Universal Serial Bus Device Class Definition for Video Media Transport Terminal

Revision 1.5

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Revision History

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1.1	June 1st, 2005	Applied RR058. Modified sections 4.1.3.1 Transport Control and 4.1.3.1.1 Playback Modes for clarification.
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1 Introduction

1.1 Purpose

This document describes in detail the characteristics of the Media Transport Terminal supported by the Video Device Class, and is considered an integral part of the *Video Device Class Specification.* However, subsequent revisions of this document are independent of the revision evolution of the main *Video Device Class Specification,* which easily accommodates modifications to the Media Transport Terminal behavior independent of the base specification.

1.2 Scope

The definition of Media Transport Terminal applies to all devices or functions within composite devices that incorporate sequential media transport functionality. This would include media transport-based devices such as video camera recorders and digital VCR decks.

1.3 Related Documents

USB Specification Revision 3.0, November 12, 2008, www.usb.org
USB Specification Revision 2.0, April 27, 2000, www.usb.org
USB Device Class Definition for Audio Devices, Version 1.0, March 18, 1998, www.usb.org
USB Device Class Definition for Video Devices, www.usb.org
HD Digital VCR Conference, Specifications of Consumer-Use Digital VCRs using 6.3 mm magnetic tape, December 1995
IEC-61834, Recording – Helical-Scan Digital Video Cassette Recording System Using 6,35 mm Magnetic Tape for Consumer Use, August 1998

1.4 Terms and Abbreviations

Term	Description
ATN	Absolute Track Number. A sequential reference number recorded as part of each track of a DVCR cassette. Within the context of a single, uninterrupted recording session, these reference numbers are monotonically increasing and, in that sense, are *absolute track number*s. However, if the medium has been recorded at different times, there may be gaps between different recorded areas, and there is no guarantee of relationship between the absolute track numbers in one area and those in another.
DVCR	Digital video cassette recorder as defined by the HD Digital VCR Conference, Specifications of Consumer-Use Digital VCRs using 6.3 mm magnetic tape.

2 Functional Characteristics

2.1 Media Transport Terminal

The Media Transport Terminal is an Input or Output Terminal with a Sequential Media Terminal type. These terminals control mechanical characteristics of the Media Transport feature of the device. This feature is only applicable to devices that provide sequential-media-transport functionality, such as video camera recorders and digital VCR decks. The Media Transport Input Terminal has a single output pin, and the Media Transport Output Terminal has a single input pin.

A Media Transport Input Terminal can stream data stored in sequential media to the host, thus functioning as a data source. A Media Transport Output Terminal can record data streamed from the host onto the media, thus functioning as a data sink.

A digital-video camera-recorder device with a media transport feature that supports bi-directional data flow (playback from and recording to sequential media) will thus have a Media Transport Input and Output Terminal pair in its device topology. This terminal pair will be correlated via the **bAssocTerminal** field in the terminal descriptor, reflecting the fact that these two terminals correspond to a single physical entity capable of bi-directional data flow.

The Media Transport Terminal provides optional support for functionality like Play, Record and Wind. For an input stream from a Media Transport Input Terminal to the host, the terminal will have the following functions:

- Play
- Wind

These functions can control various modes such as Play with reverse, Wind with fast forward, and so on.

For an output stream from the host to a Media Transport Output Terminal, the terminal will have the following function:

- Record

The Media Transport Terminal will also have functions to retrieve the status of the transport:

- Absolute Track Number Information
- Media Information
- Time Code Information
- Transport State Information

In addition, the terminal can control the function to eject media from the device:

- Eject

The symbol for the Media Transport Input Terminal is depicted in the following figure.

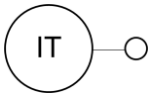

Figure 2-1 Input Terminal Icon

The symbol for the Media Transport Output Terminal is depicted in the following figure.

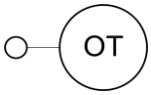

Figure 2-2 Output Terminal Icon

3 Descriptors

3.1 Media Transport Input Terminal Descriptor

The Media Transport Input Terminal is uniquely identified by the value in the **bTerminalID** field. No other Unit or Terminal within the same alternate setting of the VideoControl interface may have the same ID. This value must be passed in the **bTerminalID** field of each request that is directed to the Terminal.

The **wTerminalType** field provides pertinent information about the physical entity that the Input Terminal represents. For the Media Transport Input Terminal, this field should be set to the Sequential Media terminal type.

The **bAssocTerminal** field is used to associate an Output Terminal to this Input Terminal, effectively implementing a bi-directional Terminal pair. In almost all cases, the device would report a Media Transport Input and Output Terminal pair, where the terminals are associated with each other. An index to a string descriptor is provided to further describe the Media Transport Input Terminal. The value 0x00 is used to indicate that there is no Output Terminal associated with this Input Terminal.

The **bmControls field** is a bit-map that indicates the availability of certain Media Transport terminal controls. For future expandability, the number of bytes occupied by the **bmControls** field is indicated in the **bControlSize** field.

