
# TA Document 2000001
# AV/C Disc Media Specification - DVD

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**Abstract:**
This document describes the DVD media-specific part of the Disc General Subunit Specification

**Keywords:**
Disc Subunit, AV/C, DVD.

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Editor, 1394 Trade Association
Regency Plaza Suite 350
2350 Mission College Blvd.
Santa Clara, Calif. 95054, USA

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# 1 Overview

## 1.1 Purpose

This document describes the DVD media-specific specification for the AV/C Disc Subunit General Specification and should be used in conjunction with [R1] AV/C Disc Subunit General Specification, version 1.0.

## 1.2 Scope

This proposal describes the specification of the parameters to be used with the DVD specification and also the items specific to DVD.

# 2 References

## 2.1 Related Specifications

[R1] AV/C Disc Subunit General Specification, version 1.0 (TA Document 1998013)

[R2] AV/C Digital Interface Command Set General Specification Version 3.0 (TA Document 1998003)

[R3] Enhancements to the AV/C General Specification 3.0, Version 1.0 (TA Document 1998010)

[R4] AV/C Disc Media Type Specification – CD-DA, Version 1.0 (TA Document 1999002)

# 3 Definitions

## 3.1 Conformance levels

**3.1.1 expected:** A key word used to describe the behavior of the hardware or software in the design models *assumed* by this Specification. Other hardware and software design models may also be implemented.

**3.1.2 may:** A key word that indicates flexibility of choice with *no implied preference*.

**3.1.3 shall:** A key word indicating a mandatory requirement. Designers are *required* to implement all such mandatory requirements.

**3.1.4 should:** A key word indicating flexibility of choice with a strongly preferred alternative. Equivalent to the phrase *is recommended*.

**3.1.5 reserved fields:** A set of bits within a data structure that are defined in this specification as reserved, and are not otherwise used. Implementations of this specification shall zero these fields. Future revisions of this specification, however, may define their usage.

**3.1.6 reserved values:** A set of values for a field that are defined in this specification as reserved, and are not otherwise used. Implementations of this specification shall not generate these values for the field. Future revisions of this specification, however, may define their usage.

NOTE– IEEE is investigating whether the "may, shall, should" and possibly "expected" terms will be formally defined by IEEE. If and when this occurs, draft editors should obtain their conformance definitions from the latest IEEE style document.

## 3.2 Glossary of terms

**3.2.1 byte:** Eight bits of data, used as a synonym for octet.

**3.2.2 CSR Architecture:** A convenient abbreviation of the following reference (see clause 2): ISO/IEC 13213 : 1994 [ANSI/IEEE Std 1212, 1994 Edition], Information Technology—Microprocessor systems—Control and Status Register (CSR) Architecture for Microcomputer Buses.

**3.2.3 quadlet:** Four bytes of data.

## 3.3 Acronyms and abbreviations

AV/C Audio Video Control

# 4 The DVD Disc Subunit Identifier Descriptor

The DVD uses the Disc Subunit Identifier, as defined in [R1], AV/C Disc Subunit General Specification, version 1.0.

The DVD-specific items for the Subunit Identifier Descriptor are shown below:

## 4.1 Size of list ID, object ID and object position

The size value of list ID, object ID, and object position shall be as follows.

**Table 4.1 – Size Values**

| field name | value |
|---|---|
| size of list ID | $02_{16}$ |
| size of object ID | $00_{16}$ |
| size of object position | $02_{16}$ |

## 4.2 DVD-specific media_type information

The DVD *supported_media_type* information is shown below:

**Table 4.2 – DVD supported_media_type**

| supported_media_type (MSB) | value | supported_media_type (LSB) | value |
|---|---|---|---|
| DVD | $09_{16}$ | DVD-Audio | $01_{16}$ |
| | | DVD-Video | $02_{16}$ |
| | | reserved | All others |

These details shall be added to the relevant table in the AV/C Disc Subunit General Specification [R1] at its next update.

