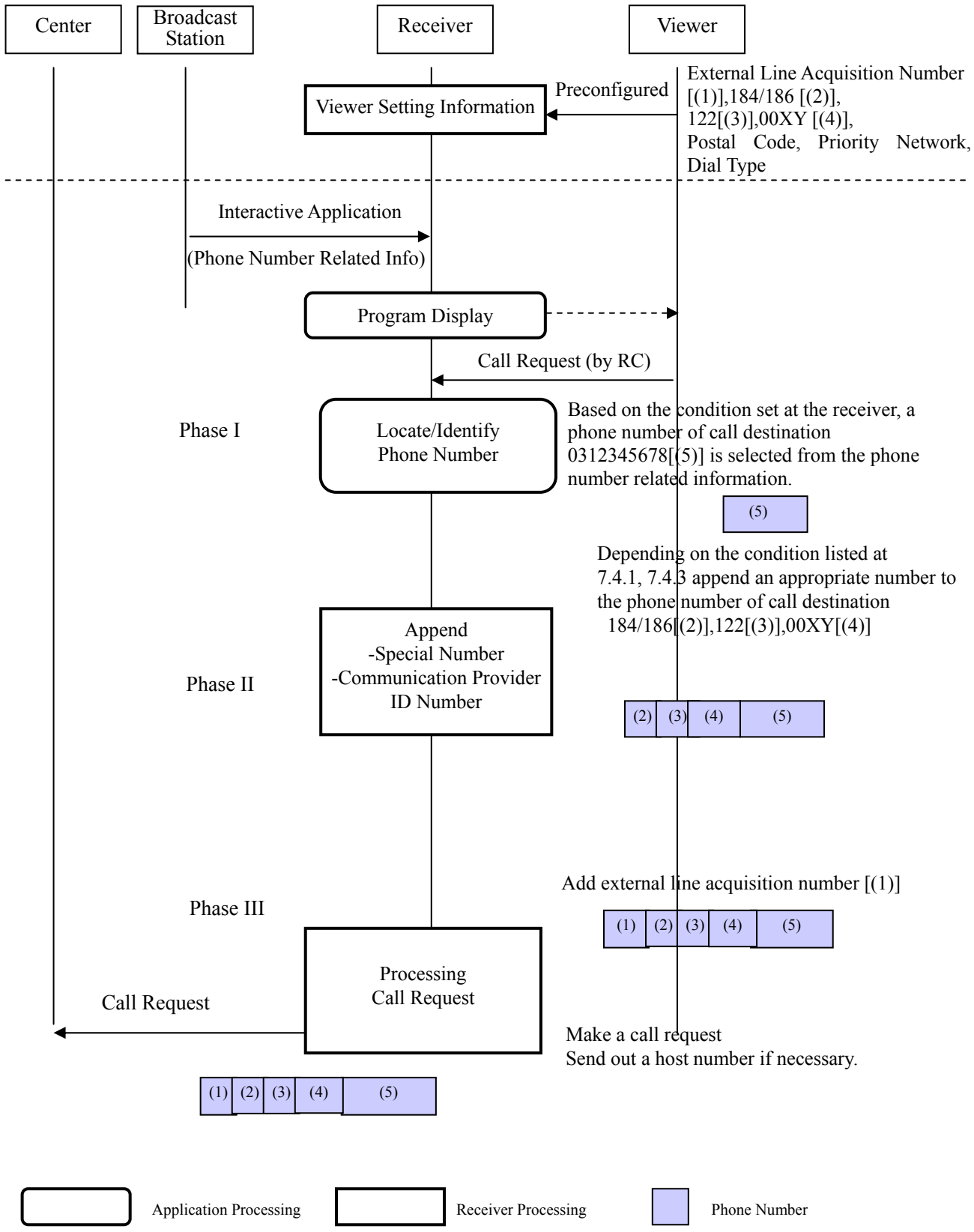


Figure 7-3 Overview of call request processing

7.3 Operation of broadcasting station Specification A

7.3.1 Conditions for transmitting phone numbers

Conditions for transmitting phone numbers in the interactive data broadcasting services are defined in this section. Note that this specification does not apply to the connection via Ethernet as a priority circuit class for the high-function receivers because such connection does not need a telephone line.

(1) Only the mandatory phone numbers are allowed for transmission by broadcasting stations.
- A communication provider identification number (i.e. 00XY) should not be appended in this transmission. This condition, however, does not include the numbers starting with 00XY (00XY+SC+********).
- The special number (122), which forces to cancel a fixed-priority connection, should not be appended in this transmission.
- Unless viewers authorizes, the special number (186), which forces to notify their originating phone number, should not be appended in this transmission. To broadcast contents with the special number (186), the broadcasters might need to obtain viewer's approval by some reliable methods. For example, display an acknowledgement message before the transmission to seek a confirmation by viewer's action on the BML contents, or use the receiver unit to configure whether to enable the special number (186) to be appended.

(2) Configuration of network identifier
- Broadcasting stations must set this flag on for the phone numbers that a caller ID notification number and a communication provider ID number can be appended. To temporary disable this append function of the receiver, turn this flag off. Table 7-3 shows the flag configuration in the current phone number system.

(3) When describing phone number with contents, configure a setting to use ” ,” to pause and detect SDT (Secondary Dial Tone) within the phone number in case it is necessary. A ” ,” (comma) will generate a dial pause duration of 2-3 seconds.

Table 7-3 Configuration of network identifier

Phone number and other numbers applicable	Network identifier configuration
0ABCDEFGHJ(K)	On
0AB0+DEFGHJ(K)	Off
00XY+SC+*****	Off
Temporary disable append function of receiver	Off

7.3.2 Application function

(1) Phone number select function

Implement a function to identify one proper telephone number by referencing the communication related information and viewer setting information stored at the receiver and compare then with the phone number related information controlled by the application.

(2) Conditions where call requests are not executed

Application does not initiate a call request under the following conditions:

- In the case where a postal code of the receiver is used for selecting a phone number, the postal code has not been set in the receiver.
- Security class of the receiver does not meet the security requirement of application.
- Circuit of the receiver does not correspond with the circuit required by the application.

(3) Referencing receiver information

The application must have an API to reference the communication related information and viewer setting information of the receiver in order to be able to identify a proper phone number from them.

(4) Interactive communication chargeable to caller

In the case where the charges of interactive communication will be billed to the caller, including the use of caller-paid phone number, it would be desirable to obtain an acknowledgement by application.

(5) Error processing for delayed call request

If an error such as “busy” or “no carrier” occurs during a delayed call request, processing as retry calling, error handing, and necessary error display will be controlled by the application.

In this case, one of the causes for "no carrier" or "busy" error could be an incorrect receiver settings of viewer data related to the call request. Therefore, it would be desirable to implement a function of error display or script design in that context.

(6) Processing related to mass calls reception service

Among the cut-through connection of mass calls reception service, there are some instances that the switchboard handles them as a cut call after a call request has been sent. For this reason, only the following cases are regarded as “cut call success”: return value (-6) as “Forced disconnection” and return value (-8) as “line busy”.

(7) Setting the timeout period of connect()

When a call request is made using connect(), in order to guarantee the behavior “No carrier detected” at the return value (-5) of carrier detection timer in the modem with no center response, it would be desirable to set the time out interval at 90,000 milliseconds or greater by application.

(8) Managing user ID and password [IP]

When a call request function is used for the connection with BML contents, do no display their user ID and password for the viewers.

(9) ISP connection information usage limits [IP]

When a call request function is used for the connection with BML contents, ISP connection information should be utilized within the corresponding BML contents only without being saved persistently in the receiver unit.

(10) Operation of getPrefixNumber( )

- Use Array[2] to Array[4] for the return value.
- In terms of private data protection, return value must not be transmitted as information to the center.

(11) Operation of setISPParams( ) [IP]

- The first argument ispname is up to 64 digits of character length (128 bytes).
- The 11th argument status value depends on the broadcasting provider who uses this function from unconfigured state [1] and there will be no restriction for its operation.

(12) Operation of getISPParams( ) [IP]

- In terms of protecting personal information, information element retrieved must not be transmitted to the center.
- Provider ID information returned by array[10] is defined at Table 7-4.

Table 7-4 Definition of return value by getISPParams() array[10]

Value (hexadecimal expression)			Definition
00	XXXX	XX	Unconfigured state.
(1 byte)	(2 bytes)	(1 byte)	
8F	XXXX	XX	Configured by the receiver function.
(1 byte)	(2 bytes)	(1 byte)	
Other than the above			ID info of broadcasting provider who executed setISPParams()
FF	original_network_id	broadcaster_id	
(1 byte)	(2 bytes)	(1 byte)	

Note: X means "not applicable".

(13) Operation when a caller ID notification number is appended by the BML contents

When there is a setting of "fixed-priority connection cancellation number" and "carrier identification number", the "fixed-priority connection cancellation number" and "carrier identification number" should be reproduced on the BML contents to guarantee the order of numbers to be dialed. However, it does not apply to the phone numbers that communication provider ID cannot be appended.

(14) Disconnecting PPP line connected by the auto-connect function [IP extension]

When the PPP connection line established by the auto-connect function of the receivers is terminated by the termination function disconnectPPP( ) from the BML contents, viewer consent of BML contents must be obtained.

7.3.3 Information to be retained by application

Application maintains the following information as required.

(1) Security class

Security class setting for receiver to execute an application

Class 0: No security requirement

Class 1: Security using CAS module is required

Class 2: Security required

(2) Host number

Identification number for such items as center to be specified by application.

(3) Telephone number related information

Dada consist of the following information element will be maintained by the application as needed.

1. Postal code of originating area

   Postal code for the area where the service can be transmitted to the phone number.

2. Telephone number

   General phone number of access point.

   (e.g. 0ABCDEFGHJ(K), 00XY-SC******)

3. Circuit class

   Set a circuit class of the receiver unit. Multiple settings enabled.

   (e.g. PSTN/ mobile circuit / PHS circuit)

4. Physical layer protocol

   Set a physical layer protocol of the receiver unit. This protocol is set for each circuit class.

   (e.g. V.22bis-MNP4, 32kPIAFS)

5. Data-link and transfer protocol

   Set data-link establishment and data transfer protocol between the receiver and the center (or the collection network).

   (e.g. BASIC system partially conforming to the X.28, TCP/IP)

6. Network identifier

   Set this indicator on by the receiver when a caller ID notification number and a communication provider ID number are appended to the applicable phone number.

7. Cut call identification

   Identify a cut-call target number from the phone numbers in the mass calls reception service.

(4) ISP connect information [IP]

1. ISP name

   Specify a name of ISP provider. Use the text strings up to 64 digits.

   (e.g. CSP net, ARIB-net)

2. AP phone number

   ISP designated by the broadcasting station or phone number of access point offered by the closed network provider. Multiple settings enabled and the selection logic depends on the BML contents.

   (e.g. 0ABCDEFGHJ(K),00XY+SC******)

3. User ID

   Set an ISP designated by the broadcasting station and user ID to access the service offered by closed network provider. Use the combination of single-byte alphanumeric and symbols. The maximum character string is 64 digits (64 bytes or less).

   (e.g., abcd1234, abcd@arib.or.jp)

4. Password

   Set password to access the ISP or closed network provider designated by broadcasting station. Use the combination of single-byte alphanumeric and symbols. The maximum character string is 32 digits (32 bytes or less).

5. Header compression

   In order to speed up the data transfer rate, set to "Enable" when executing the TCP/IP header compression.

6. Software compression

   In order to speed up the data transfer rate, set as "Compress" when executing the data compression.

7. DNS-IP address (primary)

   Set the DNS server (primary) IP address of ISP or closed network provider designated by broadcasting station. Decimal notation (0 to 255), and “.” is a delimiter.

   (e.g. ***.***.***.***)

8. DNS-IP address (secondary)

   Set the DNS server (secondary) IP address of ISP or closed network provider designated by broadcasting station. Decimal notation (0 to 255), and "." is a delimiter.

   (e.g. ***.***.***.***)

9. No-communication disconnect timer value

   If no packet is sent or received for a certain period for the PPP-connected line using the call request function, disconnect the line by referring to the below value.

   idleTime: more than 1 minute, less than 20 minutes

7.3.4 Information for connecting with host [IP]

(1) URI

The information element of URI is listed in Table 7-5.

Table 7-5 Information element of URI

Information element name	Literal	Remarks
Scheme name	http:	
	https:	When TLS1.0 and SSL3.0 security are used (Note 1)
Host name	Alphanumeric Symbol	See (2) for more information on assigning IP address directly. Follow RFC2396.
Port number	Numeric (0 to 65535)	See (3) for more information on port number use.
Path name	Alphanumeric Symbol	Follow RFC2396.

(Note 1) SSL 3.0 [IP Extension]

(2) IP address

In the IPv4 network, use decimal notation per 8-bit, and "." is a delimiter.

(e.g. ***.***.***.***)

Note that do not specify address of IPv6 network.

(3) Port number

Follow the provision in Assigned Number (RFC1340) when using port number. Table 7-6 defines specification of port number.

Table 7-6 Port number

Port number	Specification
1 to 1023	Well known port
1024 to 49151	IANA registered port
49152 to 65535	IANA dynamic

7.3.5 Operation of provider common area for receiver NVRAM

Provisions for this section will be stipulated by each broadcasting provider contracted.

7.4 Recommended receiver functions

7.4.1 The information managed by receiver Specification A

The receivers hold the communication related information indicating the status of their hardware and the audience configuration information.

(1) Communication related information

1. Security classes

   Indicates the security level implemented in the receiver.

   Class 0 Security features not implemented.

   Class 1 The security feature using CAS module.

2. Circuit class

   Indicates the circuit classes available among the types equipped with the receiver. Multiple numbers can be set.

   (e.g. PSTN/mobile phone line/ PHS line)

3. Physical layer protocol

   Indicates the physical layer protocol available for circuit class equipped with the receiver. Multiple numbers can be set.

   (e.g. V.22bis-MNP4 (PSTN), 32kPIAFS (PHS), PDC (mobile phone))

4. Datalink and transport protocols

   Indicates the datalink establishment / data transport protocols between the receiver and the center (the collecting network) implemented in the receiver. Multiple displays possible.

   (e.g. partially complies to the X.28, -BASIC system,TCP/IP)

(2) Audience configuration information

The following information is input through an interface implemented in the receiver and held in the receiver. The information is stored in the non-volatile memory of the receiver. In addition, it is desirable to implement expandability so as to accommodate the changes accompanied by the telephone number system changes. The fixed-priority connection cancel number for audience configuration information can be set only when the provider identification for the audience configuration information is set.

1. Zip code

   Indicates the zip code (7 digits) of the place the receiver resides.

   (e.g. 100-0004)

2. Priority circuit class

   Indicates the line type that is prioritized among the lines connected to the receiver.

   (e.g. PSTN/mobile phone line/ PHS line)

3. Provider identification number

   The identification number to select the provider that is selected by the audience. (currently 7 digits)

   (e.g. 00X, 00XY, 002YZ, 0091N_1N_2)

   This function is applicable to the receivers which will be sold after a revision of this Guide version 2.1, and applies to all receivers which will be sold as new models in one year after Guide version 2.1 is revised.

4. Fixed-priority connection cancel number

   The number used to disconnect the fixed-priority connection. (currently 3 digits)

   (e.g. 122)

   This function is applicable to the receivers which will be sold after a revision of this Guide version 2.1, and applies to all receivers which will be sold as new models in one year after Guide version 2.1 is revised.

5. Caller ID notification number

   Use this number to configure whether to notify the caller's telephone number to the call receiver. (currently 3 digits)

   (e.g. 186, 184)

   This function is applicable to the receivers which will be sold after a revision of this Guide version 2.1, and applies to all receivers which will be sold as new models in one year after Guide version 2.1 is revised.

(3) External line acquisition number

A receiver-specific number for external line acquisition, which is required for call initiation, should be held in non-volatile memory.

(e.g. 0)

(4) Dial types

The dial types for the PSTN line for use should be held in non-volatile memory.

(e.g Tone, 10pps, 20pps)

7.4.2 The information managed by receivers [IP] Specification A

The contents of information elements are based on the definition in ARIB STD-B21.

(1) Communication related information ARIB STD-B21 11.5.7.2

(2) Security communication related information ARIB STD-B21 11.5.7.3

The TLS related Cipher Suite should be installed based on ARIB TR-B14 Volume 6 Table 8-6.

The implementation rather than those on the table shall be dependant on the receiver.

(3) Communication device information ARIB STD-B21 11.5.7.4

Implement based on those selected in 6.2.3 Physical layer protocol implementation.

(4) Audience configuration information ARIB STD-B21 11.5.7.1

- Common information ARIB STD-B21 11.5.7.1(1)
- ISP connection information ARIB STD-B21 11.5.7.1(2) <1>

The following information elements are defined in this volume.

a. ISP names

For the name information elements, from the business point of view, Specification B shall be applied to the receiver having no function to set an ISP name

b. Header compression Specification B

c. Software compression Specification B

d. No-communication cutoff timer values

The default recommended value is 180 seconds. When variable, the recommended configurable range is 1 to 20 minutes. In following cases, the line will be cut off after a specified period of no-communication state:

- When connected with PPP by the auto-cut off feature of the receiver.
- When there is no argument idleTime at the execution of connectPPPWithISPParams().
- When sendTextMail() and sendMIMEMail() are executed.

e. Provider identification information

Hold the values specified by setISPParams( ).