The **bTransportModeSize** and **bmTransportModes** fields are valid only if Transport Control is supported as indicated by the **bmControls** field. The **bmTransportModes field** is a bit-map that indicates the transport modes supported by the SET_CUR Transport control. For future expandability, the number of bytes occupied by the **bmTransportModes** field is indicated in the **bTransportModeSize** field.

The layout of the Media Transport Input Terminal descriptor is detailed in the following table.

Table 3-1 Media Transport Input Terminal Descriptor

Offset	Field	Size	Value	Description
0	**bLength**	1	Number	Size of this descriptor, in bytes: 10 + n + m
1	**bDescriptorType**	1	Constant	CS_INTERFACE descriptor type
2	**bDescriptorSubtype**	1	Constant	VC_INPUT_TERMINAL descriptor subtype
3	**bTerminalID**	1	Constant	Constant uniquely identifying the Terminal within the video function. This value is used in all requests to address this Terminal.
4	**wTerminalType**	2	Constant	ITT_MEDIA_TRANSPORT_INPUT
6	**bAssocTerminal**	1	Constant	ID of the Output Terminal to which this Input Terminal is associated.
7	**iTerminal**	1	Index	Index of a string descriptor, describing the Input Terminal.

8	**bControlSize**	1	Number	Size of the **bmControls** field, in bytes: n
9	**bmControls**	n	Bitmap	A bit set to 1 indicates that the mentioned Control is supported for the video stream. D0: Transport Control D1: Absolute Track Number Control D2: Media Information D3: Time Code Information D4...(n*8-1): Reserved
9+n	**bTransportModeSize**	1	Number	Size of the **bmTransportModes** field, in bytes: m
10+n	**bmTransportModes**	m	Bitmap	A bit set to 1 indicates that the mentioned Transport mode is supported. D0: Play Forward D1: Pause D2: Rewind D3: Fast Forward D4: High Speed Rewind D5: Stop D6: Eject D7: Play Next Frame D8: Play Slowest Forward D9: Play Slow Forward 4 D10: Play Slow Forward 3 D11: Play Slow Forward 2 D12: Play Slow Forward 1 D13: Play X1 D14: Play Fast Forward 1 D15: Play Fast Forward 2 D16: Play Fast Forward 3 D17: Play Fast Forward 4 D18: Play Fastest Forward D19: Play Previous Frame D20: Play Slowest Reverse D21: Play Slow Reverse 4 D22: Play Slow Reverse 3 D23: Play Slow Reverse 2 D24: Play Slow Reverse 1 D25: Play X1 Reverse D26: Play Fast Reverse 1 D27: Play Fast Reverse 2 D28: Play Fast Reverse 3 D29: Play Fast Reverse 4 D30: Play Fastest Reverse D31: Record StateStart

				D32: Record Pause D33: Reverse Pause D34..(m*8-1): Reserved

3.2 Media Transport Output Terminal Descriptor

The Media Transport Output Terminal is uniquely identified by the value in the **bTerminalID** field. No other Unit or Terminal within the same alternate setting of the VideoControl interface may have the same ID. This value must be passed in the **UnitID** field of each request that is directed to the Terminal.

The **wTerminalType** field provides pertinent information about the physical entity that the Output Terminal represents. For the Media Transport Output Terminal, this field should be set to the Sequential Media terminal type.

The **bAssocTerminal** field is used to associate an Input Terminal to this Output Terminal, effectively implementing a bi-directional Terminal pair. In almost all cases, the device would report a Media Transport Input and Output Terminal pair, where the terminals are associated with each other. An index to a string descriptor is provided to further describe the Media Transport Input Terminal. The value 0x00 is used to indicate that there is no Input Terminal associated with this Output Terminal.

The **bSourceID** field is used to describe the connectivity for this Terminal. It contains the ID of the Unit or Terminal to which this Output Terminal is connected via its Input Pin.
An index to a string descriptor is provided to further describe the Output Terminal.
The **bmControls** field is a bitmap, indicating the availability of certain Media Transport terminal controls. For future expandability, the number of bytes occupied by the **bmControls** field is indicated in the **bControlSize** field.

The **bTransportModeSize** and **bmTransportModes** fields are valid only if Transport Control is supported as indicated by the **bmControls** field. The **bmTransportModes** field is a bitmap, indicating the transport modes supported by the SET_CUR Transport control. For future expandability, the number of bytes occupied by the **bmTransportModes** field is indicated in the **bTransportModeSize** field.

The following table presents an outline of the Media Transport Output Terminal descriptor.