The DVD *type_dependent_information* field in the DVD-specific media_type information contains information that is specific to the DVD *media_type*.

| Address Offset | msb | | | | | | | lsb |
|---|---|---|---|---|---|---|---|---|

DVD type-dependent information

| | |
|---|---|
| $00_{16}$ | DVD_media_spec_version |
| $01_{16}$ | $FF_{16}$ |

**Figure 4.1 – DVD type_dependent information**

The *DVD_media_spec_version* field indicates the version number of DVD medium type specification that this disc subunit conforms to. The upper 4 bits shows the major version number, and lower 4 bits shows the minor version number:

 

**Table 4.3 – DVD_media_spec_version**

| DVD_Media_spec_version | meaning |
|---|---|
| $10_{16}$ | Version 1.0 of the DVD specification |
| all others | Reserved for future specification |

## 4.3 Other Subunit Identifier information

This DVD-specific specification is used in conjunction with the Disc Subunit General specification [R1]. The *disc_subunit_version* indicates which version of the Disc Subunit specification this unit implements. For this version, it shall be set to $10_{16}$.

The generation_ID shall be set to $01_{16}$ to indicate that devices implementing this specification conform to [R3], Enhancements to the AV/C General Specification 3.0, Version 1.0. However, this specification also contains some extra clarifications (see section 5.5) which may also conform to later versions of the AV/C General specifications.

## 4.4 Disc Subunit Identifier data and reading

The Disc Subunit Identifier and its data, as specified in [R1], is mandatory in all Profiles. The whole descriptor shall be read using a READ DESCRIPTOR command set to a *data_length* of $0000_{16}$ (read all), see [R2], AV/C Digital Interface Command Set General Specification Version 3.0.

# 5 The DVD Disc Subunit Status Descriptor

All profiles of the DVD player shall support at least the *general_disc_subunit_status_area_info_block*, which contains the *media_and_edit_status_info_block*. Information in these and other disc subunit info blocks is defined in [R1] AV/C Disc Subunit General Specification, version 1.0, [R3] Enhancements to the AV/C General Specification 3.0, Version 1.0 and [R4] AV/C Disc Media Type Specification – CD-DA, Version 1.0.

## 5.1 Disc Subunit Status Descriptor structure and data

The conceptual structure of the Disc Subunit Status Descriptor that can implement all data likely to be needed for Profile_ID $10_{16}$ (Single-deck player, not capable of recording or automatic control) is shown in Figure 5.1:

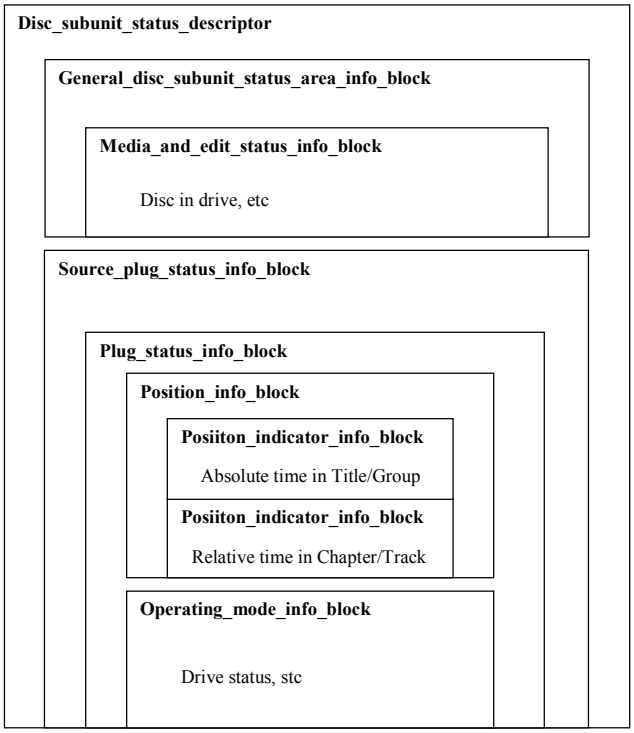


**Figure 5.1 – General Subunit Status Descriptor Structure**

Section 7, Profiles, specifies what information is mandatory for each Profile_ID.