- Fixed IP connection information ARIB STD-B21 11.5.7.1(2) <2>

The receivers not supporting Ethernet are not managed.

- Connection mode information ARIB STD-B21 11.5.7.1(2) <3>
  - The receivers not supporting Ethernet are not managed.
  - Specification B shall be applied to the value "PPP/PPPoE protocol" which is specified in obtaining an IP address.

Reference: Specification B is applied to the installation of PPP/PPPoE protocol in the receiver, considering that the receiver would be connected to a router with PPP/PPPoE protocol.

- TCP/IP application setting information ARIB STD-B21 11.5.7.1(2) <4>
    a. SMTP server name/address Specification B
    b. POP server name/address Specification B
    c. Mail address Specification B
    d. Mail password Specification B
    e. HTTPProxy server name/address Specification B
    f. HTTPProxy server port number Specification B
    g. HTTPProxy server name/address and FTPProxy server port number are not supported.

(5) Configuration conditions for each circuit class

The information elements required in the audience configuration information will be different depending on the circuit class implemented and the device. The information elements for each circuit class are shown in Table 7-8 to 7-10. For circuit classes and connection mode information, see Chapter 11 and Appendix 9 of ARIB STD-B21.

- The priority circuit class (ⅰ) of audience configuration information shall be selected from circuit classes of the communication related information. Except, however, for the receiver not supporting multiple circuit classes.
- The fixed-priority connection cancel number (ⅱ) for audience configuration information can only be configured when the provider identification (ⅲ) for the audience configuration information has been set.

Table 7-7 Configuration conditions for PSTN,ISDN, and mobile phone

Circuit class / Information elements	PSTN	ISDN				Mobile phone		
	Modem	Modem	TA (Serial)	TA (ST)	Router	PDC	PHS	PDC-P
Priority circuit class (ⅰ)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Communication provider ID (ⅱ)	Yes	Yes (*1)	Yes (*1)	Yes (*1)	-	-	-	-
Fixed-priority connection cancel number (ⅲ)	Yes	Yes (*1)	Yes (*1)	Yes (*1)	-	-	-	-
Caller ID notification number	Yes	Yes (*1)	Yes (*1)	Yes (*1)	-	Yes (*2)	Yes (*2)	-
External line acquisition number	Yes	Yes (*1)	Yes (*1)	Yes (*1)	-	-	-	-
Dial type	Yes	Yes	-	-	-	-	-	-
Specification for obtaining IP address	-	-	-	-	Yes	-	-	-

Legend Yes: the items requiring configuration -: not applicable

*1: Consider that some TA models have the add-number function explained in 7.4.3.

*2: Consider that a number indicated in Section 7.4.3 is added, depending on mobile phone settings.

Table 7-8 Configuration conditions for ADSL and FTTH

Circuit class / Information elements	ADSL				FTTH	
	ADSL modem	ADSL modem (not shared)	Router	modem (ANALOG)	ONU	Router
Preferred Circuit class (ⅰ)	Yes	Yes	Yes	Yes	Yes	Yes
Communication provider ID (ⅱ)	-	-	-	Yes (*1)	-	-
Fixed-priority connection cancel number (ⅲ)	-	-	-	Yes (*1)	-	-
Caller ID notification number	-	-	-	Yes (*1)	-	-
External line acquisition number	-	-	-	Yes (*1)	-	-
Dial type	-	-	-	Yes	-	-
Specification for obtaining IP address	Yes	Yes	Yes	-	-	Yes

Legend Yes: the items requiring configuration -: not applicable

*1: Consider that some ADSL modem models have the add-number function explained in 7.4.3.

Table 7-9 Configuration conditions for CATV

Circuit class / Information elements	CATV	
	Cable modem	Router
Priority circuit class (ⅰ)	Yes	Yes
Communication provider ID (ⅱ)	-	-
Fixed-priority connection cancel number (ⅲ)	-	-
Caller ID notification number	-	-
External line acquisition number	-	-
Dial types	-	-
Specification for obtaining IP address	Yes	Yes

Legend Yes: the items requiring configuration -: not applicable

7.4.3 Add number feature Specification A

The special number and the provider ID number based on the conditions described in Table 7-10 should be added to the receiver.

Table 7-10 Conditions for adding number to the receiver

		Network specification Identification	When caller ID notification (186/184) is configured	When a fixed priority connection cancel number (122) is configured	When a provider ID number (00XY etc.) is configured
Circuit class	PSTN (*2)	OFF	No	No	No
		ON	Yes	Yes(*1)	Yes
	Mobile phone line	OFF	No	No	No
		ON	Yes	No	No
	PHS line	OFF	No	No	No
		ON	Yes	No	No

Yes:Add No:Not add

(*1) It is recommended to add 122 only when lines configured for fixed-priority connection are used and a provider ID number rather than that of the provider specifying the fixed preferred connection is input.

(*2) When specifying mass call reception service (vote( ) function), do not add the special number and the provider ID number regardless of the specification of network ID.

7.4.4 Call initiation features Specification A

(1) Should be able to initiate a call by adding an external line acquisition number held in the receiver.

(2) Should be able to dial using the dial types (tone, 10 pulses per second, or 20 pulses per second) held in the receiver.

(3) Should be able to insert a dial pause at any point within the external line acquisition number added by the receiver and before or after the special number / provider ID number. (The pause time shall be receiver dependent.) Should be able to put dial pause when dialing based on the "," written at any point in the telephone number in the contents. (The pause time is 2 to 3 seconds per one ",".)

Note: (1) to (3) are applicable only for the dial-up connection.

(4) Should be able to call using ISP connection information pre-configured in the receiver when functions such as a data send function are issued from the BML contents at no ISP connection state. [IP]

(5) Should be able to call referring to the ISP connection information pre-configured in the receiver when call initiation functions are issued from the BML contents at no ISP connection state. Except, however, for the case the priority circuit class is Ethernet. [IP]

(6) Should be able to call using call functions from the BML contents at no ISP connection state. [IP]

(7) When multiple communication lines are connected to the receiver, the call action uses the preferred line selected by the viewer. [IP]

However, only if the viewer has given consent to use the call function connectPPP( ), when the priority circuit class is Ethernet and a PPP connection is possible, the call function connectPPP( ) can be executed for the call. [IP extension]

(8) Should not initiate new call when another call has already been established. [IP]

7.4.5 Call initiation prohibition features Specification B

(1) Configuring the call initiation prohibited state

- It is desirable to be able to set call initiation prohibited state in receivers in order to avoid mischievous calls by children, etc.
- It is desirable to require around 4-digit security codes for setting and unsetting the call initiation prohibited state and to allow only an administrator to change the state. Implement the method for deleting a password (security code) without using EMM, considering that, in the case where the security code is also used as a password (security code) for managing the parental rate described in Volume 5, people who have not subscribed pay broadcasting would use the interaction channel function. The implementation method is dependant on the receiver.

(2) Behavior of the receiver in call initiation prohibited state

The receiver in call initiation prohibited state will act as follows.

- Call from CAS should be performed responding to the request even if the receiver is in call initiation prohibited state.
- For the call request rather than that of CAS, call should not be performed, displaying a massage that the receiver is in call initiation prohibited state.

(3) Receiver behavior during an incoming call

Does not make calls during an incoming call.

7.4.6 Operations of audience configuration information [IP]

Audience configuration information should be treated as follows, in view of protecting it against misuse outside the interactive data broadcast services and avoiding leaks of personal information.

7.4.6.1 Protection function for audience configuration information Specification A

(1) The password should not be displayed and be replaced with a string such as '***' for security reason, when users set access authentication with user IDs and passwords for ISPs or always-connected network providers, and when users set the audience configuration information.

(2) Implement an ability to disable the audience configuration information when the receiver's owner changes or disposes the receiver.

7.4.6.2 Guidelines of configuration user interface for audience configuration information

The receiver should be equipped with a user interface for inputting, editing, or deleting audience configuration information. Specification A

(1) The receiver should be equipped with a user interface to avoid mistakes in settings using menu-driven helps, navigation-driven configuration tasks and so on. Specification B

(2) The current audience configuration information should be displayed when data has been already set and the user changes it to new one, by using the receiver function. However the password should not be displayed from the security protection point of view. Specification B

7.4.7 Operations of call time display [IP] Specification A

(1) When a connection has already been established or when to connect using the call function, do not display the dialog box related to the connection. (Note)

(2) When calling by the execution of a function such as the data transmission function, in unconnected state, it is recommended that the massage indicating the connection establishment as well as the connection destination point information (ISP name and telephone number, etc.) be displayed. Specification B

(3) When the line is busy, indicate it to the viewer by implementing a user-recognizable display (LED and OSD, etc. on the front panel).

(4) When an error occurs in call processing, indicate it to the viewer by implementing a user-recognizable display (LED and OSD, etc. on the front panel).

Note: This definition is applicable to all the receivers introduced to the market as new models in eight months or more after this document is issued.

7.4.8 Operations of ISP connection information [IP]

(1) Provider ID information

The receiver should hold the provider ID permanently when ISP connection information of audience configuration information is set. The configuration conditions of provider ID information are shown in Table 7-11.

Table 7-11 Configuration conditions of provider ID information

Value (hexadecimal expression)			Definition
00	XXXX	XX	Set when finding it no configuration state or when deleted at the receiver.
(1 byte)	(2 bytes)	(1 byte)	
8F	XXXX	XX	Set when the receiver function is set.
(1 byte)	(2 bytes)	(1 byte)	
Other than the above			When set by the broadcaster who has original_network_id and broadcaster_id as shown in left cell.
FF	original_network_id	broadcaster_id	
(1 byte)	(2 bytes)	(1 byte)	

Note: x means "not applicable".

(2) status values

Operational limits should not be applied when ISP connection information is configured by the receiver function. The receiver function should take responsibility to hold the changed status value permanently.

(3) ispname

The method of ispname configuration shall be receiver dependent. The maximum character string is 64 digits (128 bytes).

7.4.9 Operations of registration call [IP Extension]

There should be a function to allow the contents to record in the registration call area of the receivers unsuccessful interactive calls due to the excess communications and to process the calls and data transmissions according to instructions given by the viewer after the program ends. Transmission in the registration call function is carried out by the receiver application with the registration call contents or the registration call function but the registration call by the receiver application is defined in Specification B. See Section 1.9, "Operation of Registration Call" Volume 3, ARIB TR-B14 for details.

7.5 Guidelines at communication errors [IP] Specification A

Implement error notification functions when normal procedures of connection, data sending/receiving, and disconnection have not been done at the time of auto-connection. The display method shall depend on the receiver. Notification of errors discovered when using no auto-connection functions and at the time of data sending/receiving shall be treated with Specification B.

7.6 Details of phone number processing

The detailed relationship among the application information, audience configuration information, and communication related information in phase I through phase III is shown in Figure 7-4. The relationship when using TCP/IP protocol is shown in Figure 7-5.

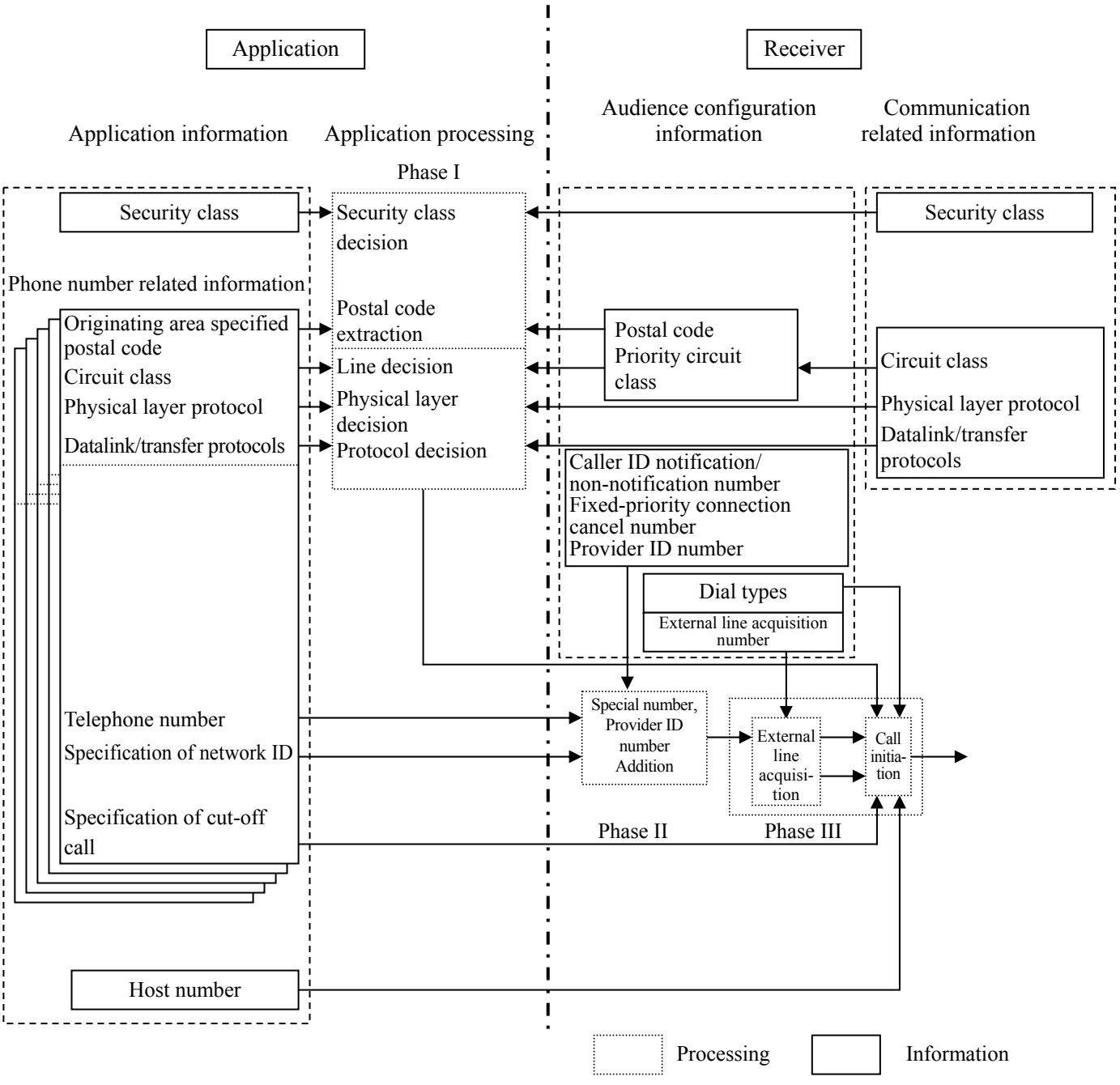


Figure 7-4 Details of Call initiation process

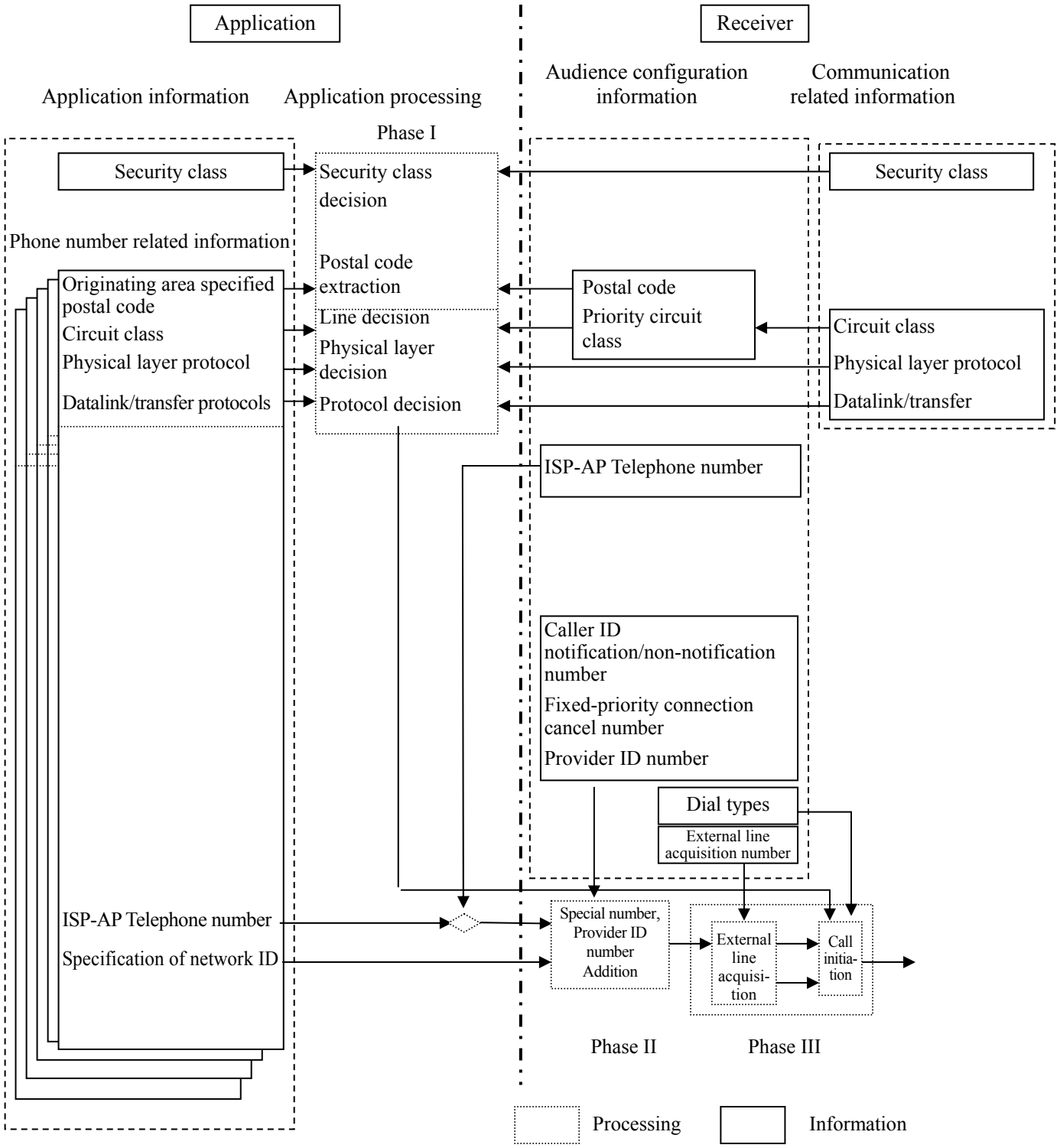


Figure 7-5 Details of call initiation process [IP]

8 Security

This chapter explains the concept of security features required for offering interactive services. The specifications of the receiver implementation shall be added as the operation specifications separately in this document or be documented in the provider standards at the CAS/data broadcaster side and at the center side.