Table 3-2 Media Transport Output Terminal Descriptor

Offset	Field	Size	Value	Description
0	**bLength**	1	Number	Size of this descriptor, in bytes: 11+ n + m
1	**bDescriptorType**	1	Constant	CS_INTERFACE descriptor type
2	**bDescriptorSubtype**	1	Constant	VC_OUTPUT_TERMINAL descriptor subtype
3	**bTerminalID**	1	Constant	Constant uniquely identifying the Terminal

				within the video function. This value is used in all requests to address this Terminal.
4	**wTerminalType**	2	Constant	OTT_MEDIA_TRANSPORT_OUTPUT
6	**bAssocTerminal**	1	Constant	Constant, identifying the Input Terminal to which this Output Terminal is associated.
7	**bSourceID**	1	Constant	ID of the Unit or Terminal to which this Terminal is connected.
8	**iTerminal**	1	Index	Index of a string descriptor, describing the Output Terminal.
9	**bControlSize**	1	Number	Size of the **bmControls** field, in bytes: n
10	**bmControls**	n	Bitmap	A bit set to 1 indicates that the mentioned Control is supported for the video stream. D0: Transport Control D1: Absolute Track Number Control D2: Media Information D3: Time Code Information D4..(n*8-1): Reserved
10+n	**bTransportModeSize**	1	Number	Size of the **bmTransportModes** field, in bytes: m.
11+n	**bmTransportModes**	m	Bitmap	A bit set to 1 indicates that the mentioned Transport mode is supported. D0: Play Forward D1: Pause D2: Rewind D3: Fast Forward D4: High Speed Rewind D5: Stop D6: Eject D7: Play Next Frame D8: Play Slowest Forward D9: Play Slow Forward 4 D10: Play Slow Forward 3 D11: Play Slow Forward 2 D12: Play Slow Forward 1 D13: Play X1 D14: Play Fast Forward 1 D15: Play Fast Forward 2 D16: Play Fast Forward 3 D17: Play Fast Forward 4 D18: Play Fastest Forward D19: Play Previous Frame D20: Play Slowest Reverse D21: Play Slow Reverse 4

				D22: Play Slow Reverse 3 D23: Play Slow Reverse 2 D24: Play Slow Reverse 1 D25: Play X1 Reverse D26: Play Fast Reverse 1 D27: Play Fast Reverse 2 D28: Play Fast Reverse 3 D29: Play Fast Reverse 4 D30: Play Fastest Reverse D31: Record StateStart D32: Record Pause D33: Reverse Pause D34..(m*8-1): Reserved

4 Requests

4.1 Media Transport Terminal Control Requests

The following sections describe the Set and Get Media Transport Terminal Control requests, which are used to manipulate the Controls within the Media Transport Input and Output Terminals.

4.1.1 Set Media Transport Terminal Control Request

This request is used to set an attribute of a Control inside a Media Transport Terminal of the video function.

Table 4-1 Set Request

bmRequestType	bRequest	wValue	wIndex	wLength	Data
00100001	SET_CUR	CS	Media Transport Terminal ID and Interface	Length of parameter block	Parameter block

The **bRequest** field indicates which attribute the request is manipulating. The MIN, MAX, and RES attributes are not supported for the Set request.

The **wValue** field specifies the Control Selector (CS) in the high byte and zero in the low byte. The Control Selector indicates which type of Control this request is manipulating. If the request specifies an unknown or unsupported CS for that terminal, the control pipe must indicate a stall.

The **wIndex** field specifies the interface to be addressed in the low byte, and the Media Transport Terminal ID in the high byte.

4.1.2 Get Media Transport Terminal Control Request

This request returns the attribute setting of a specific Control inside a Media Transport Terminal of the video function.

Table 4-2 Get Request

bmRequestType	bRequest	wValue	wIndex	wLength	Data
10100001	GET_CUR GET_INFO	CS	Media Transport Terminal ID and Interface	Length of parameter block	Parameter block

The **bRequest** field indicates which attribute that the request is reading. The MIN and MAX values are not supported for the Get request.

The **wValue** field specifies the Control Selector (CS) in the high byte and zero in the low byte. The Control Selector indicates which type of Control that this request is addressing. If the request specifies an unknown or unsupported CS for that terminal, the control pipe must indicate a stall.

The **wIndex** field specifies the interface to be addressed in the low byte, and the Media Transport Terminal ID in the high byte.

4.1.3 Media Transport Terminal Controls

The following paragraphs present a detailed description of all possible Controls that a Media Transport Terminal can incorporate. For each Control, the layout of the parameter block together with the appropriate Control Selector is listed for all forms of the Get and Set Media Transport Terminal Control request. All values are unsigned unless otherwise specified.

4.1.3.1 Transport Control

The Transport Control is used to control the transport mode of the media transport terminal. A GET_CUR request to this control will return the current transport mode. If the device implements this control, the device must support the Control Change interrupt event. If a SET_CUR request specifies an unsupported Transport Mode, the control pipe must indicate a STALL (see "USB Device Class definition for Video Devices" section 2.4.4).The GET_MAX, GET_MIN and GET_RES requests are not supported for this control selector.

In the following sections, if a SET_CUR cannot be executed, it shall result in a notification to the Host Software by using the Status Interrupt Endpoint (Control Failure Change mechanism, see "USB Device Class definition for Video Devices" section 2.4.2.2 and Figure 2-21 in section 2.4.4 "Control Transfer and Request Processing").

The format of the Transport State Mode values is defined by the following table.