## 5.2 media_and_edit_status info block

The media_and_edit_status_info_block contains details of the state of the disc in the drive and the current status of editing progress.

For an implementation conforming to Profile_ID $10_{16}$ (Single-deck player, not capable of recording or automatic control), only the *disc_in_drive* data bits (in the first byte of the primary fields) is mandatory. In this case, data contained in subsequent bytes is not mandatory and both the *compound_length* and *primary_fields_length* should reflect the actual length. The byte that contains the *disc_in_drive* bits also contains the optional *error_position* bits, which shall be set to 00b if not implemented. The remainder of the byte shall be filled with zeros.

## 5.3 Reporting DVD-Video and DVD-Audio Playing Position

A DVD-Video disc may contain several Titles. Often, one is the main movie Title, with other Titles providing associated data. Each Title may be sub-divided into Chapters.

A DVD-Audio disc may contain a number of Tracks and each Track may have Indexes. However, the Track may be part of a Group containing several such Tracks.

Position information shall be reported in two formats: time within the current Title or Group (using the *absolute_HMSF* count) and time within the current Chapter or Track (using the *relative_segment_HMSF* count).

### 5.3.1 position_info_block

The *position_info_block* contains a *descriptor_reference* which identifies the current Title or Group. These items are identified by their respective *list_ID*'s: the mapping of Title number and Group number to the relevant *list_ID* is shown in Table 5.1:

**Table 5.1 – Mapping of list_ID's for Titles and Groups**

| list_ID number | mapping |
|---|---|
| *List_ID* number (for DVD-Video Titles) | (DVD-Video Title Number) + $100F_{16}$ |
| *List_ID* number (for DVD-Audio Groups) | (DVD-Audio Group Number) + $1000_{16}$ |

For further details of *list_ID*'s, see 6.1, List ID Assignment.

### 5.3.2 position_indicator_info_blocks

The position info block shall contain two *position_indicator_info_blocks,* which report time in the two formats mentioned above. The info block using the *absolute_HMSF* format shall precede the info block using the *relative_segement_HMSF* format – see Figure 5.1 above.

When reporting time within the Title or Group, the *position_indicator_info_block* uses an *indicator_type* of $02_{16}$ (*absolute_HMSF* format) and contains Hours:Minutes:Seconds:Frame data, as described in [R1].

The second *position_indicator_info_block* uses an *indicator_type* of $08_{16}$ (*relative_segment_HMSF* format) to report time within the currently playing Chapter or Track, as described in [R4].

The mapping of DVD items to AV/C status data is shown in Table 5.2:

**Table 5.2 – Reporting of DVD-Video and DVD-Audio playing position**

| DVD-Video | DVD-Audio | AV/C Status name |
|---|---|---|
| Title | Group | Mapped to descriptor_reference (list_ID) |
| Chapter | Track | Mapped to object_position_number |
| - | Index | Mapped to segment number |
| Time HMSF | Time HMSF | Time HMSF |

The relationship of DVD items to *object_position_number* and *segment_number* is shown in Table 5.3:

**Table 5.3 – Mapping of *object_position_number* and *segment_number* to DVD items**

| AV/C Status item | DVD-Video or DVD-Audio item |
|---|---|
| *Object_position_number* (for DVD-Video Chapters) | (DVD-Video Chapter Number) - 1 |
| *Object_position_number* (for DVD-Audio Tracks) | (DVD-Audio Track Number) - 1 |
| *Segment_number* (for DVD-Video Indexes) | $FF_{16}$ |
| *Segment_number* (for DVD-Audio Indexes) | (DVD-Audio Index Number) - 1 |

For further details of *list_ID*'s, see 6.1, List ID Assignment.

In both info blocks, time is reported in Hours:Minutes:Seconds:Frames (HMSF) format. Support for Frames is optional and this byte shall be filled with $FF_{16}$ if Frames are not implemented.