8.1 Security features required for bi-directional services

When the interactive data broadcasting services offer the following services, security functions may be required: services for sending/receiving audience information, for settling a relatively small amount of money, or services in which impartiality should be taken into account. Table 8-1 shows three classes of interactive services classified from the view of security, and the security functions needed in each class.

Table 8-1 Service classes and their security functions required

Service classes	Simple service	Standard service	Advanced service
Service overview	Simple services not requiring the settlement or authentification	Services requiring a small amount of money settlement, personal authentification, impartiality	Services distributing digital contents with charging.
Examples of target application	- anonymous questionnaire - request for brochure	- shopping - gambling - signed questionnaire - opinion research requiring accuracy	- music software distribution - game software distribution
Security function			
Simple mutual authentification function	-	○ (Level 1)	○ (Level 1)
Information protection function	-	○ (Level 3)	○ (Level 3)
Tampering prevention function	-	○	○
Simple signature functions	-	-	○ (Level 1)

Note 1: The following sections outline each security function and explain its security level.

Note 2: It is desirable that the basic receiver targeting for the interactive services can realize the standard service class.

Note 3: The items encircled with bold lines in Table 8-1 are the domains preferable to be supported by the basic receiver.

8.1.1 Simple mutual authentification function

Table 8-2 shows the items to be considered for the simple mutual authentification between the viewer and the center by levels.

Table 8-2 Mutual authentification levels

Security level		Assumed system services	Required module
Level 2	Strict authentification (PKCS)	Internet system service	Both: Public key cryptography and hash function
Level 1	Protected simple authentification	Comparatively low-price article purchase	Both: Symmetric cipher processing and timestamp
Level 0	Unprotected simple authentification	Total for the other party's unconfirmed survey, etc.	Receiver: receiver ID

(The items encircled by bold lines are the domains preferable to be supported by the basic receiver or the standard service.)

When using an application requiring privacy protection and a confirmation of authenticity of the audience in communication, it requires confirming the opposite side of the connection in the early stage of the transaction. The mutual (the opposite sides) authentification function is used for this method. Mutual authentification functions can be divided into 2 types: strict authentification such as public key encryption and an alternative simple authentification in case the public key encryption cannot be used for some restrictions.

(1) Level 0

It is recommended that the viewer should confirm whether or not the other party is a fake center when individual privacy information and credit card numbers as well as others are sent to the host at the center. Therefore, during communications that are not protected, it is desirable to limit the information to be sent to a reasonable level where there is no harm even if the information is intercepted or falsified.

(2) Level 1

It is desirable to authenticate mutually using "giving message recovery".

In order to prevent spoofing, where a fake viewer reuses the receiver ID and password, the timestamp and random numbers processed by one-way function are used when information is sent to the center.

[Giving message recovery]

Figure 8-1 shows the opposite party authentification using giving message recovery. Mutual authentification can be realized by doing the same process in the opposite direction.

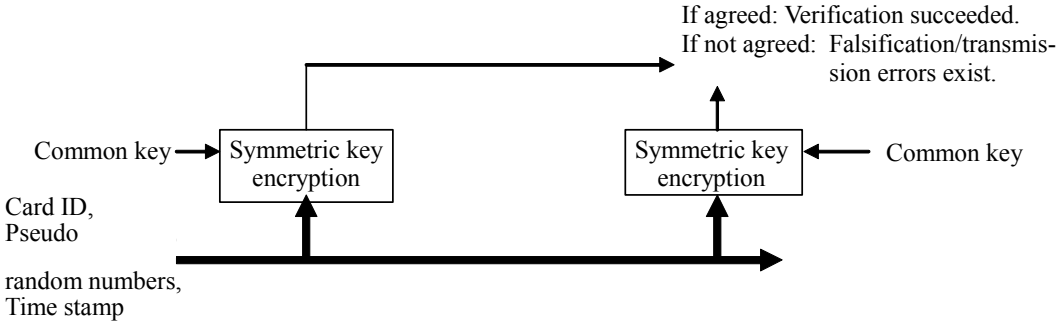


Figure 8-1 Other party authentication using giving message recovery method

When both the sending side and the receiving (verifying) side have the common keys beforehand in common key cryptography system, the sender can be confirmed if the message has been encrypted using the common key at the sender side and decrypted to become a meaningful message at the receiver side.

(3) Level 2

Utilize a set of encryption systems known as the public key cryptography system (PKCS) widely used in the Internet.

- Required modules (in addition to level 1): Public key cryptography processing function, one-way function, and certification function
- Required organizations: Certificate Authority (CA) (for issue, reference, change, update, and disposal)

8.1.2 Protection of information

Table 8-3 shows the items that should to be considered for the protection of information by levels.

Table 8-3 Information protection levels

Security level		Target viewer information	Required modules/systems
Level 3	Connection to other networks	Integration with Internet services	The center: firewall
Level 2	Information access permission management	Customer management information	The center: access management functions
Level 1	Information encryption management	Name and address	Both: common cryptography functions
Level 0	Not considered	Approved range by the owner	-

(The items encircled by bold lines are the domains preferable to be supported by the basic receiver or the standard service.)

In interactive data transmission services like online shopping, the service providers may need to know the name and address of the viewer, because they have to specify the destination. In such interactive services, it is desirable to consider the followings in view of protection of audience privacy in order to prevent intercepting audience information and so forth.

- Prevent interceptions on the network
- Prevent leaks in the center.
- Prevent admissions from outside to the center.
- Treat only necessary personal information and do not use it on other purposes or transfer it to others without his/her permission.

(1) Level 0

- The functions and operations that should be covered by the center.

The service requiring the audience information which is the target of privacy protection is preferable

to be approved by the owner of the information.

(2) Level 1

- The function and behavior preferable to be implemented in the receiver.

  Implement the ability to verify the right connection destination beforehand so as to exclude a connection to a false center (See 0) .

  Implement the ability to send audience information, which is the target of privacy protection, after encrypting it.

- The functions and operations that should be covered by the center.

  Audience information which is the target of privacy protection should be treated only by one needs to do.

(3) Level 2

- The functions and operations that should be covered by the center.

  For audience information which is the target of privacy protection, an access control function (to limit the persons who can read/register audience information) should be implemented.

(4) Level 3

- The functions and operations that should be covered by the center.

  If you need to connect to other networks such as the Internet as the service evolving, install a firewall to try to avoid leaks of the viewer's information.

8.1.3 Tampering prevention function

It is recommended to implement a function to discover tampering on the transmission channel.

8.1.4 Signature function

Table 8-4 shows the items to be considered for signature functions by levels.

Table 8-4 Signature function levels

Security level		Main application/features	Required module/systems
Level 3	Digital signature function	Information exchange required for legal evidence ability	Public key cryptography and certificate issuing authority
Level 2	Substitution of symmetric cipher	Symmetric cipher	Symmetric cipher and third-party signature organization
Level 1	Simple signature function	One-way functions, giving message recovery	Symmetric cipher
Level 0	Not considered	Memo of the confirmation number	Not required

(The items encircled by bold lines are the domains preferable to be supported by the basic receiver or the standard service.)

(1) Level 0

The memory system and output method are expected to be limited depending on the receiver, even if a reception confirmation sheet or others are received for reservation like ticket reservation. Therefore, at least it is recommended that the center should issue a reservation confirmation umber to handle trouble with the procedure. However, the center needs to be completely reliable for the handling of the reservation confirmation number.

(2) Level 1

When momentary and product transactions (including transactions of digital contents) from online shopping occur, the proof of both transactions needs to be left to prevent trouble. In this case, a digital signature is ideal to use. However, as the digital signature cannot be used if the public key cryptography function is not installed, a message Authentication code (MAC) that can also be used in systems implemented with symmetric cipher only is recommended.

However this is not a convincing proof against the excuse of the signature creator on the center side, because the recipient of the signature can also create the same message, even if the signature can be proved not to be the result of the act of a third party.

(3) Level 2

It is possible to deal with fraud on the center side by connecting a reliable third party's message authentication code to the message, and adding the message authentication code from the center. However, receiver units and third-party organizations shall continue to secure the shared common key.

(4) Level 3

Since legal admissibility of the evidence is needed, it is desirable to use the Certificate Authority implementing the public key encryption system.

8.2 Operations of TLS [IP]

Each provider defines its detailed operations.

8.3 Operations of SSL [IP Extension]

For SSL3.0 operations at level 3, see the definition in ARIB TR-B14, Volume 6, 8.2 TLS1.0 and SSL3.0.

9 Avoiding congestions

9.1 Measures against congestions

In interactive data broadcasting service unlike the conventional telephone communication, a network congestion easily happens, because the traffic concentrates on a specific center in a short period of time by a public opinion poll synchronized with the program or purchasing of tickets, etc. When a congestion happens, It comes to cause problems in operation of the program. For example, the communication from the viewer would not be completed. Furthermore, because it influences even on other communications such as telephone call, preventing a congestion is a necessity.

9.2 Broadcasting station's strategy against congestions

When creating a program of the interactive data broadcasting service, it is necessary to consider that the communication from the viewer not excessively be concentrated .

For example, it is preferable to avoid congestions by the following methods (or a combination of them) when estimating the number of communications judging from the audience rating, the participation rate, the communication time length, and the acceptance time of the communication etc. for the interactive data broadcasting service, and concluding that controlling congestion would be necessary.

9.2.1 Call Delay

- Should consider distributing (balance) call initiation times over the time period for each receiver by using procedure functions something like below in the application program sent over the broadcasting wave.
    1. Generate random numbers (random( ))
    2. Timer specification (setInterval( ))
    3. Call registration [IP Extension]
       (connect( ), sendTextData( ) etc., BASIC system,
       connectPPP( ), connectPPPWithISPParams( ), transmitTextDataOverIP( ) etc,
       TCP/IP send functions and auto-calling from the receiver triggered by these functions)

Traffic can be balanced by generating a call initiation delay by a time interval for each receiver, when the communication concentrates. Figure 9-1 shows the traffic image when performing a call delay.

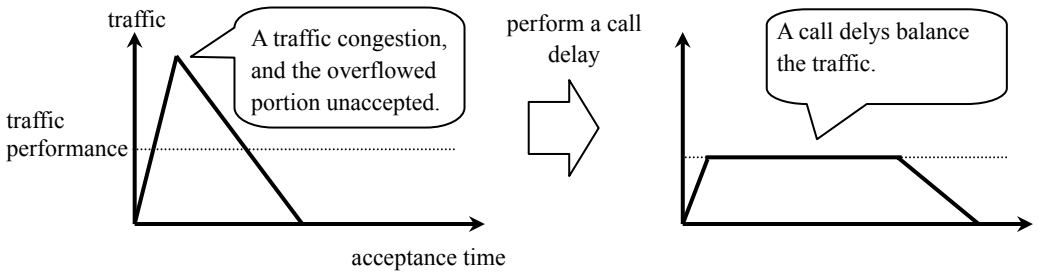


Figure 9-1 Traffic image when performing a call delay

Calls can be initiated after the program ends by setting local contents that continue after a main program ends, unless other services are tuned in.

9.2.2 Call limitations

- Should consider specifying through the broadcasting wave to which receivers the communication be permitted, by limiting the last digit of the receiver ID numbers etc. (at the application program level).
  While the last digit limitation of conventional telephone call assumes the viewer's good sense and a call from the telephone number other than specified is possible, the last digit limitation of interactive data broadcasting service is on the other hand implemented to the receiver so the communication can always be limited. However, this makes some viewers not to be able to originate a call.
  Figure 9-2 shows the traffic image when performing a call limitation.

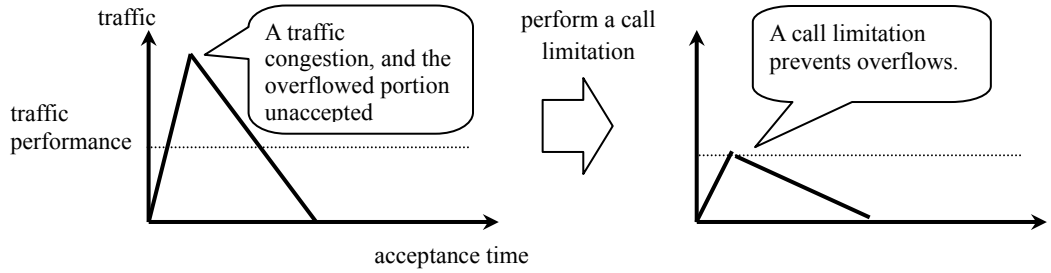


Figure 9-2 Traffic image when performing a call limitation.

9.2.3 Notification of call delay/call limitation Specification B

When the call delay and the call limitation are executed, it is preferable to notify that to the viewer from the broadcasting station to avoid the viewer's misunderstanding.

9.2.4 Using Network services

Consider using the mass calls reception service when expecting a communication concentration in short period of time.

By using the mass calls reception service, a large amount of calls can be accepted without letting them be in busy state, so decreasing the complaint from viewers who cannot connect to the telephone service etc.

9.2.5 Providing information to the telecommunication provider beforehand

It is preferable for the broadcasting station to provide information to the telecommunication provider beforehand when a large amount of communications would be expected.

When a congestion occurred even if some measures like mentioned above have been taken, consider reflecting it in the next program, and to prevent occurring it again in cooperation with the telecommunication provider.

9.3 Measures against congestion by telecommunication providers

It is preferable to consider followings about the distribution of access points and the number of lines.

9.3.1 Distribution of access points

To avoid congestion caused by a concentrating traffic on a specific switch, consider the layout of the access points to reflect the prevalence conditions of the receivers by areas etc.

9.3.2 Line numbers of the access point

Consider the line numbers so that it reflects the amount of communications from the receivers to the access point to avoid congestions.

Also it is necessary to reconsider the proper line numbers with the changes of the spreading conditions of the receivers.

9.4 Receiver features Specification A

- Implement the random number generation feature required for performing call delays.
- Retransmission should be less than twice every three minutes.

9.5 Avoiding congestions by the center server [IP]

A response delay of the center server is mainly caused by performance shortage on the server responding to demands or performance shortage of the devices on the route.

It is preferable to introduce the following measures to avoid congestions.

(1) Improvement of server's processing ability

(2) Load balancing among the servers

(3) Introduction of a cash server

(4) Introduction of a TLS or SSL accelerator when using TLS or SSL
However, SSL is defined in [IP Extension]

(5) Introduction of a BML contents delivery server (load balance to a mirrored server)

(6) Improvement on the design of BML contents (to avoid long time hold)

10 Process during Failure

10.1 Actions taken if receiver power has failed Specification A

If the power of a receiver has failed during communication, the DC circuit of the telephone subscriber line must be released immediately.

11 Contingency Planning

11.1 Functions required during emergency Specification B

The following describes the functions required to establish the disaster prevention and other important communication system and to allow the audience to switch to the emergency communication system. These functions are required if a wide-scale disaster or another emergency occurs when interactive data broadcasting service is being provided or being planned.

The functions required during wide-scale disaster or another emergency are shown on Table 11-1.

Table 11-1 Functions required during disaster or another emergency

	Function
Broadcast station	- It should be possible to stop the interactive data broadcasting service or control its stop by using the broadcast waves. - It should be possible to control not to start a new communication by using the broadcast waves.
Receiver	- It should be possible not to start a new communication by control of broadcast waves.

12 Related Laws and Rights

12.1 Related laws and regulations

Related laws which are necessary for conducting interactive data broadcasting services are shown below.

