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TASCAM BD-MP4K

CONTROL I/O Terminals
RS-232C/ETHERNET Protocol Specifications

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TEAC Corporation

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1. Overview

The BD-MP4K ("controlled device") can be controlled from an external device ("external controller"), such as a computer, through a serial RS-232C and ETHERNET connection.

2. Specifications

2.1. Serial RS-232C

2.1.1. Electrical specifications

|	
Standard:	JIS X-5101 (equivalent to the former JIS-C-6361 and EIA RS-232C standards)
	Note that this is not compatible with the RS-422 used in professional VTRs.
Impedance at receiver:	When measured with an applied voltage between -3 V and +3 V or between -15 V and +15 V, the DC resistance is between 3k ohms and 7k ohms.
	Total load capacitance is 2500 pF or less.
Open circuit voltage at transmitter:	
	25V or less
Open circuit voltage at receiver:	
	2V or less
Signal voltage:	When the open circuit voltage at the receiver is 0 V, the signal voltage is between -5 V and +5 V or between -15 V and +15V against a load impedance between 3k ohms and 7k ohms.
Signal discrimination:	Logic "1": -3V or less
	Logic "0": +3V or more

2.1.2. Communication format

Circuit type	Asynchronous / Full-duplex
Transmission type	Digital binary serial
Data signal rate (baud rate)	
	115200, 57600 or 38400 bits/sec
	During standby, 57600 bits/sec is only available.
Data bits	8 bits
Parity bits	None
Stop bits	1 bit
Maximum data length	600 byte (Start character to End character is included.)

*Data bits, Parity bits, and Stop bits are fixed.

2.1.3. Connector pin-out

Connecter	D-sub 9pin female (Inch screw thread)
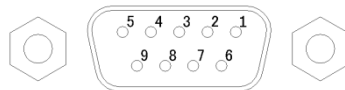
Terminal pin-out and input/output signals

Pin No.	In/Out	Signal name	Description
1	-	GND	Ground pin
2	Out	TxD	Data transmitted from this pin
3	In	RxD	Data received at this pin
4	-	NC	Not connected
5	-	S.GND	Signal ground pin
6	-	NC	Not connected
7	-	+5V Power	Can use 5V/500mA power supply
8	-	NC	Not connected
9	-	NC	Not connected

*Note

Pin 7 is the output terminal of the 5V power supply, so be careful when wiring the cable.

Controlled device（BD-MP4K）   External controller
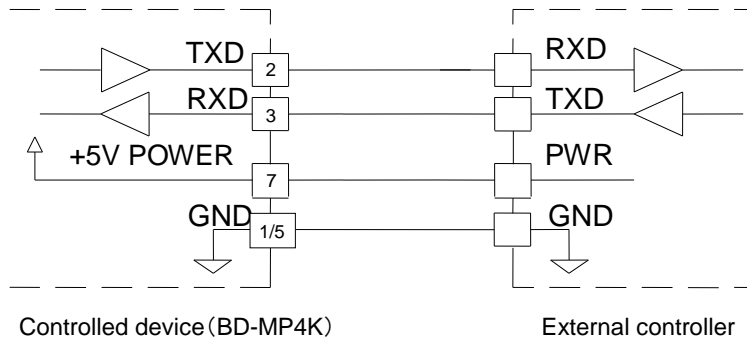
2.2. IP Control (Ethernet)

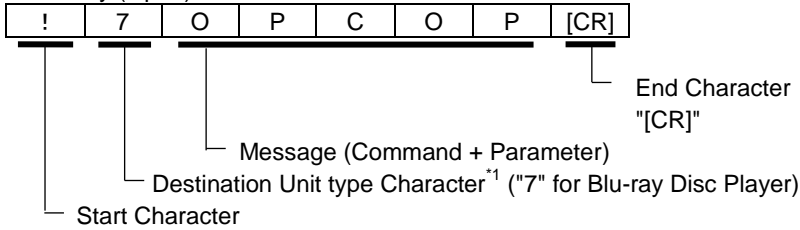|	
Transmission type	Full duplex
Transfer speed	10 / 100 / 1000 Mbps
TCP port No.	9030
Maximum data length	600 Bytes (Start character to End character is included.)