## 5.4 DVD SEARCH and SKIP functions

In the *operating_mode_info_block*, the DVD SEARCH function shall be reported as the AV/C PLAY status response, with a *speed* faster than *normal*. For further details, see [R1].

The DVD SKIP function shall be reported as the AV/C SEARCH status response. The *search_type* shall be fixed to $00_{16}$ (relative_unit) to model the actual behaviour of the SKIP function. For further details, see [R1].

## 5.5 Reading the Disc Subunit Status Descriptor

When reading specific data, a controller shall read the whole of the info block which contains that data, using the READ INFO BLOCK command with a *data_length* of $0000_{16}$ (read all), see [R3] Enhancements to the AV/C General Specification 3.0, Version 1.0. For example, when reading the *disc_in_drive* data, the whole of the *media_and_edit_status_info_block* shall be read. However, info blocks which contain only optional data need not be implemented (see section 7 Profiles). If these info blocks have not been implemented, requests to read these info blocks shall reply with the REJECTED response.

As a minimum, info blocks shall be specified by an info block reference path using a *descriptor_specifier_type* of $30_{16}$ (*info_block_reference_by_type_and_instance_count*) throughout the whole path. Details of the path structure is shown in Figure 5.1 above. Attempts to read info blocks by other methods shall return NOT IMPLEMENTED if they have not been implemented in addition to the above method.

When reading position information, a controller shall read the *position_info_block* so that position information in both formats can be read at the same time.

 

# 6 Object Lists

## 6.1 List ID Assignment

The Root Contents List has a *list_ID* of $1000_{16}$.

A DVD-Video disc identifies the current Title that is playing using the Title *list_ID* (see 5.3, Reporting DVD-Video and DVD-Audio Playing Position). Titles are assigned *list_ID*'s in the range $1010_{16}$ - $1074_{16}$.

A DVD-Audio identifies the Group that contains the current Track with a Group *list_ID* (see 5.3). Group *list_ID*'s are in the range $1001_{16}$ - $1009_{16}$.

The list assignment for Profile_ID $10_{16}$ (Single-deck player, not capable of recording or automatic control) is shown below:

**Table 6.1 – List_ID Assignment**

| List type | List_ID |
|---|---|
| root_contents_list | $1000_{16}$ |
| Group (for DVD-Audio) | $1001_{16}$ - $1009_{16}$ |
| Title (for DVD-Video) | $1010_{16}$ - $1074_{16}$ |
| Reserved | All others |

Other *list_id'*s will be defined for other Profiles.

## 6.2 Root Contents List

*media_type* shall indicate the type of content on the disc currently in the player:

**Table 6.2 – DVD media_type**

| media_type (MSB) | value | media_type (LSB) | value |
|---|---|---|---|
| DVD | $09_{16}$ | DVD-Audio | $01_{16}$ |
| | | DVD-Video | $02_{16}$ |
| | | other | $0E_{16}$ |
| | | reserved | all others |

These details shall be added to the relevant table in the AV/C Disc Subunit Specification [R1] when it is next updated. For other types of disc, see the relevant media-specific specification.

Other data, such as object-specific data, is not required for a player supporting Profile_ID $10_{16}$ (Single-deck player, not capable of recording or automatic control).

## 6.3 Time Stamp Info Block

The Root Contents List Descriptor contains a Time Stamp info block, which is defined in [R3].

For a DVD conforming to Profile_ID $10_{16}$ (Single-deck player, not capable of recording or automatic control), the *stamp_type* bit shall be set to 1. This indicates that the following time stamp data does not contain a time, but a Counter which is incremented every time a disc is inserted into the player.

The counter shall at least implement the "Minutes" field (as it's MSB) and the "Seconds" field (as it's LSB) of the *time_stamp_data*. In order to support this, the info block shall have an *info_block_type* of $00\ 06_{16}$ (*descriptor_creation_date_and_time*). Remaining fields (hours, day, month, year (LSB) and year (MSB) ) shall be set to zero if they are not used.

## 6.4 AV Object Type-Specific Capacity Info Block

The AV_Object_Type-Specific_Capacity Info Block reports the total playing time of a disc. It is defined in [R1].