12.1.1 Laws which shall be considered for responding to emergencies

(1) Telecommunications Business Law (TBL)

- Article 8 Ensuring of Essential Communications

12.1.2 Laws which shall be considered for congestion in communication networks

(1) Ordinance Concerning Terminal Facilities Etc.

- Article 11, Article 18 Transmission Functions

Appendix 1 Supplemental Description on Security

This chapter contains general information regarding security function.

1.1 Security function

1.1.1 Data encryption

It is appropriate to use public key cryptography in addition to common key encryption according to the level of security for digital data encryption. Additionally, although it is necessary to be aware of usage for applications which require simple scrambling, simple encryption functions can be used. An outline and characteristics of each method are explained below.

(1) Symmetric cipher

Symmetric cipher is also called secret key cryptography/symmetrical cryptography. Secret keys shared by senders and receivers are used, with the transmission side coding the key and the receiver side decoding the key. It is necessary for a common key to be shared by both senders and receivers with some measures beforehand.

Legitimate code processing is necessary for data, etc. which can cause damage to privacy information and financial damage on the viewer side when data is stolen or decoded. In general, at lease 56/64-bit symmetric cipher is used from the point of view of cost effectiveness in applications in which credit card numbers or viewer information notification is necessary when using non-protected public networks or electrical waves/radio waves. The symmetric code algorithm is registered in JIS X5060 (ISO/IEC9979). Since these algorithms do not guarantee the security of code algorithms, consideration of this fact is necessary during selection.

(2) Public key cryptography

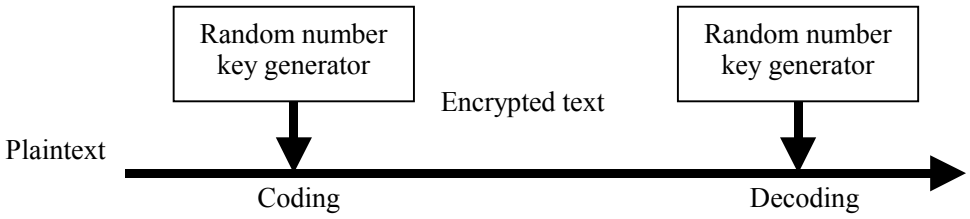
Public key cryptography is also called asymmetric cryptography. The key for encryption (public key) and key for decryption (private key) differ. Communication by coding is possible by disclosing the public key and secretly managing the secret key. The calculation amount is much larger in comparison with common keys. Therefore, it is mainly used to share common keys for symmetric cipher.

Some of the public key cryptography (RSA cipher) has a signature function. When using it as signature function, calculations are made for the private key in data to be signed and the public key is then used by verifier to verify the signature results.

(3) Simple encryption

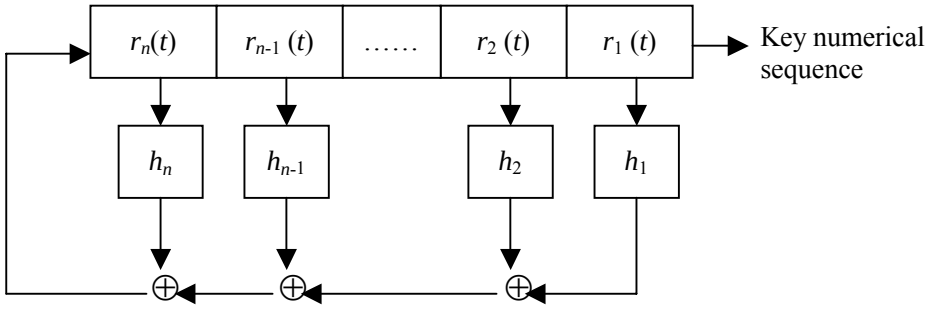
As an example of simple encryption, there is a synchronous sequence code for the linear feedback shift register method to use the M sequence in the Vernam cipher and the random number key generator. However, since this method has linearity and it can be deciphered by a known plaintext attack, it is necessary to be aware of this in the application.

The Vernam cipher is a basic code that can be expressed as in appended figure 1-1.



Appended figure 1-1 Vernam symmetric cipher

The output of the linear feedback shift register is used as a random number generator (RNG) for the Vernam cipher.



$r_i(t)$: Value of each digit register h_i: Function that changes the register value

Appended figure 1-2 Simple encryption device using the linear feedback register

1.1.2 Modules used for other security

(1) Message digest (Hash function)

Mathematical function to map large (sometimes extremely large) areas into small areas. The well-founded function needs to be one-way and collision free at the same time.

(2) Message authentication code

Message authentication can be realized by symmetric cipher. In general, the message authentication code is the initial vector (initial value) of the results calculated by the CBC mode (Cipher Block Chaining mode) of symmetric cipher. When the message is short, padding can be used.

(3) Pseudo random numbers

Although in some cases pseudorandom numbers and strict random numbers are necessary, it seems that the pseudorandom numbers are sufficient for the random numbers handled in this chapter.

In symmetric cipher, when the same data is sent, the results are exactly the same when the key and the initial values are the same, even if they are encrypted. By misusing this property, confusion can be created by recycling the encryption data exploited within the communication pathway. In order to

prevent this, a different pseudorandom number for each communication, etc. is included and transmitted, and by executing and returning a simple operation (adding 1, for example) in receiver side, handling the above fraud is possible (challenge code). The results of the calculations for symmetric cipher can be pseudorandom numbers for timer or counter seeds.

(4) Timestamp

To prevent third parties from reusing correct signature data, timestamps are used to prevent signatures without reproducibility from being generated, even if they have the same signature contents.

(5) Simple personal identification function

It is necessary to confirm the person in question in order to confirm whether that person has the right to use certain data and modules. PIN authorization is used for simple personal verification technology.

[PIN authorization]

It is used when the card owner is confirmed. Since input from remote control is necessary and the number of digits be easily memorized by the user, 4 to 8 digits are suitable as the number.

(6) Certificate

It is necessary to authenticate other party using public key cryptography. Since it is necessary to issue certificates accurately without falsification, etc., it is necessary that the organization that issues the certificate be a neutral organization that has the trust of both of the signer and the verifier.

(7) Receiver IDs

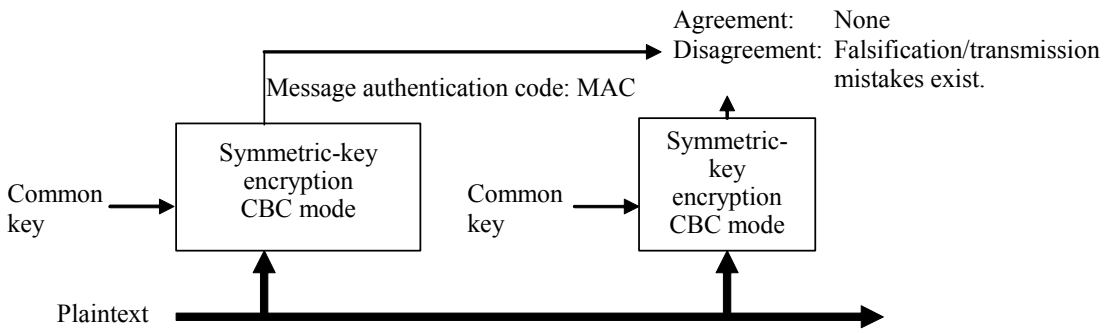
There are two types of identification numbers: the decoder ID of the receiver itself and the card ID stored on an IC card. Both are used for identification, but it should be aware that the ownership of these IDs may be different. The card ID must be written when the card is issued. Although this value needs not to be secret, it must not be altered.

1.1.3 Data integrity

Basic functions: The symmetric cipher function is used.

The message authentication code (Message Authentication Code or MAC) can be substituted. For details, see (JIS X 5055 [ISO/IEC9797]).

Crypto communication is used, not as the purpose, and but to ensure the message is passed on to other party without falsification/transmission errors, etc. Transmission of the message and the coding of entire message in CBC mode are conducted. The value of the IV register following the completion of encryption of the message is transmitted as MAC. The receiver also carries out a similar calculation. If there are a falsifications and transmission errors on the line, abnormalities can be detected since the MAC value is different. Appended figure 1-3 shows how the message authentication code is used.



Appended figure 1-3 Data integrity using the message authentication code

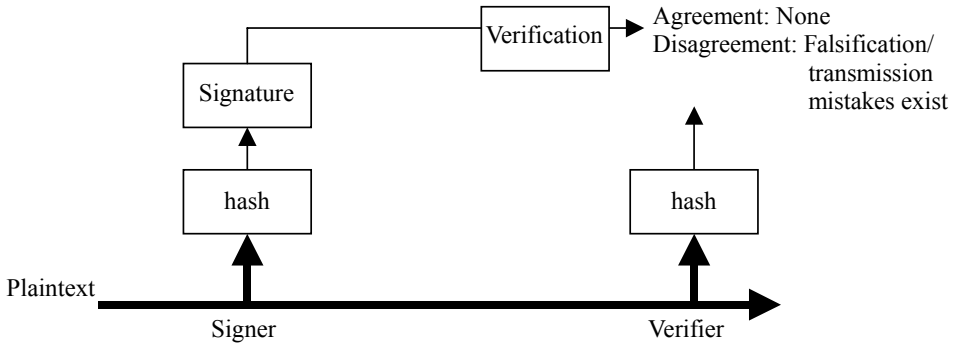
In addition, the CRC can be used as a concise protocol. However, in this case the falsification of data cannot be detected.

Reference materials:

1. JIS X 5055 "Security technology - Data completeness function using encryption inspection function by block encryption algorithm"
2. ISO/IEC9797 Information technology - Security techniques - Data integrity mechanism using a cryptographic check function employing a block cipher algorithm

Advanced functions: Public key cryptography and message digest are used.

After the message is digested, the signature is given to the sent data. Message digest, which is also called the hash function (JIS X 5057 [ISO/IEC 10118]), is used to generate a summary for the constant length (digest) of arbitrary length data. The signature has the upper limit for the data length. When long data is efficiently signed, a digest is created for the data as preprocessing and the digest is signed (JIS X 5056-3 [ISO/IEC 9798-3]). Use of public key cryptography and the hash function are shown in appended figure 1-4.



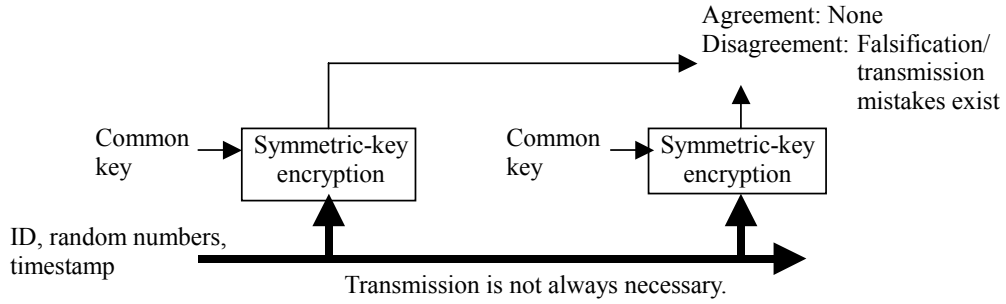
Appended figure 1-4 Data integrity using public key cryptography and the hash function

Reference materials:

1. JIS X 5057-1, “Security technology - Hash function - Part 1: Introduction”
2. ISO/IEC 10118-1 Information technology - Security techniques - Hash-functions -
3. JIS X 5057-2, “Security technology - Hash function - Part 2: Hash function using n bit-block encryption algorithm”
4. ISO/IEC 10118-2 Information technology - Security techniques - Hash-functions using n-bit block cipher algorithm-
5. JIS X 5056-3, “Security technology - Entity authentication function - Part 3: Authentication function using a public key algorithm”
6. ISO/IEC 9798-3 Information technology - Security techniques - Entity authentication mechanisms Part.3: Entity authentication using a public key algorithm

1.1.4 Other party authentication

Basic functions: The symmetric cipher function (giving message recovery method) is used. A simple method for authenticating the other party using symmetric cipher is shown in appended figure 1-5.



Appended figure 1-5 Simple authentication of the other party using symmetric cipher

In symmetric cipher, when the sender and verifier share a common key beforehand, the message is encrypted by the transmission side using the common key and the sender can be convinced if it becomes a message with some meaning when the receiver decodes the cipher text.

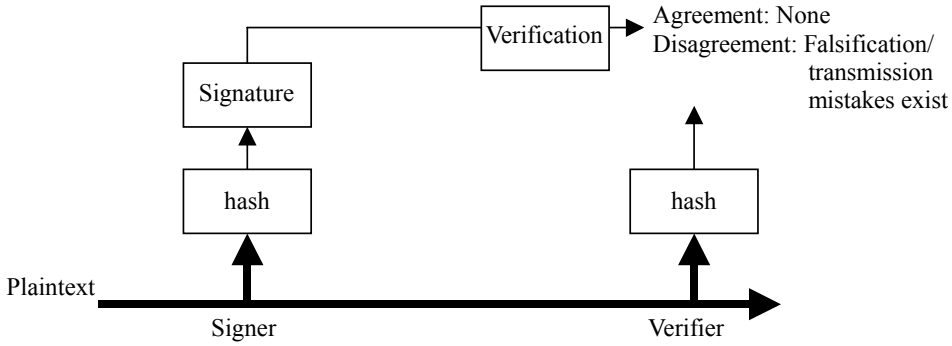
For mutual authentication, the verifier makes a simple calculation agreed by both parties such as adding 1 to the random numbers generated by the caller, etc., and encrypts is again to send it back. In this way both parties can confirm the authentication. (It is also possible to identify the other party by using the sender ID notification function, etc. of the network service as a concise protocol according to the security requirements. ）

Reference materials:

1. JIS X 5056-3, “Security technology - Entity authentication function - Part 2: Authentication function using symmetrical cryptography algorithm”
2. ISO/IEC 9798-3 Information technology - Security techniques - Entity authentication mechanisms Part.2: Entity authentication using symmetric encipherment algorithms

Advanced functions: The public key cryptography function is used.

Requests the presentation of the certificate issued by the certificate issuing authority in public key cryptography (X.509) to authenticate the other communication party by public key cryptography. The method for authenticating the other party that uses public key cryptography is shown in appended figure 1-6.



Appended figure 1-6 Other party authentication using public key cryptography

(As a concise protocol, the simple authentication described in X.509 that uses the hash function as a one-way function is also applicable.)

Reference materials:

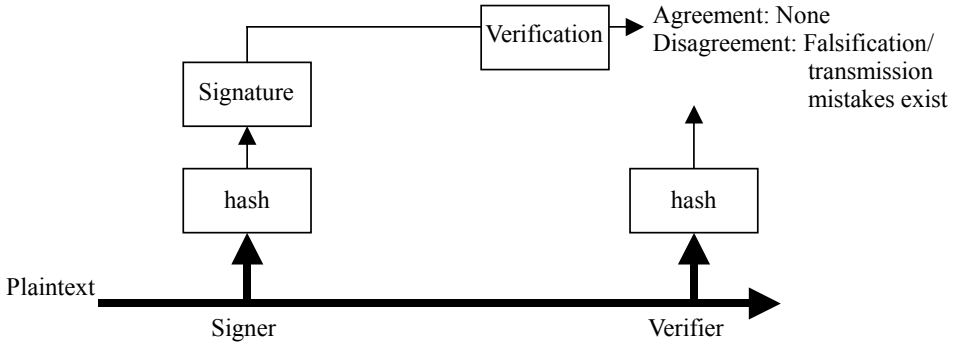
1. X.590 directory - Authentication framework

1.1.5 Signatures

- Basic functions: The symmetric cipher function is used.

  Granting the message authentication code described in the signature data substitutes signatures.

  Advanced functions: The message digest function and the public key cryptography function are used. How to use the message authentication code is shown in appended figure 1-7.



Appended figure 1-7 Signatures using public key cryptography

After the message digest is given to the sent data, the signature of the public key cryptosystem is given.

1.1.6 Key management

Key management includes the key storage method, the key generation method, key update, and key disposal, etc. Since the security level decreases if there is a defect in one item somewhere, all items cannot be disregarded.

Key storage method:

The key storage method concerns the safety of the location to memorize the private key for public key cryptography and the common key for symmetric cipher. This safety is mainly decided by the following items. The security requirements were arranged for reference in the following table. In this example, the center assumes where the center installation site and personal management area precisely carried out. Although the receivers are assumed to be used for general families and there may be attacks against the receiver units to some degree, organized attacks are not considered. During actual operation, the same consideration is necessary based on the security policy.

In general, the private key for public key cryptography and the master key for symmetric cipher are not written with the value as is. Once it is encrypted with the key for another symmetric cipher, and when it is used, it requires the input of a PIN number or password, etc.