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3. Protocol Overview

The Serial Control Protocol consists of three command characters and parameter characters of variable length. Characters are the ASCII Code.

O	P	C	O	P

Parameter Characters（variable length)

Command Characters (3 characters, fixed)
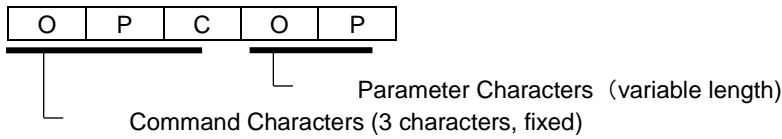
3.1. RS-232C Protocol

Controller -> Device Message Example

Disc Tray (Open)

!	7	O	P	C	O	P	[CR]

End Character "[CR]"

Message (Command + Parameter)

Destination Unit type Character[*1] ("7" for Blu-ray Disc Player)

Start Character

Special Character

[CR]   Carriage Return ASCII Code 0x0D

Device -> Controller Message Example

Status = Play

!	7	S	S	T	P	L

Message (Command + Parameter)

Source Unit type Character[*1] ("7" for Blu-ray Disc Player)

Start Character

*1 Unit Type is the model category ID. The Blu-ray player is "7".

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3.2. ETHERNET Protocol

Protocol is TCP. (Transmission Control Protocol)
Destination Port Number is 9030. (fixed)

Controller -> Device Message Example

Disc Tray (Open)

1st Char	2nd Char	3rd Char	4th Char	5th Char	6th Char	7th Char	Last Char
!	7	O	P	C	O	P	[CR]

- End Character "[CR]"
- Message (Command + Parameter)
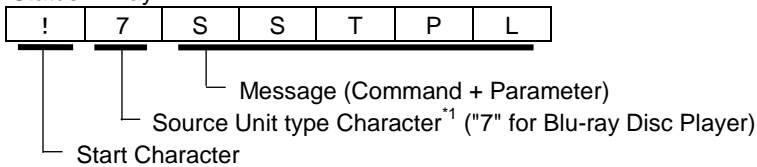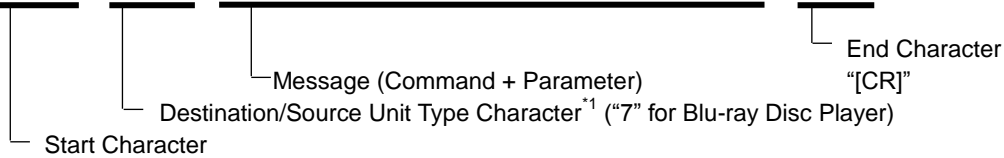- Destination/Source Unit Type Character[*1] ("7" for Blu-ray Disc Player)
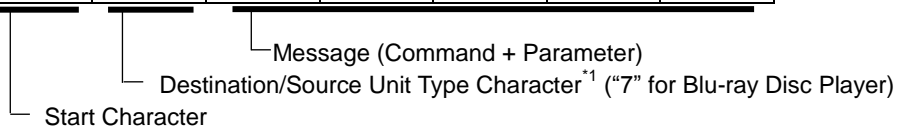- Start Character

Special Character
   [CR]   Carriage Return ASCII Code 0x0D

Device -> Controller Message Example

Status = Play

1st Char	2nd Char	3rd Char	4th Char	5th Char	6th Char	Last Char
!	7	S	T	T	P	L

- Message (Command + Parameter)
- Destination/Source Unit Type Character[*1] ("7" for Blu-ray Disc Player)
- Start Character

   *1   Unit Type is the model category ID. The Blu-ray player is "7".

Note:
   The connection between server and client should be held open continuously.
   If the connection is closed, the client will not be able to see Status notification messages from the server.
   Only one client connection at a time can be made.

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4. Communication Protocol

4.1. Message Structure

There are three kinds of message, "COMMAND", "REQUEST", and "ANSWER /NOTIFICATION".

4.2. ACK (Acknowledge) and NACK (Not Acknowledge)

4.2.1. ACK

It is an affirmative reply sent to a controller from a device. When data transfer completes properly, a device notify of that to a controller.