Table 4-3 Transport Control

Control Selector		TRANSPORT_CONTROL		
Mandatory Requests		GET_CUR, GET_INFO		
Optional Requests		SET_CUR		
wLength		1		
Offset	Field	Size	Value	Description
0	**bTransportStatebTransportMode**	1	Number	The setting for the Transport State Mode attribute: Playback modes: 0x0 = Play Next Frame 0x1 = Play Slowest Forward 0x2 = Play Slow Forward 4 0x3 = Play Slow Forward 3

				0x4 = Play Slow Forward 2 0x5 = Play Slow Forward 1 0x6 = Play X1 0x7 = Play Fast Forward 1 0x8 = Play Fast Forward 2 0x9 = Play Fast Forward 3 0xA = Play Fast Forward 4 0xB = Play Fastest Forward 0xC = Play Previous Frame 0xD = Play Slowest Reverse 0xE = Play Slow Reverse 4 0xF = Play Slow Reverse 3 0x10 = Play Slow Reverse 2 0x11 = Play Slow Reverse 1 0x12 = Play X1 REVERSE 0x13 = Play Fast Reverse 1 0x14 = Play Fast Reverse 2 0x15 = Play Fast Reverse 3 0x16 = Play Fast Reverse 4 0x17 = Play Fastest Reverse 5 0x18 = Play Forward 0x19 = Pause 0x1A = Reverse Pause 0x1B-0x3F = Reserved <u>Rewind Modes:</u> 0x40 = Stop 0x41 = Fast Forward 0x42 = Rewind 0x43 = High Speed Rewind 0x44-4Fh = Reserved <u>Record Modes:</u> 0x50 = Record StateStart 0x51 = Record Pause 0x52-5Fh = Reserved <u>Eject Modes:</u> 0x60 = Eject 0x61-0x6F=Reserved <u>Status modes:</u> 0x70 = Play Unspecified Slow Forward 0x71 = Play Unspecified Fast Forward 0x72 = Play Unspecified Slow Reverse 0x73 = Play Unspecified Fast Reverse 0x74 = Stop Top 0x75 = Stop End

				0x76 = Stop Emergency 0x77 = Stop Condensation 0x78- 0x7E = Reserved 0x7F = Unspecified Status 0x80-0xFF = Reserved

4.1.3.1.1 Playback Modes

The Playback modes are used to command the media transport mechanism to play data previously recorded on the media. Playback modes are used with both SET_CUR and GET_CUR requests. If the request specifies an unsupported playback mode, the control pipe must indicate a stall.

The values of playback mode are defined by following table.

Table 4-4 Playback Mode

PlayBackMode	Value	Description
NEXT FRAME	0x00	Play the next sequential frame or field.
SLOWEST FORWARD	0x01	Play in the forward direction at a special-effect speed. Speed variations in forward playback are referred to as trick play modes. Actual speed of media control depends on device implementation. SLOWEST <= SLOW4 <= SLOW3 <= SLOW2 <= SLOW1 <= X1 X1 <= FAST1 <= FAST2 <= FAST3 <= FAST4 <= FASTEST
SLOW FORWARD4	0x02	Play forward direction at a special-effect speed. Speed variations in forward playback are referred to as trick play modes. Actual speed of media control depends on device implementation. SLOWEST <= SLOW4 <= SLOW3 <= SLOW2 <= SLOW1 <= X1 X1 <= FAST1 <= FAST2 <= FAST3 <= FAST4 <= FASTEST Play the previous sequential frame or field.
SLOW FORWARD3	0x03	
SLOW FORWARD2	0x04	
SLOW FORWARD1	0x05	
X1 FORWARD	0x06	
FAST FORWARD1	0x07	
FAST FORWARD2	0x08	
FAST FORWARD3	0x09	
FAST FORWARD4	0x0A	
FASTEST FORWARD	0x0B	
PREVIOUS FRAME	0x0C	
SLOWEST REVERSE	0x0D	Play in the reverse direction at a special-effect speed.

		Speed variations in reverse playback are referred as trick play modes. Actual speed of media control depends on device implementation. SLOWEST <= SLOW4 <= SLOW3 <= SLOW2 <= SLOW1 <= X1 X1 <= FAST1 <= FAST2 <= FAST3 <= FAST4 <= FASTEST
SLOW REVERSE4	0x0E	Play in the reverse direction at a special-effect speed. Speed variations in reverse playback are referred as trick play modes. Actual speed of media control depends on device implementation. SLOWEST <= SLOW4 <= SLOW3 <= SLOW2 <= SLOW1 <= X1 X1 <= FAST1 <= FAST2 <= FAST3 <= FAST4 <= FASTEST
SLOW REVERSE3	0x0F	
SLOW REVERSE2	0x10	
SLOW REVERSE1	0x11	
X1 REVERSE	0x12	
FAST REVERSE1	0x13	
FAST REVERSE2	0x14	
FAST REVERSE3	0x15	
FAST REVERSE4	0x16	
FASTEST REVERSE	0x17	
FORWARD	0x18	Play at normal speed.
PAUSE	0x19	Pause.
REVERSE PAUSE	0x1A	Reverse Pause. (This function will be the function which is the same as PAUSE in some device)

The requested playback command will be not executed under following conditions:

- If the sequential media reached the end of media, commands that initiate playback in a forward direction should be refused (NEXT FRAME, FORWARD, ** FORWARD*).
- If the sequential media is at the beginning of media, commands that initiate playback in a reverse direction should be refused (PREVIOUS FRAME, REVERSE, ** REVERSE*).
- If the sequential media is not loaded, all requests are refused.
- If there is a possible risk of transport damage, all requests should be refused.
- If there is an unsolicited condition of sequential media, all requests should be refused.