Appended table 1-1　Features related to key storage locations

	Center	Device (user)
Environment of the location where the device is set up	High safety can be set.	Can easily be attacked.
Entering and leaving management	Strict management possible.	Management impossible
Operator education/management	Strict management possible.	Management impossible
Physical tolerance (tamper resistant)	Intermediate level. Can be supplemented with other items.	The most important item. Cannot be supplemented with other items.
Chassis structure of the device	Consideration necessary to some degree	Very important
Wiring circuit on the board	Same as above	Consideration necessary when the chassis is weak against attack
Signal terminal	Same as above	Same as above
LSI structure	Same as above	Same as above
Decipherability level of software	Same as above	Consideration necessary when physical tolerance is weak against attack
Difficulty level of analysis of firmware/programs	Same as above	Same as above
Access limits to memory	Same as above	Same as above

In IFPS PUB 140-1, the conditions to satisfy the security requirement levels in four stages are arranged.

IFPS PUB 140-1, “security requirements for cryptographic modules,”

http://www-09.nist.gov/div897/pubs/fip140-1.htm

(1) Key generation/key disposal

The key for symmetric cipher is comparatively easily generated since it uses random numbers. On the other hand, since a program and calculation amount of a certain level are required for public key cryptography, to generate a good quality key, a key generation center, etc. may also be necessary according to the system configuration. An example of the generation method for the RSA encryption key is described in appendix of X.509.

Additionally, it is also very important for the key disposal to assess the effectiveness of the signature. In general, it is also necessary for the center to manage the function to comprehend the key renewal or disposal, etc.

(2) Key update

There is no encryption algorithm that can maintain the security of generated keys permanently and it is necessary to renew the key. Generally, public key cryptography has as an example having a valid term of about two years, if there are no problems. When using symmetric cipher with public key cryptography, in almost every case the session key (disposable key) is used.

When public key cryptography only is used, the key management of multiple layers is conducted. It is

necessary to minimize use of the master key that is the most important key.

1.1.7 Security expandability

With the improvement of computing power in the future and diversification in the circulation of multimedia data, security techniques have been revised, and it is recommended that expandability be provided to take into account those technologies if required.

(1) Symmetric cipher

Due to the improvement in calculation ability, existing 64-bit symmetric cipher is making a transition to 128-bit symmetric cipher. Recently, encryption algorithms which can prove security (prove how safe it is) are being developed.

(2) Public key cryptography

Due to the improvement in calculation ability, the size of bits for public key cryptography continues to expand; as for the future direction, public key cryptography using encryption techniques which can prove security and which is based on elliptical curves will have been researched and developed. In the future, it is necessary that current algorithms be replaced from the perspective of the maturity level of these algorithms and the amount of security required.

Appended table 1-2 Recent trends in public key cryptography system algorithms

Safety verification	Public key cryptography		Digital signature	
	Algorithm	Record/presentation	Algorithm	Record/presentation
Equivalent to prime factorization (without proof)	RSAES-EPOC	PKCS #1 Ver. 2 (July 1998)	RSASSA-PKCS1-v1_5	De facto standards
			Fiat-Shamir signature	Potential for zero-knowledge signature
			ESIGN	High speed is a feature.
Equivalent to prime factorization (with proof)	EPOC (with hash)	Eurocrypto ‘98	-	-
Discrete logarithm problem	Diffie-Hellman key distribution	Effective for key distribution	DSA	NIST
	ElGamal	Crypto ‘84	Shnorr	-
	Cramer-Shoup	Crypto ‘98		
Elliptic curve discrete logarithm problem	Elliptic curve ElGamal	Features the possibility to shorten the key length.	Elliptic curve DSA	-
			Elliptic curve Schnorr	-

Deviation of each algorithm and improvement algorithm were omitted.

(3) Copyright protection method

Due to the diversification of multimedia data circulation and ease of copying digital data, it is necessary

to solve the copyright problem according to the contents. In order to solve this problem, copy protection technology, digital watermark technology by which copyright protection information, etc. is embedded into contents, and superdistribution technology, etc. have to be used.

1.2 Application of security

In examples given in this chapter, it is assumed that the security functions described in Section 5.1 are combined and applied to the interactive digital data services. The security is divided into multiple levels according to the security requirements. In level 0, the security requirements are assumed that the receivers having no CAS function can use the service. The highest level of security seems to be difficult to install in the receivers having basic functions only at the start of data broadcasting services. These functions seem to be installed in the receivers having advanced functions and in the future receivers having basic functions. The security functions that may be realized by the receiver having CAS function are surrounded by heavy lines, as shown in appended tables 1-3 to 1-7.

1.2.1 Protection of audience information

The items that should be considered to protect the audience information are grouped into levels and shown in appended table 1-3.

Table 1-3 Protection levels of audience information

Security level		Audience information handled	Required modules/systems
Level 3	Another network connection	Integration to Internet-based services	Center: Firewall
Level 2	Control of audience information access authority	Customer control information	Center: Access control function
Level 1	Audience information encryption control	Personal names, addresses and others	Both: Common ciphering function
Level 0	Not considered	Approved range by the owner	-

In interactive data transmission services like online shopping, the service providers may need to know the name and address of the viewer, because they have to specify the destination. In such services, the following points should be considered to prevent a leakage of audience data from the viewpoint of privacy protection.

- Prevent interceptions on the network
- Leakage protection in the center
- Protection of center access from outside
- Handle the minimum required personal data. Do not use such data for another purpose or do not transfer it to another.

(1) Level 0

- The functions and operations that should be covered by the center

  If the service requires the audience information that relates to the privacy protection, it should be

agreed with each audience.

(2) Level 1

- The functions and operations that should be covered by the receivers

  To prevent a connection to a false center, the destination of connection must be checked in advance (see xx).

  The audience information that relates to the privacy protection must be encrypted and transferred.

- The functions and operations that should be covered by the center

  The audience information that relates to the privacy protection must be handled by the minimum number of persons.

(3) Level 2

- The functions and operations that should be covered by the center

  The right to access to the audience information that relates to the privacy protection must be managed (in order to limit the persons who can read or register the audience information and others).

(4) Level 3

- The functions and operations that should be covered by the center

  If the system is necessary to connect to another network such as Internet when the services are expanded, the firewall must be installed to protect audience information from being leaked.

1.2.2 Protection of copyright owners

The items that should be considered to protect the copyright owners are grouped into levels and shown in appended table 1-4.

Appended table 1-4 Protection levels of copyright owners

Security level		Typical applications/ features	Required modules/systems
Level 3	Superdistribution	Free distribution management	Special devices, special management center
Level 2	Copy protection	Prohibited recording by receivers	Copy protection, digital watermark
Level 1	Scrambling	Simple copy protection, circuit interception	Receiver: Tamper resistant Both: Common ciphering function
Level 0	Not considered	Attachment of copyright information	-

Due to the diversification of multimedia data circulation and ease of copying digital data, it is necessary to solve the copyright problem according to the contents.

(1) Level 0

If the technical copyright protection function cannot be installed from necessity, at least the information about copyright should be provided to users. There are only legal means against its violation.

(2) Level 1

- The functions and operations that should be covered by the receivers

  Electrical interception on the line can be protected by use of symmetric cipher.

  In addition, the digital contents such as audio and video data must be converted into analog data by decoding with symmetric cipher in the tamper resistant (guard vessel). Output of analog data alone can prevent at least the illegal copy of digital contents without data degradation.

(3) Level 2

- The functions and operations that should be covered by the center

  By using the redundancy that slightly remains in the media encoding system for digital contents, the copyright owner information and receiver ID information must be embedded as the secondary information that has a limited impact on the playback data (digital watermark technology).

- The functions and operations that should be covered by the receivers

  If illegal copies are circulated, the person participating those copies can be identified by the receiver ID information included in each copy. This cannot avoid illegal copies but can raise the deterrent effects.

- The functions and operations that should be covered by the receivers

  The playback devices that take account of copy protection need to be used for copy protection. Such devices need to be tamper resistant.

(4) Level 3

- The functions and operations that should be covered by the center and receivers

  An approach that has been considered to satisfy both free distribution of digital contents and ensuring of copyright owners' profit is the "superdistribution". However, this is the future function if its implementation and management issues are considered.

1.2.3 Consideration for impartiality

Items that should be considered for impartiality are classified in levels shown on appended table 1-5.

Appended table 1-5 Levels of impartiality

Security level		Primary application example/ features	Required modules/systems
Level 3	Simple electronic voting *	Simple electronic voting	Both: Advanced function based on public key cryptosystem
Level 2	Impartiality function *	Opinion polls	Both: Symmetric cipher processing Center: Distribution of safety token in advance
Level 1	Simple impartiality function	Sampling and check for duplication	Receivers: Pseudo random number generation
Level 0	Not considered	Mass-call reception service	-

* The reliable voting management center (equivalent to the election administration office) is required.

* Token: An electronic voting card

(1) Level 0

The mass-call reception service that is given as the typical service example is appropriate for calculation of a large amount of calls. However, the same receiver may generate multiple calls for a certain service, and this may not meet the requirements of data broadcasting operators.

(2) Level 1

If the calculated voting results may affect on the words and actions of audience (viewers), the elimination of duplicate voting is required to assure the impartiality of voting. The following gives two typical examples that can be realized by the interactive data broadcaster and the receivers only.

Example 1: Check for duplication of voting by using the receiver ID uniquely assigned to each receiver.

- Preparation: The voting acceptance center prepares the ID list of receivers that can be used for voting.
- Voting: Each receiver sends its ID together with the voting data.
- Counting: The voting acceptance center checks each receiver ID by comparing it with the ID list to avoid the duplicate voting during counting.

Example 2: Sampling (or limited voting)

If too many viewers are expected to vote or if the very high voter turnout is expected, the voting acceptance host may go down or the network may congest. In such case, the sampling (or random selection) function may be required to use and the entire voting result may be estimated from a partial voting data.

- Preparation:

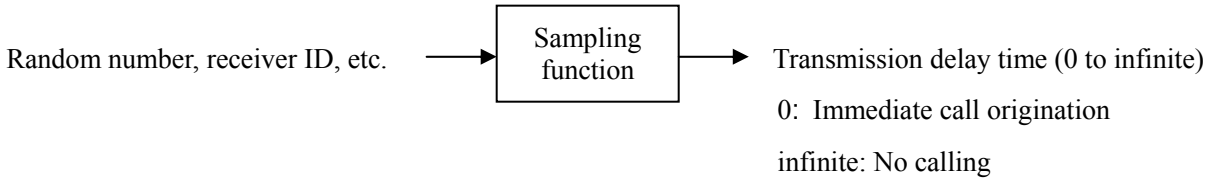
The interactive data broadcasting operator determined the sampling function by considering the sampling algorithm. (The simplest example is the limitation of voting by using the end digit of each receiver ID although this has a statistical problem.) The

interactive data broadcasting service provider needs to determine the algorithm that has the minimum statistical problem for the contents of survey when selecting the sampling function. Note that the sampling function needs to allow single-direction transfer so that the voting by fake receivers can be eliminated for a certain level.

- Voting:

  The sampling function is broadcasted on the broadcasting waves.

  Each receiver generates random numbers, receives the sampling function, and sends the voting data. The permission of its voting is determined by its output. The concept of sampling function input and output is shown in appended figure 1-8.



Appended figure 1-8 Sampling function and data input and output

(3) Level 2

- The functions and operations that should be covered by the center

  In order to exclude a communication from fake receivers and a risk of illegal use of receiver ID of another person, the voting management center should be established, the receivers should be checked for an illegal use, and the tokens (equivalent to voting cards) should be delivered to viewers having the receivers. Each voting is checked using the token and receiver ID.

- The functions and operations that should be covered by the center and receivers

  The symmetric cipher function needs to be used.

(4) Level 3

If receivers are used as voting terminals for election, the higher security functions need to be installed for electronic voting. The points to be guaranteed are:

- Legality of voters (The right to vote must be checked.)
- Security of ballot (The anonymity must be protected.)
- Prevention of multiple voting
- Check of the reflection on ballot (The raising of objection must be secured.)

These points must be guaranteed. However, if the voting is not based on one's will due to constraint from another person, the security is not guaranteed although it may also occur in the ordinary voting.

1.2.4 Simple mutual authentication function between the viewer and the center

Items that should be considered as simple mutual authentication between the viewer and the center are classified in levels shown on appended table 1-6.

Appended table 1-6 Mutual authentication levels

Security level		Assumed system service	Required module
Level 2	Strict authentication (PKCS)	Internet system service	Both: Public key cryptography and hash function
Level 1	Protected simple authentication	Comparatively low-price article purchase	Both: Symmetric cipher processing and timestamp
Level 0	Unprotected simple authentication	Total for the other party's unconfirmed survey, etc.	Receiver units: Receiver ID

If the applications that require to confirm privacy protection and legitimacy of the viewer in communication are used, it is necessary to confirm the identity of the other party and the connection point at an early stage in the transaction. The mutual (other party) authentication function is used for this procedure. The mutual authentication function can be classified into two types: one is strict authentication that mainly uses public key and the second one is simple authentication that substitutes strict authentication when the public key cannot be used due to some restriction.

(1) Level 0

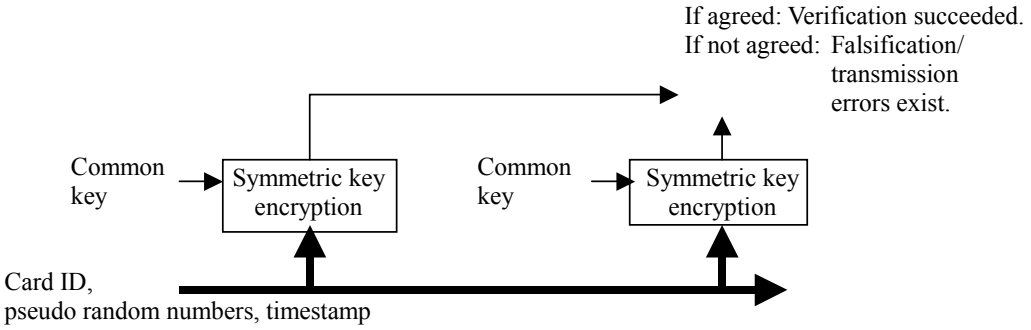
It is recommended that the viewer should confirm whether or not the other party is a fake center when individual privacy information and credit card numbers as well as others are sent to the host at the center. Therefore, during communications that are not protected, it is desirable to limit the information to be sent to a reasonable level where there is no harm even if the information is intercepted or falsified.

(2) Level 1

In order to prevent spoofing, where a fake viewer reuses the receiver ID and password, the timestamp and random numbers processed by one-way function are used when information is sent to the center.

- Giving message recovery

  Appended figure 1-9 shows a method to authenticate the other party using "giving message recovery" method. Mutual authentication is also possible in the opposite direction.



Appended figure 1-9 Other party authentication using giving message recovery method

In symmetric cipher, when the sender and receiver (verifier) share a common key beforehand, messages are encrypted by the transmission side using the common key, and the sender can be confirmed if it becomes a message with some meaning when the receiver decodes the scripted text.

(3) Level 2

A series of code processing systems known as public key cryptosystem (PKCS) widely used by the Internet is used. It is widely used on the Internet as it is implemented in many browsers.

- Required modules (in addition to level 1): Public key cryptography processing function, one-way function, and certification function
- Required organizations: Certificate Authority (CA) (for issue, reference, change, update, and disposal)

1.2.5 Signature

Items that should be considered as signature functions are classified in levels shown on appended table 1-7.

Appended table 1-7 Signature function levels

Security level		Primary application example/ features	Required modules/systems
Level 3	Digital signature function	Information exchange required for legal evidence ability	Public key cryptography and certificate issuing authority
Level 2	Substitution of symmetric cipher	Symmetric cipher	Symmetric cipher and third-party signature organization
Level 1	Simple signature function	One-way functions, giving message recovery	Symmetric cipher
Level 0	No consideration	Memo of the confirmation number	Unnecessary

(1) Level 0

The memory system and output method are expected to be limited depending on the receiver, even if a reception confirmation sheet or others are received for reservation like ticket reservation. Therefore, at least it is recommended that the center should issue a reservation confirmation umber to handle trouble with the procedure. However, the center needs to be completely reliable for the handling of the reservation confirmation number.

(2) Level 1

When momentary and product transactions (including transactions of digital contents) from online shopping occur, the proof of both transactions needs to be left to prevent trouble. In this case, a digital signature is ideal to use. However, as the digital signature cannot be used if the public key cryptography function is not installed, a message Authentication code (MAC) that can also be used in systems implemented with symmetric cipher only is recommended.

However, this signature is different from the signature that uses public key cryptography as follows. The signature results that are not generated by a third party can be confirmed. However, those who receive the signatures can also create the same message, and the center cannot prevent fraudulent acts.

(3) Level 2

It is possible to deal with fraud on the center side by connecting a reliable third party's message authentication code to the message, and adding the message authentication code from the center. However, receiver units and third-party organizations shall continue to secure the shared common key.

(4) Level 3

If the admissible legal proof is needed, the organization that issues certificates using public key cryptography is recommended.

Appendix 2 Reference information regarding billing methods

In Appendix 2, the reference information for when data broadcasters decide on a charging method is described.

2.1 Billing method

A method (billing method) in which viewers using interactive data broadcasting services pay for using services electronically. Currently available billing methods are described below. Terms used in this reference do not define economic terms, and these terms are only for describing the service image.

2.1.1 Network payment transactions

(1) Network payment transactions

It is a system for using the payment billing services provided by communications providers. The information charge can be paid according to the telephone rate. There are information charge collection services, etc.