4.2.2. NACK

It is a negative reply sent to a controller from a device. When data transfer does not complete properly, a device notify of that to a controller.

Name	Value(HEX)	Transmission Requirement
ACK	'ack' (0x61/0x63/0x6B)	The device acknowledged that the command was received normally from the controller.
NACK	'nack' (0x6E/0x61/0x63/0x6B)	・The device received the End Character 'CR(0x0D)' before receiving the Start Character '!(0x21)'. ・The device does not receive ID'7(0x37)'just after Start Character'!(0x21)'. ・The device receives an unknown character just after '!7'. ・The device receives an unknown command just after '!7'. ・Parameter is out of range. ・The size of data is abnormal. ・5msec passed before the device receives the next code necessary to complete the command.

4.3. Communication Rules

4.3.1. Initiative of Communication

In the communication between a controller and a device, the controller must have the initiative. However, the Status Information notification automatically from the device is an exception.

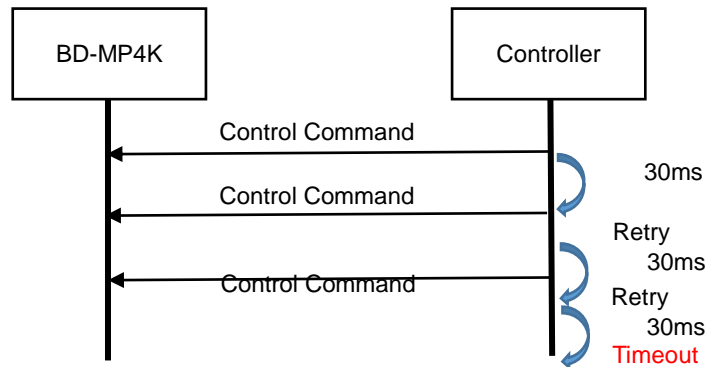When the device receives a command from the host, the device returns the following.

・When receiving the command which doesn't require a status information
  ACK ('ack')
・When receiving the command which require a status information
  ACK ('ack')＋('+') Status information (ANSWER)
・For the communication failure or an unknown commands etc.
  NACK ('nack')

4.3.2. Communication Sequence

The host must not send any new command after the previous command before the host receives ACK or NACK, or the timeout (see "4.3.3. Timeout") has expired.

4.3.3. Timeout

After a controller sends a message to a device, the host waits for a reply from the device for 30 ms (IP Control) / 300 ms (RS-232C). When the controller does not receive a reply over 30 ms (IP Control) / 300ms (RS-232C) from the device, the controller sends the same message to the device. However, when the controller does not receive a reply from the device after sending the same message 3 times (that means Tim Out), the controller sends End character 'CR' (0x0D) to the device. After that, the controller should execute the recovery process such as retry.

4.3.4. ACK
Refer to "4.2.1. ACK".

4.3.5. NACK
The device returns a NACK immediately after detecting a failure in the communication with the controller (see "4.2.2. NACK"). If the host receives a NACK, it must stop sending the current remaining command immediately and execute the recovery process such as retry.

4.3.6. Command Interval time
・Interval time between Characters from a controller must be less than 5ms. The device sends NACK when 5msec passed before the device receives the next character code.
・Interval time between Commands is more than 30 ms.
　In case of less than 30 ms as interval time between commands,
　1) Executing the subsequent command is not guaranteed.
　2) When there are buffer spaces of a device for a command, the device will execute the command.
　3) When there is no buffer space of a device for a command, the device does not execute the command, and will send Busy (@0BDERBUSY) to the host instead.
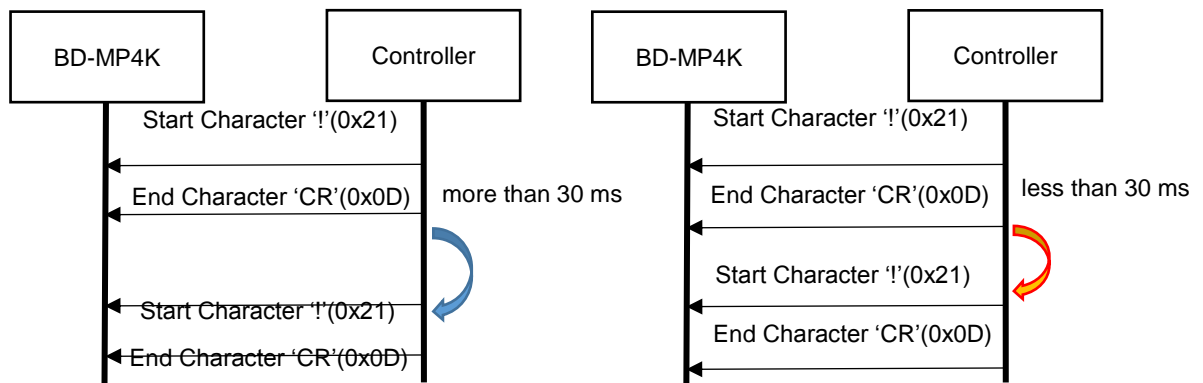
4.4. Basic Control Flow