By transmitting a Transport Control GET_CUR request after a SET_CUR request of this control, the host software can discover whether a request was executed. For example, if host software issued a PLAY_FORWARD request to the Media Transport Terminal, but the sequential media had already reached the end and stopped, the request would not be executed. In that case, the host software would issue a Transport Control GET_CUR request, and by doing so would know that the request was refused.

4.1.3.1.2 Wind Modes

The Wind modes are used to control movement of the media in the transport mechanism. Wind modes are used with both SET_CUR and GET_CUR requests. Motion initiated by the Wind modes differs from motion initiated by the Play or Record modes in that the precise track position may be not be monitored.

High Speed Rewind moves the media toward the beginning of the media as quickly as possible. Motion initiated by that Rewind mode differs from motion initiated by the High-speed Rewind mode in that the media may be mounted on the tracking head. In Rewind mode, because the tracking head may be attached to the media, the device can detect the information that is recorded on the media. In the case of High-speed Rewind, the device cannot do that. The actual speeds of the Forward and Rewind modes are implementation dependent.

The requested command will be not executed under the following conditions:

- If the sequential media reached end of media, FORWARD commands should be refused.
- If the sequential media is at beginning of media, REWIND and High Speed Rewind should be refused.
- If the sequential media is not loaded, all requests are refused.
- If there is a possible risk of transport damage, all requests should be refused.
- If there is an unsolicited condition of the sequential media, all requests should be refused.

By transmitting a Transport Control GET_CUR request after a SET_CUR request of this control, the host software can discover whether a request was executed. For example, if the host software issued a FORWARD request to the Media Transport Terminal, but the sequential media had already reached the end and stopped, the request would not be executed. In that case, the host software would issue a Transport Control GET_CUR request, and by doing so would know that the request was refused.

4.1.3.1.3 Record Modes

The Record modes are used to command the media transport mechanism to record a signal on the sequential media.
Record modes are used with both SET_CUR and GET_CUR requests. If no media is loaded or a write-protected media is loaded, the device shall refuse the Record Control command and notify the host software by using the Status Interrupt endpoint.

The requested command will be not executed under following conditions:

- If the sequential media reached end of media, Record and Start commands should be refused.
- If the sequential media is not loaded, all commands are refused.

- If there is a possible risk of transport damage, all requests should be refused.
- If there is an unsolicited condition of the sequential media, all requests should be refused.

By transmitting a Transport Control GET_CUR request after a SET_CUR request of this control, the host software can discover whether a request was executed. For example, if the host software issued a RECORD_START request to the Media Transport Terminal, but the sequential media had already reached the end and stopped, the request would not be executed. In that case, the host software would issue a Transport Control GET_CUR request, and by doing so would know that the request was refused.

4.1.3.1.4 Eject Modes

The Eject mode is used to eject the sequential media from the media transport. Eject modes are used with both SET_CUR and GET_CUR requests. By transmitting Transport Control GET_CUR after an eject request, the host software can discover whether the tray of sequential media loaded can be opened. If the value of **bmEjectMode** is zero, it means that the tray was not opened. The device returns EJECT if the tray is open and returns STOP if the tray is closed.

4.1.3.1.5 Status Modes

The Status modes are used only with GET_CUR requests to indicate the current state of the Transport control and should not be used with the SET_CUR requests.

The values of status mode are defined by following table.

Table 4-5 Status Mode

Status Mode	Value	Description
PLAY UNSPECIFIED SLOW FORWARD	0x70	Slow forward play at vendor specific speed.
PLAY UNSPECIFIED FAST FORWARD	0x71	Fast forward play at vendor specific speed.
PLAY UNSPECIFIED SLOW REVERSE	0x72	Slow reverse play at vendor specific speed.
PLAY UNSPECIFIED FAST REVERSE	0x73	Fast reverse play at vendor specific speed.
STOP TOP	0x74	Stopped at the start of the media.
STOP END	0x75	Stopped at the end of the media.
STOP EMERGENCY	0x76	Stopped due to unexpected conditions.
STOP CONDENSATION	0x77	Stopped due to possible risk of transport damage.
UNSPECIFIED STATUS	0x7F	Unknown status.

4.1.3.2 Absolute Track Number (ATN) Control

The Absolute Track Number Information Control is used to get the absolute track number value for the current medium position, and to move the medium position for a specified absolute track number. The values of the Absolute Track Number Information mode are defined by the following table.