2.1.2 Card payments

(1) Credit

For credit card users, it is a system in which the credit companies pay instead of the users. The credit company charges the user later.

(2) Debit

For users with deposits in a band account, etc., it is a system in which payment is made directly from the user's account.

2.1.3 Other payments

(1) Prepaid

A system in which payment is made within a value amount managed at the center (information on money and value) and the payment amounts are deducted from this value.

(2) Log collection

It is a method that records data broadcasting service use charges, and carries out bulk settlements later like PPC billing, etc.

(3) Home banking

It is a service that can carry out account transfers and balance inquiries, etc., from the user's home.

2.2 Comparison of billing methods

A comparison of billing methods is shown in appended table 2-1.

Appended table 2-1 Comparison of billing methods

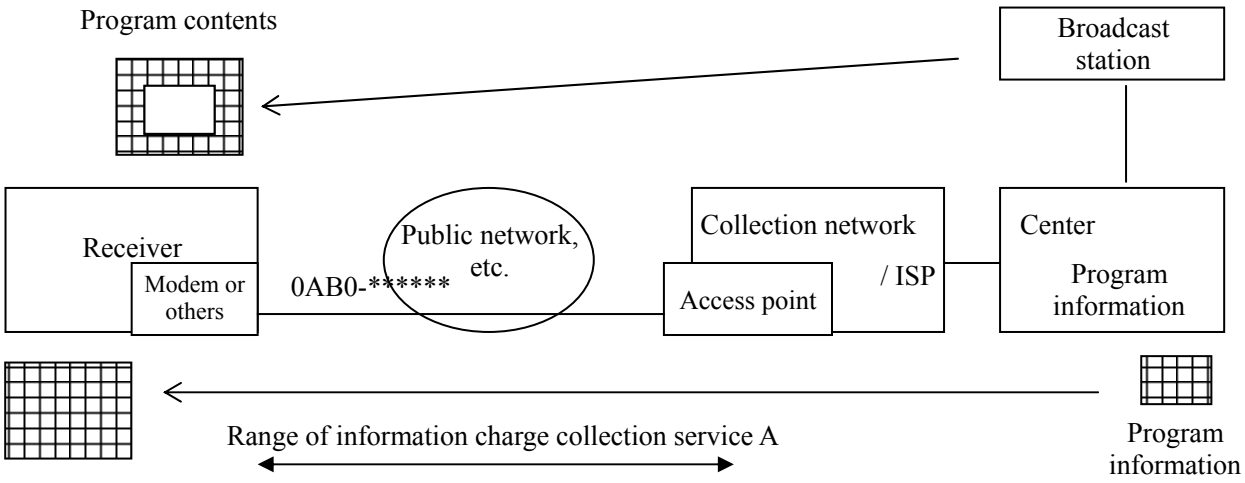
Method	Cost of user	Applicable contents	Main application billing area	Diffusion
Network payment transactions	Small	Excluding product sales	10 yen to 300 yen (Small amount range); 1 yen to 10,000 yen (Large amount range)	⊙
Credit	Small	Product sales, contents	Several thousand yen to tens of thousands of yens or more	⊙
Debit	Small	Product sales, contents	Several thousand yen to tens of thousands of yens	△
Prepaid	Small	Product sales, contents	Several hundred yen to several thousand yen	△
Log collection	Small	Streaming contents	Several hundred yen to several thousand yen	⊙
Home banking	Medium	Balance confirmation, account transfer	-	△

2.3 Network payment

The network payment mechanism is achieved by having the communications providers represent the original information provider to collect the information charge that the original information provider shall have collected, and by collecting the charge when the telephone billing is due. The information provider does not have to send or manage the bill for a large amount of viewers, and therefore can provide information efficiently. There are information charge collection services currently available.

2.3.1 Information charge collection service A

An example of information charge collection service A is shown in appended figure 2-1.



Appended figure 2-1 Information charge collection service A

(1) Service outline

a. The broadcasting station registers program information provided by information charge collection service A in the center in advance.

b. The receivers call the number (0AB0-******) of the specified information charge collection service A using data broadcasting or some other method.

c. The receiver is connected to the center through the collection network.

d. The receivers receive data for the data broadcasting program information from the center according to the contents of the service.

e. Payment collection is made in the system of information charge collection service A for the information charge set beforehand.

(2) Required functions of receivers

- Communication function

  New protocol implementation by information charge collection service A is not required.

(3) Required functions in the center

- Program information notice distribution function

  A function to deliver program information related to data broadcasting and necessary information for information charge collection service A (information on outlines and others of programs notified before information provision).

(4) Items to be considered for operation

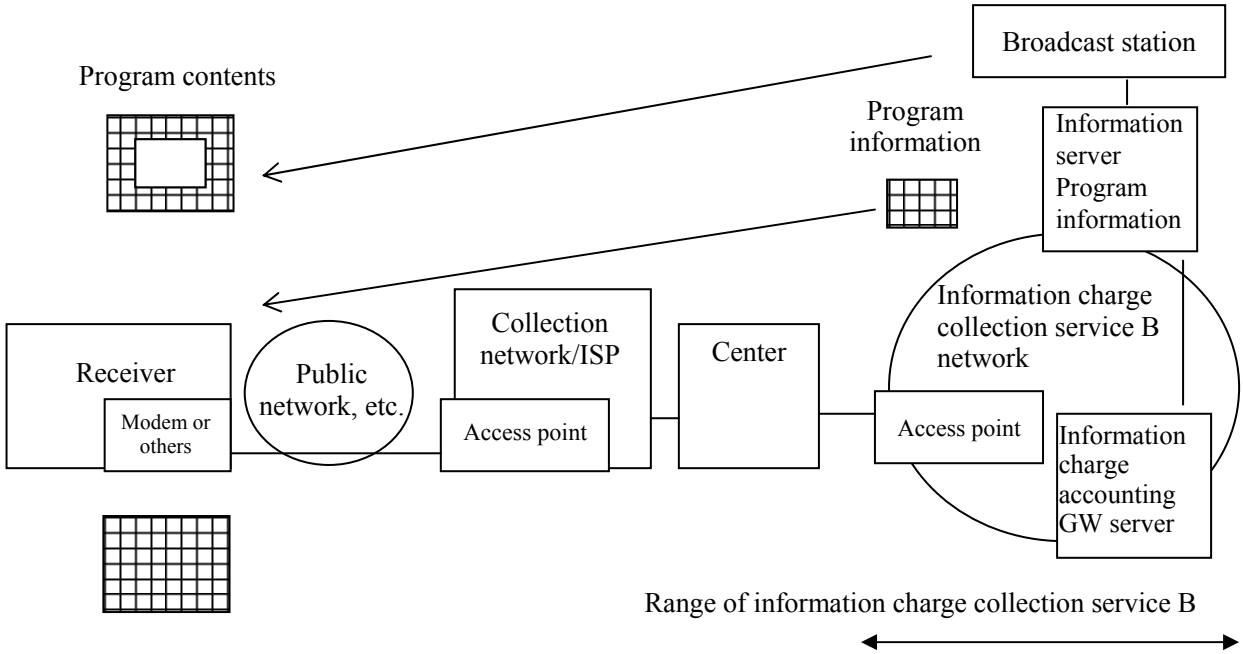
- Prepare a line exclusively for providing information to the access point of the collection network.
- An access from PHS and mobile phones is not possible.

(5) Operation flow until the start of information charge collection service A

The program planning manual is examined, and after completion of examination made by the ethics examination organization, the contract of information charge collection service A is concluded.

2.3.2 Information charge collection service B

An example of information charge collection service B is shown in appended figure 2-2.



Appended figure 2-2 Information charge collection service B

(1) Service outline

a. The broadcasting station registers data broadcasting program information provided by information charge collection service B in the information server that has been connected to the information charge collection service B network in advance.

b. The receivers call an access point of the collection network that has been specified by data broadcasting or some other method.

c. The receiver is connected to the center through the collection network.

d. The center connects to the access point for the network of information charge collection service B, connects to the information server after user authentication, and selects the target information (contents).

e. The center automatically enters the information server the pay information connection ID and password for purchasing the selected data broadcasting program information.

f. The center receives the data of the data broadcasting program information from the information server.

g. The center transmits the data broadcasting program information to the receivers.

h. The information charge is billed in the information charge accounting GW server.

(2) Required functions of receivers

- Communication function

  New protocol implementation by information charge collection service B is not required.

(3) Required functions in the center

- Program information notice distribution function

  The function to deliver data broadcasting program information that has been received from the information server to the receivers

- Security function

  SSL3.0 or higher.

(4) Operation flow until the start of information charge collection service B

The program planning manual is examined, and after completion of examination made by the ethics examination organization, the contract of information charge collection service B is concluded. Additionally, the use of SSL protocol ID (*) needs to be acquired separately.

(*) The SSL protocol ID is required for secure communication that uses the SSL protocol. It is issued by the reliable third-party organization.

2.4 Card payments

When interactive data broadcasting services are used, their payment can be made using credit cards and debit cards. The same payment processing as for actual stores is used, and the safety of payment needs to be guaranteed.

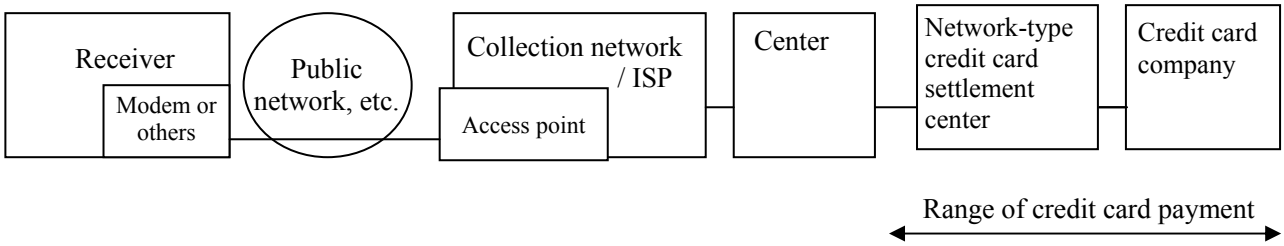
The features of card payment are shown in appended table 2-2.

Appended table 2-2 Card payment features

	Credit card	Debit card
Payment method	Deferred payment	Payment at purchase
Personal identification	Name, card number, and expiration date	Account number and security code
Line of credit	Depends on the issue subject	Deposit balance
Special card reader and writer	Not required	Required
Problems		Card reader is necessary in the receiver unit.

2.4.1 Credit card payment

An example of credit card payment is shown in appended figure 2-3.



Appended figure 2-3 Credit card payment

(1) Service outline

a. The data required for credit card transaction (such as the credit card number and credit card company name) is registered in the center beforehand.

b. When a payment from interactive program viewer is requested, mutual authentication on the viewer and the host is carried out in the center.

c. The center checks the credit according to the transaction amount with the credit card company through the network credit card payment center.

d. The user fee is claimed by the credit card company from the viewer later, and is deducted from the viewer's bank account.

(2) Required functions of receivers

- Communication function

  The security function required for credit card transaction is installed. New protocol implementation by credit card payment is not required.

(3) Required functions in the center

- Credit card number and other data management function

  The function to manage the information required for credit card payment beforehand if required.

- Functions compatible with the network credit card payment center

  The credit inquiry, inquiry result reception, and other functions

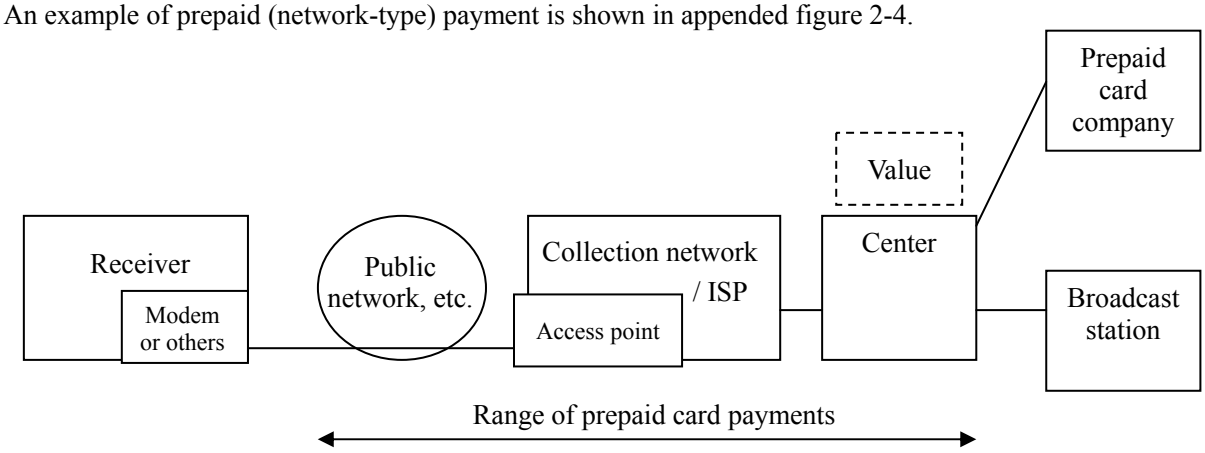
- Sales management function

  The function to manage sales transactions in the same way as member stores of the credit card company.

2.5 Other payments

2.5.1 Prepaid (network-type) payments

An example of prepaid (network-type) payment is shown in appended figure 2-4.



Appended figure 2-4 Prepaid payments

(1) Service outline

a. The center manages the prepaid card ID, security code, and prepaid value.

b. When an interactive data service payment is requested by an interactive program viewer, mutual authentication is carried out on the viewer and the host of the center, and the viewer is requested to enter the prepaid card ID and security code.

c. When the prepaid card ID and security code are entered by the viewer, the center notifies the viewer of the current balance.

d. The center subtracts the interactive data broadcasting service price from the managed value balance. When the value balance becomes 0, the process is carried out to invalidate the prepaid card ID.

e. The center provides information relating to the sales to the broadcasting station and prepaid card company.

f. The broadcasting station claims the amount from the prepaid card company.

(2) Required functions of receivers

- Communication function

  Security function required by prepaid (network-type) card payment. New protocol implementation by prepaid (network-type) card payment is not required.

(3) Required functions in the center

- Prepaid card number and other data management functions

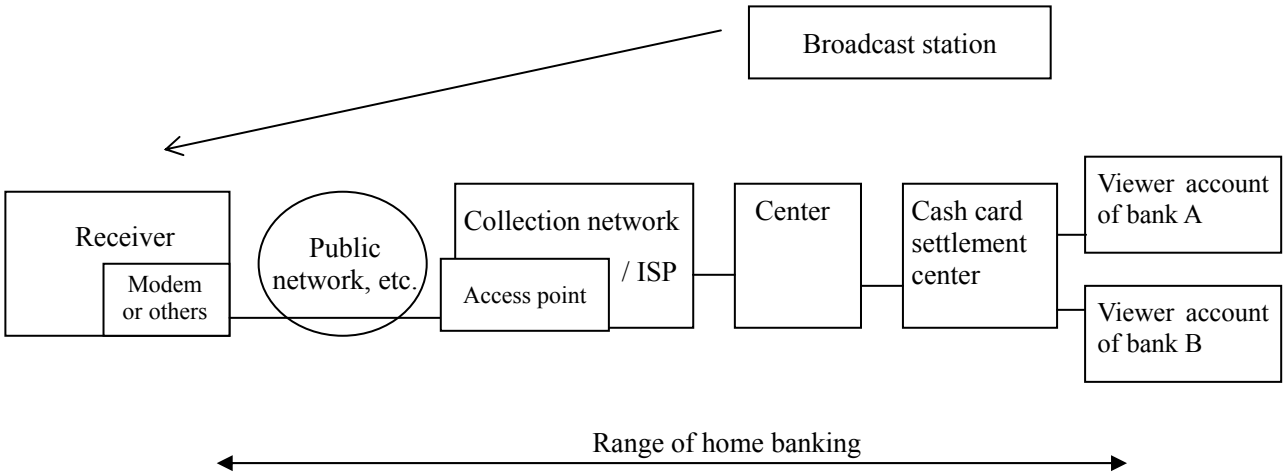
  The function to manage the required information such as the prepaid card ID, security code, prepaid card value.

- Sales management function

  The function to manage information relating to the sales of sold products (such as the product code, cost, and data broadcasting program).

2.5.2 Home banking

An example of home banking is shown in appended figure 2-5.



Appended figure 2-5 Home banking

(1) Service outline

a. The required data for home banking (such as the bank account number and bank names) is registered at the center in advance as required.

b. When home banking is requested from an interactive program viewer, mutual authentication on the viewer and the host is carried out in the center.

c. The center is connected with the bank that holds the viewer account through a cash card payment center.

d. Based on the home banking requests of the viewer, transactions corresponding to the requests are carried out between the bank with the viewer's account and the center. For example, a transfer request is made to an account in bank B for payment.

(2) Required functions of the receivers

- Communication function

  Security function required for home banking payment. New protocol implementation by home banking payment is not required.

(3) Required functions in the center

- Bank account number and other data management functions

  The function to manage the information required for home banking beforehand if required.

- Functions corresponding to the cash card payment center

  The function corresponding to the balance inquiry, transfer request and other transactions.