4.4.1. Device Control Flow

The device sends the controller an ACK (Acknowledgement) and executes that command when the device receives a Control command from the controller. The list of the Control command is shown in "5. Command Table".
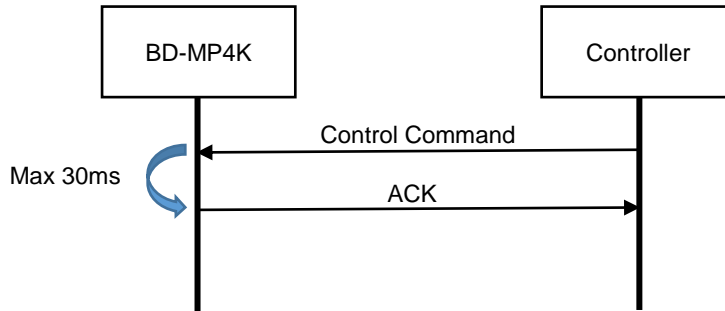
If the device receives an unknown command or an End Character 'CR' (0x0D) without a Start Character '!', it causes transmission failure and the device returns a NACK. Refer to "4.2.2. NACK" about NACK transmission condition.

4.4.2. Status Request Flow

The device returns an ACK and the ANSWER requested by the controller when the device receives the Status Request from the controller. The list of the Status Request and the corresponding answer is shown in "5.3. Current Status Request"
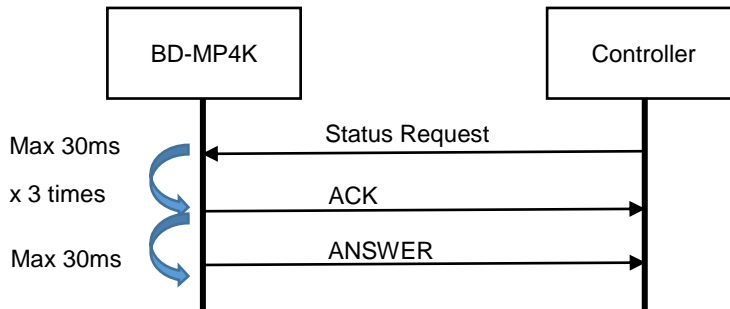
When a device receives Status Request from a controller, the device sends an ACK to the controller. After that, the device gets the current status, and then sends it to the controller.

If the device receives an unknown command or an End Character 'CR' (0x0D) without a Start Character '!', it causes transmission failure and the device returns a NACK. Refer to "4.2.2. NACK" about NACK transmission condition.

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4.4.3. Status Notification Flow