Table 4-6 Absolute Track Number Control

Control selector		ATN_INFORMATION_CONTROL		
Mandatory Requests		GET_CUR, GET_INFO		
Optional Requests		SET_CUR		
wLength		5		
Offset	Field	Size	Value	Description
0	**bmMediumType**	1	Bitmap	The media attribute setting: D0: No media present D1: 0=No information, 1=Available D2: DVCR media (1=YES) D3: Fail Bit (1=ATN control is failed) D4…D7: Reserved
1	**dwATN_Data**	4	Number	D0: Blank flag. If there is a recording area discontinuity (including non-recording areas) between the beginning of the media and the location specified by this absolute track number, this bit should be set to zero. If there is no discontinuity before this absolute track number, this bit should be set to one. D1..D23: Absolute Track Number. This is encoded as specified by the HD Digital VCR conference. D24..D31: Reserved

Note: The ATN Control also supports the SET_CUR request. The SET_CUR request asks the Media Transport Terminal to search for a specified absolute track number by using the **dwATN_Data** field on the medium. The ATN Control also requests that the Media Transport Terminal be paused in playback mode immediately after searching for the specified absolute track number on the medium.

4.1.3.3 Media Information Control

The Media Information control is used to request information about the media that is currently inserted. The values of the Media Information modes are defined by the following table.

Table 4-7 Media Information Control

Control Selector	MEDIA_INFORMATION_CONTROL
Mandatory Requests	GET_CUR, GET_INFO

wLength		2		
Offset	Field	Size	Value	Description
0	**bmMediaType**	1	Bitmap	The setting for the media type attribute: D0: DVCR Standard cassette D1: DVCR small cassette D2: DVCR medium cassette D3: No cassette present D4: Unknown cassette D5..D7: Reserved
1	**bmWriteProtect**	1	Bitmap	The setting for the write protect attribute: D0: Recording allowed (1 = YES) D1..D7: Reserved

4.1.3.4 Time Code Information Control

The Time Code Information is used to get the Time Code for the current medium position, and optionally to move the medium position to the location for a specified Time Code. The value of the Time Code Information control is defined in the following table.

Table 4-8 Time Code Information Control

Control Selector		TIME_CODE_INFORMATION_CONTROL		
Mandatory Requests		GET_CUR, GET_INFO		
Optional Requests		SET_CUR		
wLength		4		
Offset	Field	Size	Value	Description
0	**bcdFrame**	1	Number	The setting for the frame attribute
1	**bcdSecond**	1	Number	The setting for the second attribute
2	**bcdMinute**	1	Number	The setting for the minute attribute
3	**bcdHour**	1	Number	The setting for the hour attribute

Note: The Time Code Information control optionally supports the SET_CUR request. If supported, the SET_CUR request asks the Media Transport Terminal to position the sequential media to the location associated with the Time Code specified by the **bcdFrame**, **bcdSecond**, **bcdMinute**, and **bcdHour** parameters of the control. The search is relative to the time code at the current position within the sequential media. This specification does not define the outcome of a SET_CUR request in the event a time code discontinuity is encountered during the search, or in the event a non-existent time code is specified.

The **bcdFrame**, **bcdSecond**, **bcdMinute** and **bcdHour** values are all encoded in binary coded decimal (BCD) format where each nibble of a byte represents a decimal digit. This is represented in the following table.

Table 4-9 Structure of Time Code Values

Field	MSB							LSB
bFrame	BF (*)	Tens of frames			Units of frames			
bSecond	1	Tens of seconds			Units of seconds			
bMinute	1	Tens of minutes			Units of minutes			
bHour	1	1	Tens of hours		Units of hours			

(*) – If the BF (blank flag) bit is set, it indicates that there may be a discontinuity in the time code.

Appendix A. Control Selector Codes

A.1. Media Transport Terminal Control Selectors

Table A- 1 Media Transport Terminal Control Selector Codes

Control selector	Value
MTT_CONTROL_UNDEFINED	0x00
TRANSPORT_CONTROL	0x01
ATN_INFORMATION_CONTROL	0x02
MEDIA_INFORMATION_CONTROL	0x03
TIME_CODE_INFORMATION_CONTROL	0x04

Appendix B. Behavior of the ATN control with SET_CUR Request

Figure B- 1 illustrates the model of ATN control with SET_CUR request. The USB Logical Device Layer provides the function for performing generic USB operation with a device.