Appendix 3 Supplementary explanation concerning the line congestion

3.1 What is the line congestion?

Line congestion is the phenomenon when telephone fails to connect due to the concentration of communication that exceeds the ability of switchboard to handle the number of calls within a fixed time. The call congestion increases due to the repeated re-dialing by callers to other parties until a connection is made.

3.2 Advantages obtained by avoiding congestion

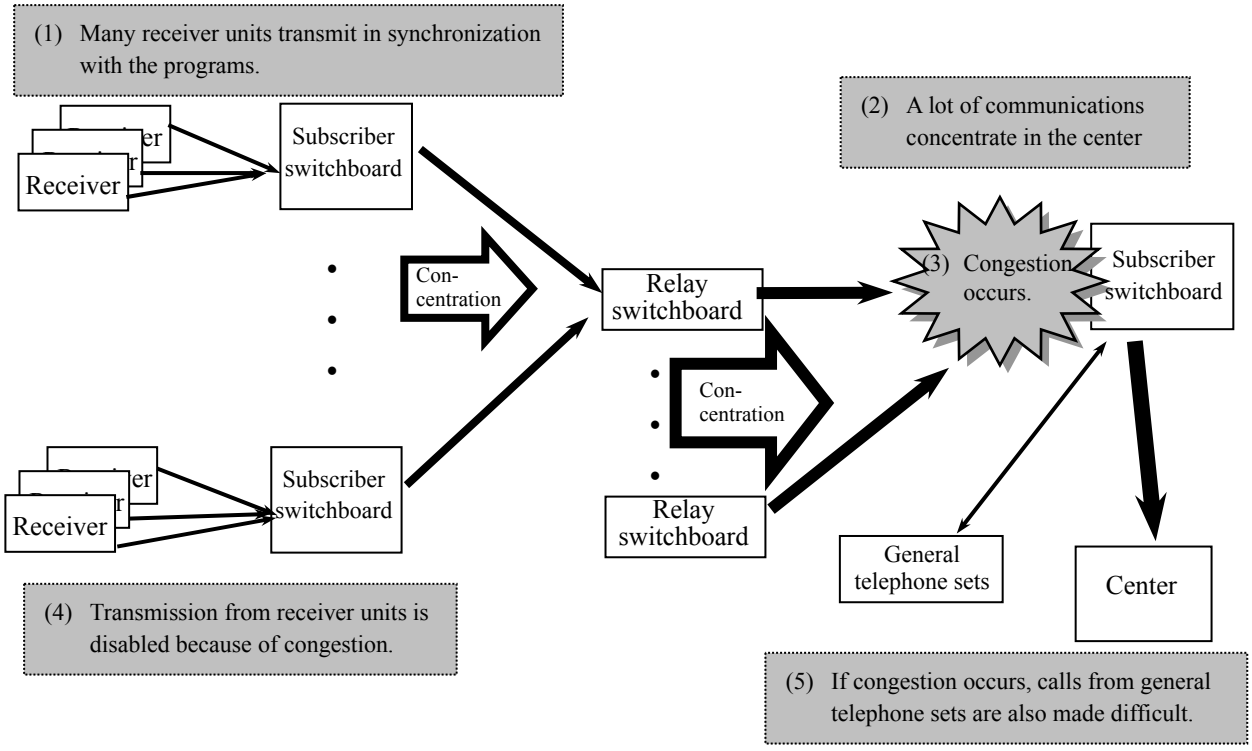
The advantages obtained for viewers and broadcaster are shown in appended table 3-1.

Appended table 3-1 Advantages obtained for viewers and broadcasting stations

Viewers	As it is rare for the line to be busy during transmission, almost all communications are possible. Therefore, it is not necessary to make repeated calls.
Broadcaster	When communication synchronizes in programs and concentrates in a short period of time, the response data that exceeds the limit of traffic processing capability cannot be collected. But a lot of response data can be collected efficiently by delaying transmission or others.

3.3 Mechanism of congestion occurrence

A mechanism of congestion occurrence is shown as an image in appended figure 3-1.



Appended figure 3-1 An image of mechanism of congestion occurrence

Appendix 4 Supplementary explanation concerning network services

4.1 Mass-call reception service

4.1.1 Service outline

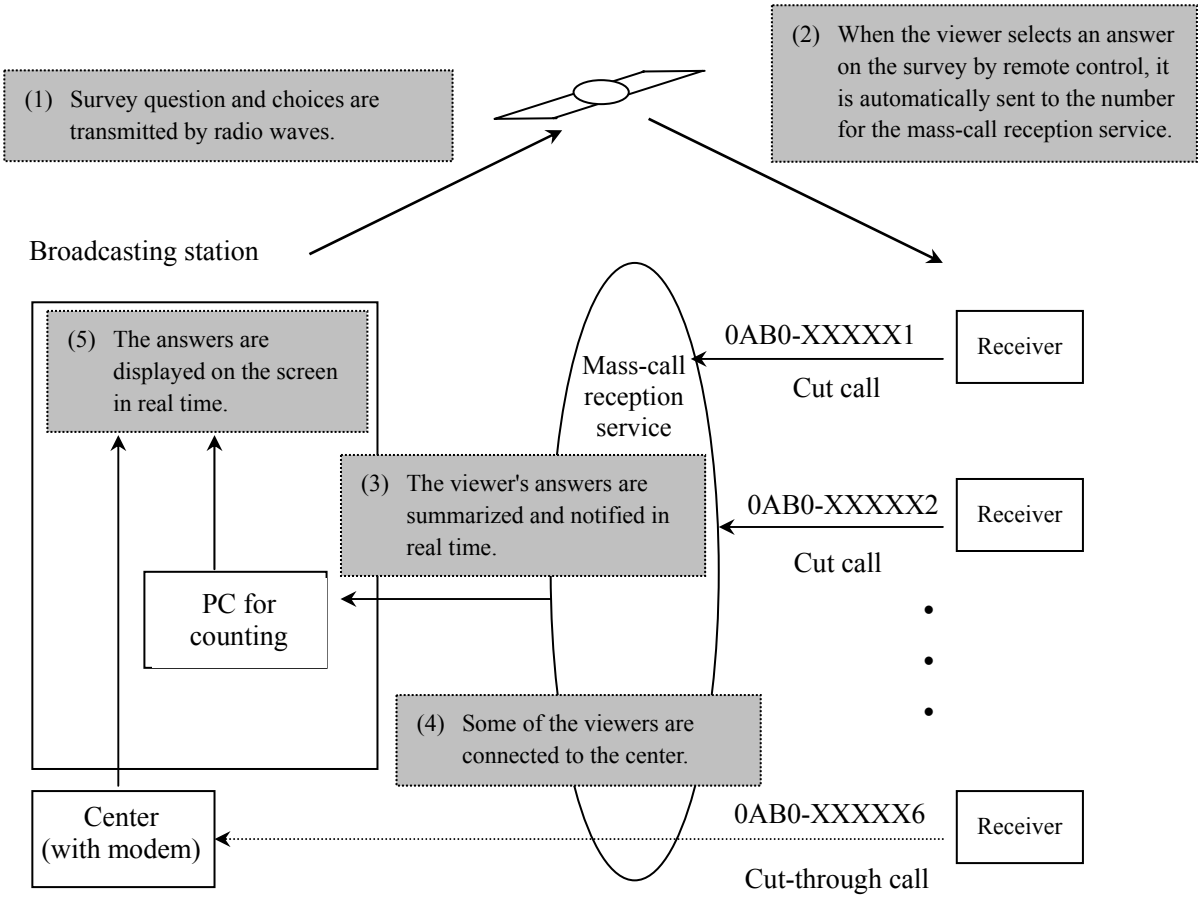
When a communication is sent for the notified service number (0AB0-xxxxxx), it is automatically counted and the total result (the total of each service number) in the viewer participation program is informed to the broadcaster.

From among the callers, there is the "cut-through function" that connects to the telephone line (operator or center) for reception of communication that corresponds to the number of lines set in advance.

Up to 6 telephone numbers per program can be assigned to the mass-call reception service that use broadcasting media.

4.1.2 Application examples (for receivers only)

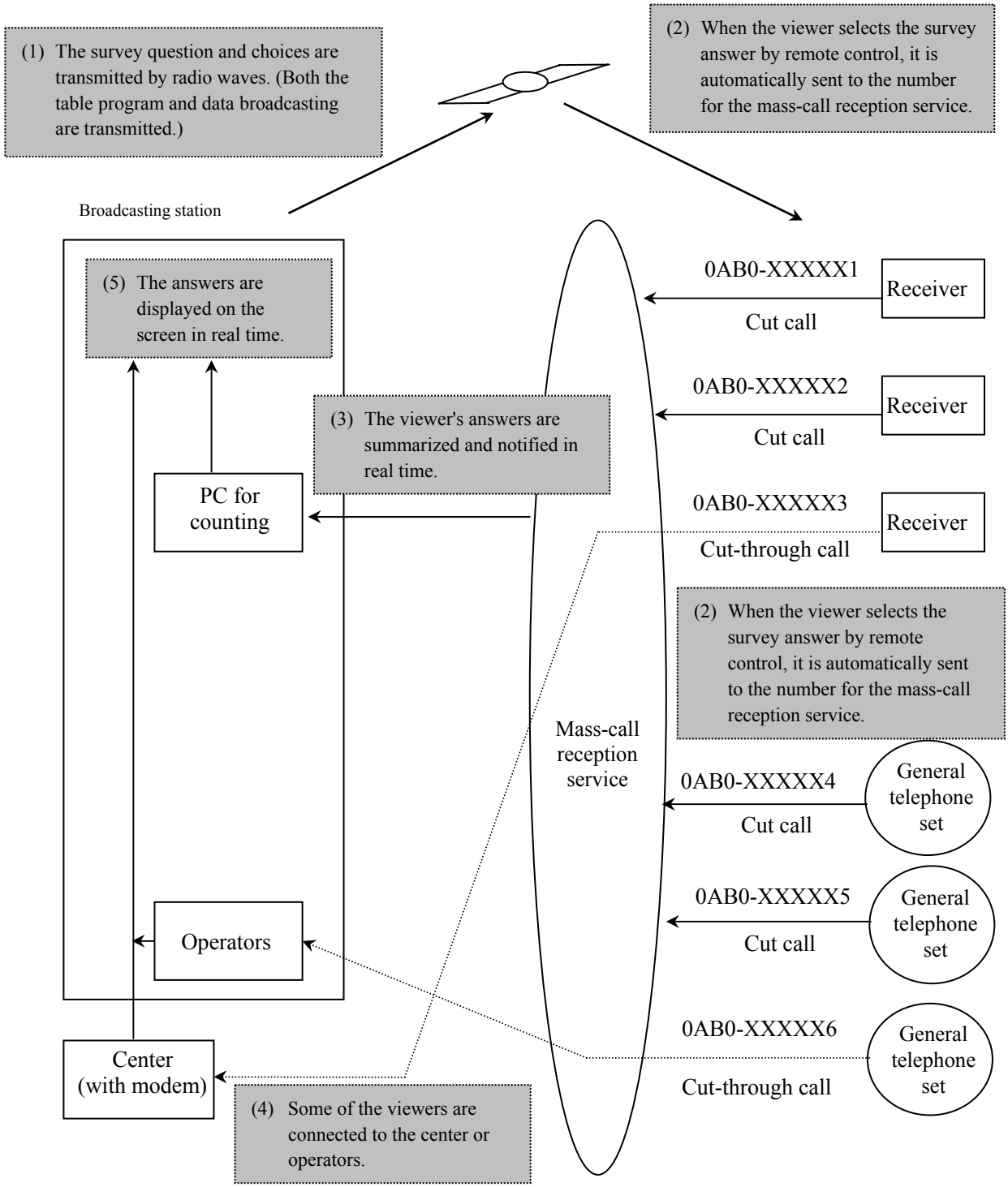
An image of survey program that uses the mass-call reception service is shown in appended figure 4-1.



Appended figure 4-1 Survey program image (the service for receivers only)

4.1.3 Application examples (service for both receivers and general telephone sets)

An image of survey program that uses the mass-call reception service is shown in appended figure 4-2.



Appended figure 4-2 Survey program image (the service for both receivers and general telephone sets)

4.2 Nationwide common telephone number service

An example of using the nationwide common telephone number service is shown below in order to unite the telephone numbers of the access points when multiple access points are established.

4.2.1 When access point lines are used for billing of receivers

If the toll-free service of nationwide common numbers is used, all calls sent to a single nationwide common number can be redirected to the preset access points according to the regions where those calls are originated.

4.2.2 When billing on the call origination side of access point lines

If the service to charge callers is used for nationwide common numbers, all calls sent to a single nationwide common number can be redirected to the preset access points according to the regions where those calls are originated.

Appendix 5 Transmission method and connection requirements of number to cancel the priority carrier routine (122)

5.1 Transmission method

(1) The fixed priority connection is cancelled and the communications carrier is specified.

122 + 00XY + 0ABCDEFGHJ(K)

(2) In case (1), a special number (such as 184 or 186) of the sender information notification service is used as well.

184 (186) + 122 + 00XY + 0ABCDEFGHJ(K)

5.2 Connection requirements

(1) Transmission with PSTN

A. The connection requirements for a telephone number transmission of 122 + 00XY + access point from the receivers is shown in appended table 5-1.

Appended table 5-1 Connection requirements for a telephone number transmission of 122 + 00XY + access point

Access point phone numbers (example) \ Line at receiver side		If fixed priority connection is set	If fixed priority connection is not set
Calling side is charged.	0ABCDEFGHJ	○	△
Called side is charged.	0120+DEFGHJ	×	×
	0800+DEFGHJ	×	×
	00XY+SC+********	×	×
Calling side is charged.	0180+DEFGHJ	×	×
	0990+DEFGHJ	×	×
	0570+DEFGHJ	×	×

[Explanatory notes] ○: Connected to the 00XY broadcaster whose number is sent after 122.

△: Connected to the 00YY broadcaster whose number is sent following 122 after the announcement saying the 122 is not necessary.

×: Not connected

B. The line is not connected if a phone number consisting of 122 and the access point is dialed.

(2) Transmission with a mobile phone or a PHS

a. The line is not connected if a phone number consisting of 122+00XY+access point is dialed.

b. The line is not connected if a phone number consisting of 122 and the access point is dialed.

5.3 Time to start the priority connection service

The priority connection service will start in the fourth quarter of 2000 fiscal year.

Volume 7

Broadband CS Digital Broadcast Transmission Operation Rules

Contents

1 Introduction

1.1 Preface

This volume defines the standards for operations and broadcasting at broadband CS digital broadcasting stations. The broadband CS digital broadcasters should broadcast programs based on these rules. Also, the BS and broadband CS dual-purpose receivers need to be able to utilize in the expected format the signals that are sent based on these rules.

However, if signals that fully satisfy each rule cannot be sent due to the equipment servicing status of a broadcaster, the receivers may not respond to the intention of that transmitter.

1.2 Purpose

This volume defines signal transmission standards for broadband CS digital broadcasting that comform with ARIB STD-B20 “Transmission System for Digital Broadcasting.”

1.3 Scope

These rules apply to the operations and broadcasting at broadband CS digital broadcasting stations.

2 Related Documents

Same as Part 1.

3 Definitions

Same as Part 1.

4 Information Source Coding

Same as Part 1.

5 Signal Multiplexing

5.1 In-service signal multiplexing

Same as Part 1.

5.2 MPEG2 (systems) detailed operations

5.2.1 Service definitions

Same as Part 1.

5.2.2 Video, audio and subtitle synchronization

Same as Part 1.

5.2.3 EPG and data multiplexing

The maximum bit rate to be assigned to the EPG and data broadcasting is as follows.

○ EPG	:	Up to 3Mbps for total SI (Average per second. For details, see Section 11.2 of “Broadband CS Digital Broadcasting PSI/SI Operation Rules”.)
○ Data broadcasting	:	See Sections 5.1.2.6, 7.2.2, and 7.2.3 of Volume 3.

5.2.4 PAT and NIT operations

Same as Part 1.

5.2.5 Handling of PMT and ES

Same as Part 1.

5.2.6 Default maximum bit rate

Same as Part 1.

5.3 TS multiplexing

5.3.1 Maximum number of services

The maximum number of services per TS shall be 48.

Also, the maximum count for each service shall be as follows, and the transmission shall not exceed these limits.

Each operator shall be assigned the service ID as defined in Section 8.2.1.

Digital TV service	: 16
Digital audio service	: 24
Data service	: 48

The total number of services per network is limited to 200 due to the limited EPG data traffic.

5.3.2 Maximum number of slots

The maximum number of slots to be assigned to TS transmission is 48.

5.3.3 Statistical multiplexing

If statistical multiplexing is used for multiple SDTV, multi-view TV and other sets, the maximum number of applicable ESs shall be 16. Also, each bit rate shall be within the video coding rate defined in Section 4.1.2.

5.4 TS operation guideline

Same as Part 1.

6 Coding and Modulation of Transmission Paths

The QPSK(3/4) modulation system is used for broadband CS digital broadcasting as an interim measure after consideration of radio interference by adjacent satellites so that such broadcasting signals can be received in a nationally unified method. This system is one of coding rates for modulation systems and error-correcting systems by ARIB STD-B20. The surrounding environments including adjacent satellites and others may change and the receiving performance of existing receivers is carefully noted, and this QPSK(3/4) modulation system may be changed in the future.