For this application, the *capacity_format_indicator* shall be set to $00_{16}$ (time in HMSF format). Data for this shall be in BCD format, with two bytes used for hours (giving up to 9999 hours). One byte shall be used for each of Minutes, Seconds and Frames, see Table 6.3:

**Table 6.3 – Data format for Disc Capacities**

| Offset | HMSF Data | |
|---|---|---|
| 00 00 | Hours (thousands) | Hours (hundreds) |
| 00 01 | Hours (tens) | Hours (units) |
| 00 02 | Minutes (MSB) | Minutes (LSB) |
| 00 03 | Seconds (MSB) | Seconds (MSB) |
| 00 04 | Frames (MSB) | Frames (LSB) |

If the number of Hours is 99 or less, then the thousands and hundreds nibbles shall be set to zero.

Currently, the Frames byte shall be set to $FF_{16}$.

The *AV_Object_total_playback_time* is set to the total time recorded on the disc. For a read-only disc, the *AV_Object_maximum_recording_capacity* and the *AV_Object_remaining_recording_capacity* shall be set to zero. The Disc General specification defines these lengths as 2 bytes.

 

## 6.5 Root Contents List structure and support level

All Profiles shall implement the basic Root Contents List structure. This includes the *disc_subunit_list_attributes*, *media_type*, *disc_recordable_information*, *time_stamp_info_block* and *default_playlist_info_block*, as defined in [R1].

Section 7, Profiles, specifies what information is mandatory for each Profile_ID.

For a player conforming to Profile_ID $10_{16}$ (Single-deck player, not capable of recording or automatic control), the *default_playlist_info_block* shall specify the *root_contents_list*.

## 6.6 Reading the Root Contents List

The root contents list shall be read using the READ DESCRIPTOR command using one read command, see [R2], AV/C Digital Interface Command Set General Specification Version 3.0. If the controller is expecting to be reading from a DVD player conforming to Profile_ID $10_{16}$, it is not recommended for that controller to read the complete root contents list. This is because some implementations could hold much data in the root contents list. For this reason, a controller which is expecting to read from a DVD player implementing Profile_ID $10_{16}$ should read the first 33 bytes of information using *data_length* = $21_{16}$, *address* = 00 $00_{16}$. This includes all data up to and including the *default_playlist_info_block*.

Controllers capable of working with DVD players conforming to other Profile_ID's should first check the length of the root contents list (e.g. by reading the first 33 bytes as above).

# 7 Profiles

DVD players may be implemented with different levels of functionality. Profiles identify what are the minimum mandatory items in each Profile.

All Profiles shall implement the Subunit Identifier Descriptor.

The Disc Subunit Status descriptor structure, as detailed below in Table 7.1 and in section 5.1 shall be implemented in all Profiles.

All Profiles shall implement the basic Root Contents List structure, as described in section 6.5.

Table 7.1 shows the minimum mandatory support level for descriptor structures, their data and the relevant command support for each Profile.

**Table 7.1 – Profiles**

| Implementation _Profile_ID | meaning |
|---|---|
| $10_{16}$ | **Single-deck player, not capable of recording or automatic control:** |
| | **1) Subunit identifier descriptor**<br>**2) Disc subunit status descriptor (see 5.1)**<br>Disc_in_Drive, contained in the media_and_edit_status_info_block;<br>**3) Root Contents List (see 6.5)**<br>Media_type;<br>Time Stamp Info Block (implemented as a Counter);<br>Default Play List Info Block, set to the root_contents_list;<br>**4) Command Support**<br>OPEN DESCRIPTOR;<br>READ DESCRIPTOR;<br>READ INFO BLOCK. |
| All Others | **Reserved** |

 

# 8 DVD Implementation Guidelines document (informative)

Further details of a DVD implementation can found in the DVD Guidelines document, "Guideline of Transmission and Control for DVD-Video / Audio through IEEE1394 bus". This document also contains many examples.

The document can be obtained from the DVD Forum.