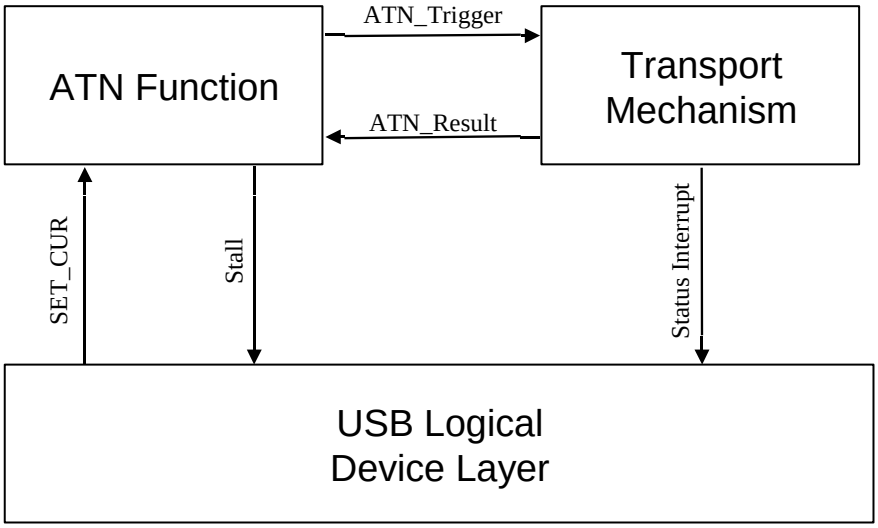

Figure B- 1 Model of ATN Control with SET_CUR Request

The ATN control SET_CUR request may issue from the host controller to the ATN Function layer through the USB Logical Device layer. This signal shall include an ATN value to specify the tape position. Result of the ATN control SET_CUR request, the ATN_Trigger is issued by the ATN Function layer to the Transport Mechanism. The ATN_Trigger also include an ATN value.

Because of ATN behavior, the ATN_Result signal is issued by Transport Mechanism to the ATN Function layer. The ATN_Result signal shall be COMPLETE value or FAIL value. If the ATN_Result signal with FAIL value is received by the ATN Function layer, the ATN Function layer issue a ATN control interrupt with the FAIL bit is set to one

Figure B- 2 outlines the state machine of Transport Mechanism for ATN control with SET_CUR request. The ATN behavior may start in any state S1

Transition T1: The ATN_Trigger is detected in any state shall transition to the Fast Forward (FF) state or the Rewind state S2. The status interrupt shall be issued to USB Logical Device Layer, and issued to the host.

Transition T2: Specified ATN is not found on the tape. The state is changed from S2 to Stop state S3. The status interrupt shall be issued to USB Logical Device Layer, and the ATN_Result

signal with FAIL value is issued to ATN Function Layer. Because of the FAIL value, the device shall issue a ATN control change interrupt with the FAIL bit is set to one.

Transition T3: Specified ATN is found out on the tape. The state is changed from S2 to Pause state S4. The status interrupt shall be issued to USB Logical Device Layer and issued to the host, and the ATN_Result signal with COMPLETE value is issued to ATN Function Layer.

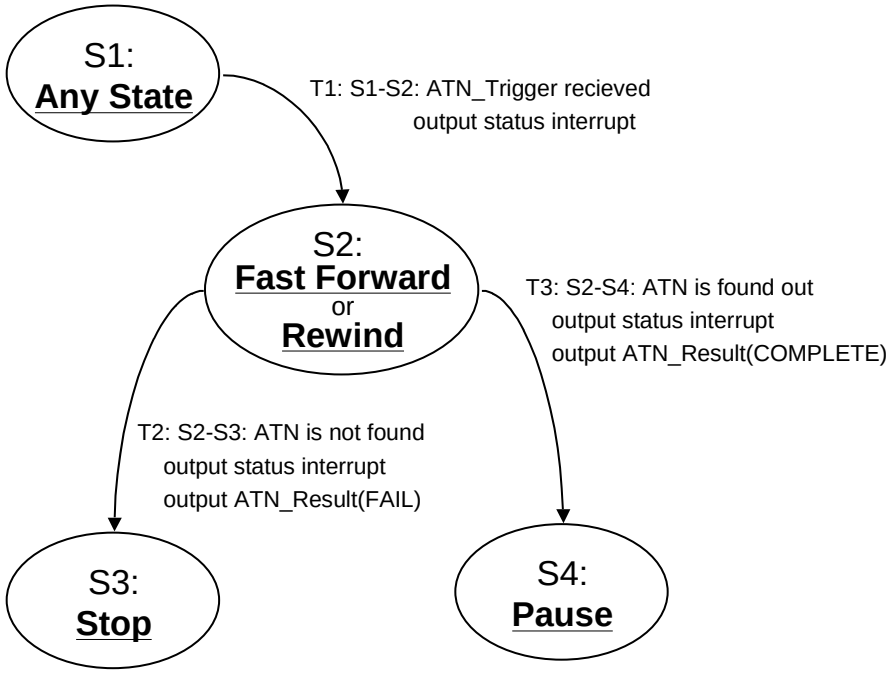

Figure B- 2 Transport Mechanism for ATN Control with SET_CUR Request

Figure B- 3 provides a chart of typical sequence for the ATN control with SET_CUR request in succeeded case. In this case, the Transport Mechanism found out the specified ATN on the tape after Fast Forward is worked. If the state of the Transport Mechanism is changed, the Status Interrupt is issued to the host controller, for example state is changed from Fast Forward to Pause.