A device notifies of Status Information listed in "5.3. Current Status Request" whenever the status of the device is changed, such as the transport status, the current track, the storage media status, and other status.
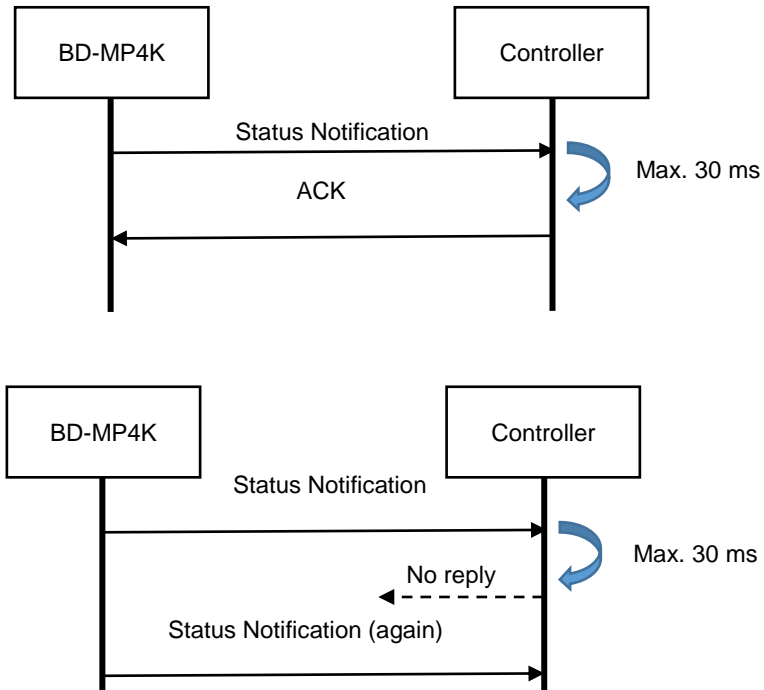
A device sends Status Notification to a controller. The controller replies ACK to the device. The device waits for the ACK for Max 30ms. When the device does not receive the ACK from the host, the device sends the same Status Notification to the host again. After that, the device does not send the same Status Notification even if it does not receive an ACK from the host.

The Status Information is same as the answer for the Status Request listed in "5.3. Current Status Request".

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5. Command Table

NOTE
- *Italic* characters of command mean parameter. (Ex: Hide MENU "!7OSD*XX*" -> Parameter: *XX*)
- "Track" means "Chapter" (during the DVD or BD playback) and "File" (USB and other playback). "Group" means "Title" (DVD or BD playback) and "Track" (Audio CD playback).

5.1. Key Control

#	Function	Command/Response	Status Request	Description
1	Power On	!7PWR01	-	Power On *For Ethernet, the command is invalid. Please use WoL function. This command should be sent in the transfer speed of 57600 bits/sec.
2	Power Off	!7PWR00	-	Power Off (Standby)
3	Stop	!7STP	-	Stop
4	Play	!7PLY	-	Play
5	Play Pause	!7PAS	-	Playback is Paused
6	Track (Chapter/File) Skip	!7SKP*nnnn*	-	DVD/BD: Search for a chapter by specifying the number. File: Search for a file in the current folder by specifying the number. *nnnn*: Chapter or file number ('0001'-'2000')
7	Track (Chapter/File) Skip Next	!7SKPNX	-	DVD/BD: Skip to the next chapter, File: Skip to the next file.
8	Track (Chapter/File) Skip Prev.	!7SKPPV	-	DVD/BD: Skip to the previous chapter, File: Skip to the next file.
9	Group (Title/CD-track) Skip	!7GSK*nnnn*	-	DVD/BD: Search for a file by specifying the track number. CD: Search for a track by specifying the track number. *nnnn*: Title or track number ('0001'-'2000')
10	Group (Title/CD-track) Skip Next	!7GSKNX	-	DVD/BD: Skip to the next title, CD: Skip to the next track
11	Group (Title/CD-track) Skip Prev.	!7GSKPV	-	DVD/BD: Skip to the previous title, CD: Skip to the previous track.
12	Time Display Mode	!7TMD*XX*	!7?TMD	*XX*: Time Display Mode 'TL': Title/Disc/File Elapsed, 'TR': Title/Disc/File Remain, 'EL': Chapter/Track/File Elapsed, 'RM': Chapter/Track/File Remain
13	Hide MENU	!7OSD*XX*	!7?OSD	Hides the menu on the home screen and transport icons (►, ▐▐, and so on) displayed on the screen. *XX*: On/Off '00': Hide Menu - On (Hidden) '01': Hide Menu - Off (Displayed)
14	Setup Menu	!7SMN	-	Opens the Setup Menu.
15	Top Menu (Disc Menu)	!7TMN	-	(During playback of a video disc) Shows the top menu screen
16	Option Menu	!7OMN	-	When playing back or paused, opens the Option Menu screen.
17	Pop Up Menu	!7PMN	-	Shows Pop Up Menu in the disc.