6.1 TS composition

Same as Part 1.

6.1.1 TS frame configuration

Same as Part 1.

6.1.2 Actions to illegal TMCC signals

If a TMCC code violation has occurred due to a transmission path error between the contracted broadcasting company and uplink station or due to a failure of equipment of the contracted broadcasting company, or if an illegal number of TS packets are received, the TS composition unit operates as follows.

This can prevent the inconsistency between TMCC codes and frame configuration of broadcasting signals. Another TS that shares the same transponder is not affected.

Also, the receiver basically needs not consider the TMCC errors except for a transmission path error, and the voter logic operation and other special processing are not required.

(1) After analysis of TMCC basic information (the information sent form the contracted broadcasting company for TMCC generation at the uplink station), if the TMCC basic information shows the number of slots that differs from the assigned one although the correct number of slots is received, all packets of the assigned slots are transmitted with the QPSK.

(2) If the illegal number of TS packets are received, the packets that exceed the assigned slot count are abandoned. Null packets are sent if insufficient. In both cases, no packets can be received.

(3) If the dummy packets of TMCC basic information are not null, they are treated as null packets and the original packets are not transmitted. In this case, no packet is received.

(4) If the transmission TS is not delivered due to an open circuit or others, all packets of assigned slots are treated in QPSK system and null packets are sent.

6.1.3 Response during no broadcasting period

If broadcasting is stopped, the break of broadcasting may be expressed from the station by PSI/SI operation or the broadcasting may be stopped due to maintenance of the transmitter. The following describes the responses if the broadcasting is stopped due to the disabled PSI/SI transmission.

(1) If the required TS is not delivered to the uplink station due to the maintenance of transmitter of the contracted broadcasting company or others, the TS composition unit sets all packets of the slots assigned to the TS to null and sends them in the QPSK system. This operation is the same as for the open circuit described above.

(2) The uplink station does not generate a PSI/SI signal or others so that the receiver can understand the stopped broadcasting.

6.1.4 Transmission system of TMCC basic information

Same as Part 1.

6.2 TMCC operations

Same as Part 1.

6.3 Operation of Emergency Warning System (EWS)

Same as Part 1.

6.4 Site-Diversity Operations

Same as Part 1.

6.5 Phase Reference Burst

Same as Part 1.

7 Operations

7.1 Operation of hierarchy modulation

The operation of hierarchy modulation is not planned for broadband CS digital broadcasting.

7.2 Switching of video formats

7.2.1 Video format switching operations

Same as Part 1.

7.2.2 HDTV operations with three service IDs

A single HDTV component group can be operated using multiple service IDs. For details, see Chapter 17 “Event Sharing” of the Broadband CS Digital Broadcasting PSI/SI Operation Rules.

7.2.3 Operations at transmitter during video format switching

Same as Part 1.

7.3 Provisional organization

Same as Part 1.

7.4 Multi-view TV

Same as Part 1.

7.5 Event relay

Same as Part 1.

7.6 Handling of inactive broadcasting

The stop of broadcasting can be in the following four cases.

Also, the division of broadcasting and stopped broadcasting, and the PSI/SI operation states are defined in Table 7.6.1 in Volume 7 of Part 1 of this Guide.

(1) Inactive-1: The normal broadcasting stopped period

All traffic signals such as video, audio, data and other signals being sent from the contracted broadcasting company to the uplink station are made null packets and the service is not described in the PAT. This state must be responded for each service ID.

(2) Inactive-2: The stopped status of independent voice or data broadcasting

The service is described in the PAT but the PMT does not exist for the independent voice broadcaster or independent data broadcaster.

(3) Inactive-3: The stopped status of provisional services

As the service is provisional, the PAT information of provisional service does not exist if its broadcasting is stopped.

(4) No signal: The broadcasting stopped status due to equipment failure or maintenance

No signal is transferred from the contracted broadcasting company to the uplink station due to a failure of transmitter unit or circuit between the contracted broadcasting company and uplink station, due to the maintenance of the company's transmitter unit or circuit terminator unit (including the failure or maintenance of circuits, circuit terminator units, or MUX unit of the same TS) and others. In these cases, the uplink station inserts null packets into the traffic signals and they are sent in the QPSK system.

Also, the RF of broadband CS digital broadcasting may be lost due the maintenance work.

7.7 Operation of clock

Same as Part 1.

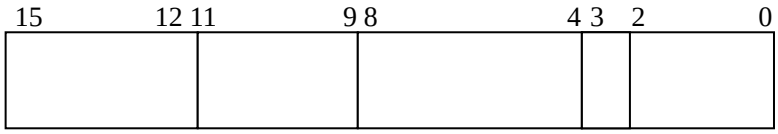
7.8 Subtitles and caption

Same as Part 1.

8 Various Numerics Assignment List

8.1 Various Numerics Assignment Guideline

8.1.1 Guideline for transport stream ID (transport_stream_id) assignment



transport_stream_id (16-bit)

The 16-bit "transport_stream_id" is grouped as illustrated above, and they are assigned the values in the following rules.

Bits 15 to 12	The same value as the lower 4 bits of network_id is assigned.
Bits 11 to 9	Reserved
Bits 8 to 4	Indicates the number of the satellite transponder for this TS broadcasting. The channel number is converted into binary value and used.
Bit 3	Reserved
Bits 2 to 0	The smallest slot number assigned to the operator included in the TS is assigned for the TS that exists in the same satellite transponder. This value is the same as the relative TS number in the TMCC signal.

Also, “0x0000” and “0xFFFF” shall not be assigned as the transport_stream_id.

For example, if the transponder that sends the specific TS is modified in the future, the ID value will be changed in the rules described above. However, the ID of default TS that is required for initial receiver setup is not changed after the time when it was determined in 2001.

8.1.2 Service ID (service_id) assignment guideline

The following shows the basic rules of service ID assignment.

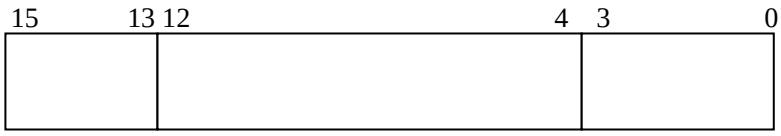
(1) Unique 3-digit service IDs are assigned for the entire broadband CS digital broadcasting.

(2) As the broadband CS digital broadcasting features multi-channel services, the service IDs are not assigned separately to each of media types or contracted broadcasting companies.

Also, the 16-bit service ID is converted from the 3-digit decimal value into the 16-bit binary value and assigned.

8.1.3 Assignment of information provider ID (information_provider_id)

The ERT and the information provider ID (information_provider_id) † used in the reference descriptor are assigned in the following rules.



information_provider_id (16-bit)

The 16-bit “information_provider_id” is divided as illustrated above, and each is assigned the value in the following rules.

Bits 15 to 13	Reserved. They are 0000.
Bits 12 to 4	The same value as the lower 9 bits of transport_stream_id is assigned.
Bits 3 to 0	The value is assigned to the operator having the smallest slot number that has been assigned to the operator included in the TS.

† : Not used at the moment.

8.1.4 Assignment of broadcaster ID (broadcaster_id)

A broadcaster ID is used to identify the group of broadband CS digital broadcasters and the group of services. Unique broadcaster IDs are assigned for the entire broadband CS digital broadcasting.

The following assignment guideline is used.

(1) “0x00” is not assigned.

(2) Continuous values after “0x01” are assigned.

(3) Binary values are used.

8.1.5 Values of identifiers

The identifiers shall have the following values.

Table 8.1.2 Values of Identifiers

Identifier		Value		Remarks
Network name (network_name)		e2 CS1	e2 CS2	
Network ID (network_id)		0x0006	0x0007	
Conditional access system ID (CA_system_id)		0x0005		
Data coding system ID (data_component_id)				
	XML base coding system	0x000B		
	Caption and superscript coding system	0x0008		
	Download coding system	0x0009		
System management ID (system_management_id)		0x0401		

8.1.6 Other IDs values

Same as Part 1.

8.2 ID list

The following lists the values of identifiers (IDs) uniquely assigned within the broadband CS digital broadcasting network.

8.2.1 TS_id list

Table 8.2.1 Broadband CS digital broadcasting TS_id list (as of April 25th, 2007)

TS_id	Transponder	Contracted Broadcasting Companies
0x6020	ND2	Multi Channel Entertainment Inc.
0x7040	ND4	Multi Channel Entertainment Inc.
0x7040	ND4	CS Kyushu Co. Ltd.
0x7060	ND6	CS Eiga Housou Company
0x7060	ND6	Hollywood Movies Company
0x6080	ND8	ep Broadcasting Corporation
0x6080	ND8	CS-WOWOW Inc.
0x60A0	ND10	Multi Channel Entertainment Inc.
0x70C0	ND12	CS One Ten, Ltd.
0x70E0	ND14	Active! Sports
0x7100	ND16	InteracTV Co., Ltd.
0x7100	ND16	Hankyu Corporation
0x7120	ND18	InteracTV Co., Ltd.
0x7140	ND20	Satellite Service
0x7160	ND22	C-TBS, Incorporated
0x7180	ND24	CS Nippon Corporation

8.2.2 service_id list

Unique service IDs are assigned for the entire broadband CS digital broadcasting based on the service ID assignment guideline of Section 8.1.2. The service IDs are not assigned separately to each media or contracted broadcasting company.

The default services that are received during receiver installation and adjustment at audience homes shall be as defined in Section 5.12 “Reception service during shipment” in Volume 2 of this Guide.

Notes: The latest service ID assignment information is available at the ARIB homepage. Its address is http://www.arib.or.jp/TR_B15/CS110/service_id/110cs-service-id.pdf.

Table 8.2.2 Reference: Broadband CS digital broadcasting service_id list (as of April 25th, 2007)

Contracted broadcasting companies	service_id
Multi Channel Entertainment Inc.	001, 228, 233, 800, 801, 802
ep Broadcasting Corporation	055
CS-WOWOW Inc.	091, 092

Commissioned broadcaster	service_id
Multi Channel Entertainment Inc.	100, 259, 312, 322, 331
Hankyu Corporation	101, 290
CS One Ten, Ltd.	110, 260, 303, 323, 324, 352, 353, 354, 360, 361
CS Eiga Housou Company	123, 220, 221, 222, 223, 224
CS Nippon Corporation	147, 257, 291, 300, 320, 321, 350
C-TBS, Incorporated	160, 161, 185, 293, 301, 304, 325, 330, 351
InteracTV Co., Ltd.	177, 226, 261, 313, 333, 342
Satellite Service	183, 258, 292, 302, 332, 340, 341
CS Kyushu Co. Ltd.	194, 334
Hollywood Movies Company	232, 310, 311, 343
Active! Sports	250, 251, 252, 253, 254, 255, 256

8.2.3 broadcaster_id list

Table 8.2.3 Broadband CS digital broadcasting broadcaster_id list (as of April 25th, 2007)

broadcaster_id	Contracted broadcasting companies
0x01	Not assigned
0x02	Not assigned
0x03	Not assigned
0x04	Multi Channel Entertainment Inc.
0x05	CS Kyushu Co. Ltd.
0x06	CS Eiga Housou Company
0x07	Hollywood Movies Company
0x08	ep Broadcasting Corporation
0x09	Not assigned
0x0A	CS-WOWOW Inc.
0x0B	CS One Ten, Ltd.
0x0C	Active! Sports
0x0D	InteracTV Co., Ltd.
0x0E	Hankyu Corporation
0x0F	Not assigned
0x10	Satellite Service
0x11	C-TBS, Incorporated
0x12	CS Nippon Corporation

8.2.4 Logo ID list

The logo IDs are assigned to each operator. Basically, the 12-slot operator is assigned 6 logo IDs, the 24-slot operator is assigned 8 IDs, the 36-slot operator is assigned 10 IDs, the 48-slot operator is assigned 11 IDs, the 72-slot operator is assigned 15 IDs, and the 108-slot operator is assigned 18 IDs according to their authorization.

The network log ID shall be “FFFxh” and “x” shall be the network ID number.

Table 8.2.4 Broadband CS digital broadcasting logo ID list (as of April 25th, 2007)

Logo ID	Contracted broadcasting companies
000h to 007h	Multi Channel Entertainment Inc.
008h to 00Dh	Multi Channel Entertainment Inc.
00Eh to 013h	Not assigned
014h to 01Dh	Multi Channel Entertainment Inc.
01Eh to 023h	CS Kyushu Co. Ltd.
024h to 02Bh	CS Eiga Housou Company
02Ch to 033h	Hollywood Movies Company
034h to 03Bh	ep Broadcasting Corporation
03Ch to 043h	Not assigned
044h to 049h	CS-WOWOW Inc.
04Fh to 059h	CS One Ten, Ltd.
05Ah to 064h	Active! Sports
065h to 073h	InteracTV Co., Ltd.
074h to 079h	Hankyu Corporation
07Ah to 07Fh	Not assigned
080h to 08Ah	Satellite Service
08Bh to 095h	C-TBS, Incorporated
096h to 0A0h	CS Nippon Corporation
1F6h, 1F7h	SKY Perfect Communications Inc.

Note: Although the network log ID is “FFFxh” (where, “x” is the network ID number), the lower 9 bits are shown in the table, and it is “1Fxh”.

8.3 One-touch buttons

If the one-touch button function is implemented for single-touch tuning, the recommended button assignment examples given below should be used. However, the implementation of this function is the product planning matter.

Table 8.3.1(1) Network A one-touch button list (at instant of April 25th, 2007)

Button	service_id	Commissioned broadcaster
1	001	Multi Channel Entertainment Inc. (Promotion Channel)
2		
3		
4		
5	055	ep Broadcasting Corporation
6		
7		
8		
9	091	CS-WOWOW Inc.

Table 8.3.1(2) Network B one-touch button list (at instant of April 25th, 2007)

Button	service_id	Commissioned broadcaster
1	100	Multi Channel Entertainment Inc. (Promotion Channel)
2	110	CS One Ten, Ltd.
3	123	CS Eiga Housou Company
4	300	CS Nippon Corporation
5	250	Active! Sports
6	160	C-TBS, Incorporated
7	177	InteracTV Company
8	302	Satellite Service Company
9	194	CS Kyushu Co. Ltd.
10	101	Hankyu Corporation
11		
12		

Note: The recommended service ID of Hollywood Movies Company will be assigned button 12 of Network B in the future.

(This page is intentionally left blank.)

Volume 8

Contents Protection Rules for BS and Broadband CS Dual-Purpose Digital Broadcasting Receivers

Contents

(This page is intentionally left blank.)

1 Introduction

The broadband CS digital broadcasting contents are protected based on the rules defined in Volume 8 of Part 1 in this Guide, Volumes 1 to 7 of Part 2 of this Guide, and the “Service Information for Digital Broadcasting System Standard” (ARIB STD-B10) and “Receiver for Digital Broadcasting Standard” (ARIB STD-B21) defined by the Association of Radio Industries and Businesses (hereinafter, referred to as ARIB). However, to actually utilize the standards, it is necessary to specify detailed operations separately. Also, any discrepancy in interpretation of contents protection functions is not allowed between the broadcast operators and receiver manufacturers. Thus, this document, “Contents Protection Rules for BS and Broadcast CS Dual-Purpose Digital Broadcasting Receivers” has been drawn out.

The CS digital broadcasters shall comply with the broadcast transmission operation rules defined in this Guide.

The receiver manufacturers shall comply with the rules defined in this Volume, and protect the contents during various outputs for transmission signal recording and display and during their storage. Also, adequate attention should be paid not to cause a malfunction and other problems due to the undefined signals and others.

2 Related Documents

Same as Part 1.

3 Scope

This Guide applies the signal transmission standards, the receiver specifications, and the function implementation standards of receivers that relate to the contents protection functions of the BS and broadband CS dual-purpose digital broadcasting receivers.

4 Definitions

Same as Part 1.

5 Broadcast Operation Rules

Same as Part 1.

6 Functional Requirements of Receivers

Same as Part 1.

7 Function Implementation Standards of Receivers

Same as Part 1.

8 Description

Same as Part 1.

9 Application Renewal Period of Receivers

Same as Part 1.

Appendix A Recording Formats and Contents Protection Qualification Standards for Recording

Same as Part 1.

Appendix B Contents Protection Method for Removable Recording Media that Can be Mounted on the Applicable Receivers

Same as Part 1.

OPERATIONAL GUIDELINES FOR DIGITAL SATELLITE BROADCASTING

ARIB TECHNICAL REPORT

ARIB TR-B15 Version 4.1-E1
(Fascicle 4)
(September 26, 2007)

This Document is based on ARIB technical report of “Operational Guidelines for Digital Satellite Broadcasting” in Japanese edition and translated into English in December 2007

Published by

Association of Radio Industries and Businesses

Nittochi Bldg. 11F
1-4-1 Kasumigaseki Chiyoda-ku, Tokyo 100-0013, Japan
TEL 81-3-5510-8590
FAX 81-3-3592-1103

Printed in Japan