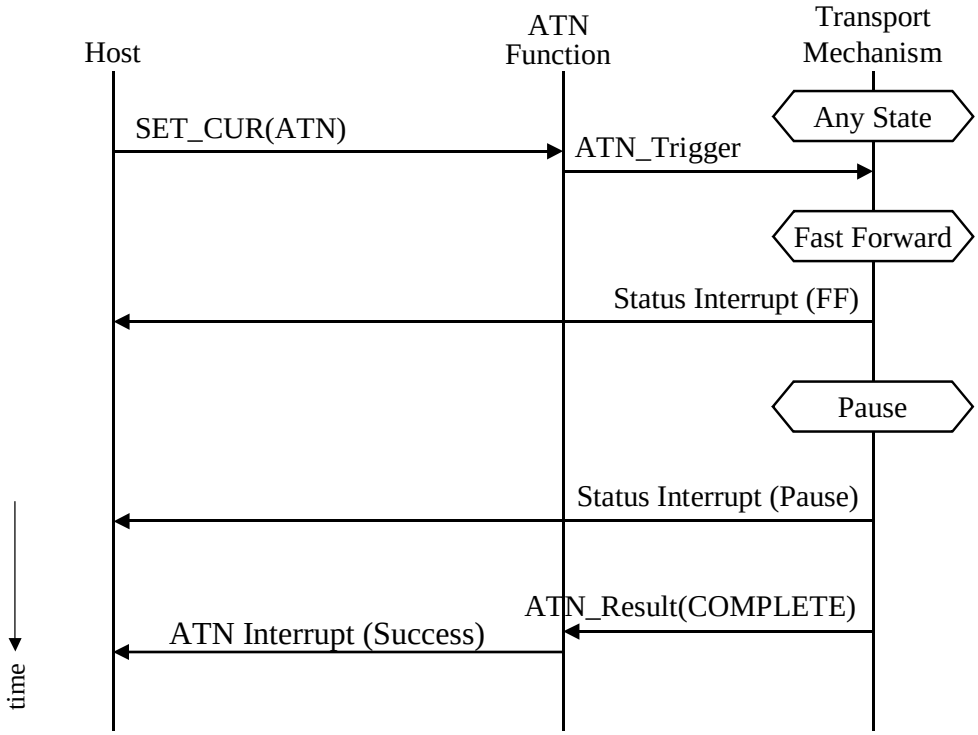

Figure B- 3 Typical Sequence for the ATN Control (Succeed Case)

Figure B- 4 provides a chart of typical sequence for the ATN control with SET_CUR request in fail case. In this case, the Transport Mechanism can not find the specified ATN on the tape after Fast Forward is worked. Result of that case, the Transport Mechanism issue the ATN_Result with FAIL value, and then a ATN control change interrupt with the FAIL bit is set to one is issued by the ATN Function layer to the host controller. If the state of the Transport Mechanism is changed, the Status Interrupt is issued to the host controller, for example state is changed from Fast Forward to Stop.

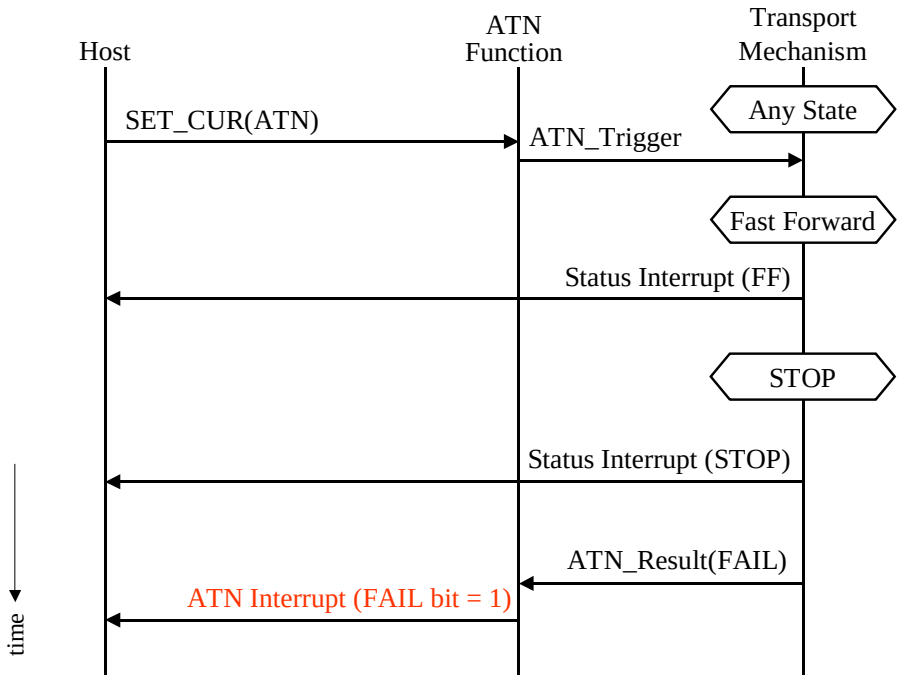

Figure B- 4 Typical Sequence for the ATN Control (Fail Case)