18	Return	!7RET	-	Return to the previous setup menu screen in the BD/DVD disc.
19	Audio Dialog	!7ADG*X*	-	Change dialog to the next one in the BD/DVD disc. *X*: Audio stream code '+': Primary '-': Secondary
20	Subtitle	!7SBT1	-	Change to the next subtitle language in the BD/DVD disc.
21	Enter	!7ENT	-	Decides selected item in the setup menu screen, etc. in the BD/DVD disc.
22	Disc Tray (Open/Close)	!7OPC*XX*	-	Controls Disc Tray. *XX*: Disc Tray Open/Close 'OP': Open 'CL': Close
23	Video Resolution (Specified resolution)	!7RSC*X*	!7?RSC	Changes the resolution of HDMI *X*: Resolution '1': Auto, '2': 480/576i, '3': 480/576P, '4': 720P '5': 1080i, '6': 1080P, '7': 2160P
24	Display/Info	!7DSP	-	Shows information on screen display. (IR remote ON SCREEN button)
25	Function/Color	!7CBC*X*	-	Carries out a function peculiar to a disc. *X*: Color '1':Red, '2':Green, '3':Blue, '4':Yellow
26	Home	!7HOM	-	Shows HOME menu screen of the unit.
27	Ten Key	!7NUM*X*	-	Inputs 0-9 *X*: Number '1': 1, '2': 2, '3': 3, '4': 4, '5': 5, '6': 6, '7': 7, '8': 8, '9': 9, '0': 0
28	Slow/Search	!7SCN*ds*	!7?SCN	*d:* Direction 'F' : Forward, 'R' :Reverse *s*: Search Speed 'f' : fast (cyclic 1,2,3,4,5,normal) 's' : slow (cyclic 1/16x,1/8x,1/4x,1/2x,1x) Note: 'Rs' (Reverse & slow) is not supported.
29	MUTE	!7MUT*XX*	!7?MUT	*XX*: On/Off '00': Mute on '01': Mute off
30	Cursor	!7OSD*X*	-	*X*: Direction of cursor movement '1':Left, '2':Right, '3':Up, '4':Down
31	Clear	!7CLR	-	This clears the value in the field being input. In the bookmark list, this deletes the selected bookmark.

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5.2. Menu Setting

#	Function	Command	Status Request	Response	Description
1	Disc Auto Playback	!7APL00	!7?APL	!7APL00	On(repeat off)
		!7APL01		!7APL01	Off
		!7APL02		!7APL02	On(repeat on)
2	PIP Mark	!7PMK00	!7?PMK	!7PMK00	On
		!7PMK01		!7PMK01	Off
3	HDMI 3D	!73DOAT	!7?3DO	!73DOAT	Auto
		!73DO01		!73DO01	Off
4	TV Screen (TV Aspect Ratio)	!7ASC9W	!7?ASC	!7ASC9W	16:9 Wide (16:9 Full)
		!7ASC9A		!7ASC9A	16:9 Wide/Auto (16:9 Normal)
		!7ASC3P		!7ASC3P	4:3 pan & scan
		!7ASC3L		!7ASC3L	4:3 letterbox
5	TV System	!7TVSNT	!7?TVS	!7TVSNT	NTSC
		!7TVSPL		!7TVSPL	PAL
		!7TVSMS		!7TVSMS	Multi-system
6	HDMI 1080p 24Hz	!7R1K00	!7?R1K	!7R1K00	On
		!7R1K01		!7R1K01	Off
7	HDMI Color Space	!7CLSRV	!7?CLS	!7CLSRV	RGB Video Level (RGB)
		!7CLSRP		!7CLSRP	RGB PC Level (Full RGB)
		!7CLSY4		!7CLSY4	YCbCr 4:4:4 (YCbCr)
		!7CLSY2		!7CLSY2	YCbCr 4:2:2 (YCbCr422)
8	HDMI Deep Color	!7DPC48	!7?DPC	!7DPC48	48 Bits
		!7DPC36		!7DPC36	36 Bits
		!7DPC30		!7DPC30	30 Bits
		!7DPCOF		!7DPCOF	Off
9	Secondary Audio Mark	!7SCA00	!7?SCA	!7SCA00	On
		!7SCA01		!7SCA01	Off
10	Audio Output - Fs Setting	!7COO48	!7?COO	!7COO48	48k LPCM
		!7COO96		!7COO96	96k LPCM
		!7COO19		!7COO19	192k LPCM
11	Speaker Settings - Configuration Down Mix Mode	!7SPC*XX*	!7?SPC	!7SPC*XX*	*XX*: Speaker /Woofer Number (Woofer Number is fixed to 1.) '21': 2.1Ch, '31': 3.1Ch '41': 4.1Ch, '51': 5.1Ch '61': 6.1Ch, '71': 7.1Ch

#		Command	Query	Response	Description
12	Speaker Settings - Configuration Speaker Setting	!7SPSdsvvvdddd			*d*:Type 'C': center 'L': L, 'R': R 'l': Ls (Lss), 'r': Rs (Rss) 'B': Lsr, 'b': Rsr 'S': SW1 *s*:Size '0':Large, '1':Small *vvvv*: Level (Trim) [unit: dB] '-100' – '+000' – '+100' (Both +000 and -000 are acceptable) ex) '-010': -1dB, '+100': +10dB If the 4th character is between 0 and 4, it becomes 0. If it is between 5 and 9, it becomes 5. *dddd*: Delay [unit: cm] '0000' – '1000', step 5 ex) '0005': 5 cm If the 4th character is between 0 and 4, it becomes 0. If it is between 5 and 9, it becomes 5. If the value is greater than 1000, it becomes 1000.
13	Firmware Upgrade	!7FWUUS	-	!7FWUUS	Via USB Storage
		!7FWUDS		!7FWUDS	Via Disc
14	HDMI CEC	!7CCRH1	!7?CCR	!7CCRH1	HDMI1 on
		!7CCRH2		!7CCRH2	HDMI2 on
		!7CCROF		!7CCROF	Off
15	Reset Factory Defaults	!7INI	-	!7INI	Load Default
16	BD-Live Connection	!7LNA00	!7?LNA	!7LNA00	On (Permitted)
		!7LNALT		!7LNALT	Limited (Partially Permitted)
		!7LNA01		!7LNA01	Off (Prohibited)
17	HDR Setting	!7HDRAT	!7?HDR	!7HDRAT	Auto
		!7HDRHD		!7HDRHD	HDR
		!7HDRSD		!7HDRSD	SDR
18	Dolby vision Mode	!7DBVAT	!7?DBV	!7DBVAT	Auto
		!7DBVLO		!7DBVLO	Low Latency
		!7DBVLR		!7DBVLR	LL RGB
		!7DBVOF		!7DBVOF	Off
19	Motion Video Process Video Mode	!7MVMbbbssshhhcccst	!7?MVM	!7MVMCU	Custom *bbb*: Brightness: '-10' ~ '+10' *sss*: Saturation: '-10' ~ '+10' *hhh*: Hue: '-10' ~ '+10' *ccc*: Contrast: '-10' ~ '+10' *s*: Sharpness: '0' ~ '5' *t*: CTI: '0' ~ '3'
		!7MVMST		!7MVMST	Standard
		!7MVMVI		!7MVMVI	Vivid
		!7MVMCI		!7MVMCI	Cinema
20	Motion Video Process Color Adjust	!7MVCcbbbssshhh	!7?MVCc	!7MVCcbbbssshhh	*x*: color 'R': Red, 'G': Green, 'B': Blue, 'Y': Yellow, 'C': Cyan, 'M': Magenta *bbb*: Brightness: '-10' ~ '+10' *sss*: Saturation: '-10' ~ '+10' *hhh*: Hue: '-10' ~ '+10'

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21	Motion Video Process Noise Reduction	!7MVN*x*	!7?MVN	!7MVNx	x: Noise reduction level '0' ~ '3'
22	Audio Post Process EQ	!7PEQOF	!7?PEQ	!7PEQOF	Off
		!7PEQRO		!7PEQRO	Rock
		!7PEQPO		!7PEQPO	Pop
		!7PEQLI		!7PEQLI	Live
		!7PEQDA		!7PEQDA	Dance
		!7PEQCL		!7PEQCL	Classical
		!7PEQSO		!7PEQSO	Soft
23	Audio Post Process DOWNMIX	!7DMXOF	!7?DNM	!7DMXOF	Off
		!7DMXDH		!7DMXDH	DH
		!7DMXDV		!7DMXDV	DVS
		!7DMXMV		!7DMXMV	MVS

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5.3. Current Status Request

#	Function	Command	Response	Description
1	Power Status	!7?PWR	ACK	See "Key Control"
			No response	
2	Disc Status	!7?MST	!7MSTNC	There is not disc media
			!7MSTCI	There is disc media.
			!7MSTUF	Mounted media is unformatted. (unknown disc)
			!7MSTTO	Disc tray is opening or open
			!7MSTTC	Disc tray is closing or closed
			!7MSTTE	Disc tray error
3	Status	!7?SST	!7SSTPL	Play
			!7SSTPP	Pause
			!7SSTDVS*X*	Slow play *X*: Direction 'R' : Reverse, 'F': Forward
			!7SSTDVF*X*	Search play *X*: Direction 'R' : Reverse, 'F': Forward
			!7SSTDVSU	Setup mode.
			!7SSTDVMC	Media mode (Media Center)
			!7SSTDVTR	Track Menu (Root Menu) playback in process.
			!7SSTDVHM	Home menu mode.
4	Total Chapter Number	!7?STT	!7TTN*XXXX*	*XXXX*: Total Chapter number (BD/DVD) or file number in the folder (file) '0000' to '9999' 'UNKN': Unknown
5	Current Chapter Number	!7?STC	!7TNM*XXXX*	*XXXX*: Chapter number (BD/DVD) or file number in the folder (file) '0000' to '9999' 'UNKN': Unknown
6	Total Title Number	!7?STG	!7TGN*XXXX*	*XXXX*: Total title number (BD/DVD) or track number (CD) '0000' to '9999' 'UNKN': Unknown
7	Current Title Number	!7?SGN	!7GNM*XXXX*	*XXXX*: Title number (BD/DVD) or track number (CD) '0000' to '9999' 'UNKN': Unknown
8	Elapse Time	!7?SET	!7SET*hhhmmss*	*hhhmmss*: Time; hhh: hours (3 digits), mm; minutes (2 digits), ss: seconds (2 digits)
9	Remain Time	!7?SRT	!7SRT*hhhmmss*	*hhhmmss*: Time; hhh: hours (3 digits), mm; minutes (2 digits), ss: seconds (2 digits)

TASCAM

*Note-1
The acceptable character set is ISO/IEC8859-1.

	x0	x1	x2	x3	x4	x5	x6	x7	x8	x9	xA	xB	xC	xD	xE	xF
0x																
1x																
2x	*SP*	!	"	#	$	%	&		(	)	*	+	,	-	.	/
3x	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
4x	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
5x	P	Q	R	S	T	U	V	W	X	Y	Z	[	¥	]	^	_
6x	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
7x	p	q	r	s	t	u	v	w	x	y	z	{	|	}	~	
8x																
9x																
Ax	*NBSP*	¡	¢	£	¤	¥	¦	§	¨	©	ª	«	¬		®	¯
Bx	°	±	²	³	´	µ	¶	·	¸	¹	º	»	¼	½	¾	¿
Cx	À	Á	Â	Ã	Ä	Å	Æ	Ç	È	É	Ê	Ë	Ì	Í	Î	Ï
Dx	Ð	Ñ	Ò	Ó	Ô	Õ	Ö	×	Ø	Ù	Ú	Û	Ü	Ý	Þ	ß
Ex	à	á	â	ã	Ä	å	æ	ç	è	É	ê	ë	ì	í	î	ï
Fx	ð	ñ	ò	ó	Ô	õ	ö	÷	ø	Ù	ú	û	ü	ý	þ	ÿ

Revisions

Ver. 1.00   Initial issue
Ver. 1.01   3. Protocol Overview: "CR" is deleted in the case of "Device -> Controller Message Example"