Specification
for
Serial Interface DVD－2500BT / 3800BD

D&M Holdings Inc.

DENON Brand Company

Contents

1 Serial communication interface

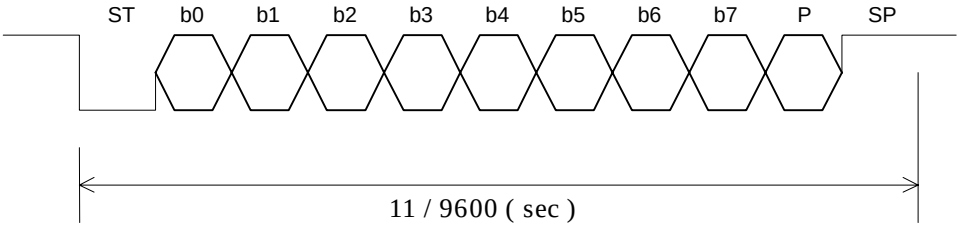
1.1 Physical interface

Arrangement of connector signals

	RS-232C	
Terminal #	Signal	I /O
1	GND	-
2	TxD	O
3	RxD	I
4	NC	-
5	S.GROUND	-
6	NC	-
7	NC	-
8	NC	-
9	NC	-

1.2 Transfer format of serial data

- Interface : As per RS-232C or RS-422A
- Communication system : Half-duplex communication
- Data transfer mode : Start stop synchronization
- Transfer rate : 9,600bps
- Start bit (ST) : 1 bit
- Data bit (b0-b7) : 8 bits
- Parity (P) : Even number / None Parity
  (default:Even number)
- Stop bit (SP) : 1 bit
- Transfer data : ASCII code
- Control characters : STX (02h)
  ETX (03h)
  ETB (17h)
  NAK (15h)



1.3 Command format and answer format

This unit shall be based on commands each of which consists of a data row (some commands are without a PC) composed of command codes (CC) and parameter codes (PC) . The trans-mitting station shall be designed to send block check characters (BCC) following ETX, with the data row enclosed in STX (text start : 02h) and ETX (text termination : 03h) . The receiving station shall regard receipt of BCC as the completion of command reception when it has received STX.

Here are the formats.

Commands : <STX> <CC> <PC0> <PC1> <PC2> <---------> <PCn> <ETX> <BCCH> <BCCL>

STX (Start of TeXt)	: 02h
CC (Command Code)	: Command code
PC (Parameter Code)	: Defined for each command (contents and number of parameters)
ETX (End of TeXt)	: 03h
BCC (Block Check Character)	:

CC + PC0 + PC1 + PC2 + ---------- + PCn + ETX = XYh

(Each of X and Y is 4 bit long) X , Y=0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F

BCCH (high-level byte) = X as converted to an ASCII code

BCCL (low-level byte) = Y as converted to an ASCII code

Answers : <STX> <RC> <AC> <PC0> <PC1> <PC2> <--------> <PCn> <ETX> <BCCH> <BCCL>

STX (Start of TeXt)	: 02h
RC (Reply Code)	: Reply code (=Command code)
AC (Answer Code)	: Answer code
PC (Parameter Code)	: Defined for each command (contents and number of parameters)
ETX (End of TeXt)	: 03h
BCC (Block Check Character)	:

RC +AC + PC0 + PC1 + PC2 + ---------- + PCn + ETX = XYh

(Each of X and Y is 4 bit long) X , Y=0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F

BCCH (high-level byte) = X as converted to an ASCII code

BCCL (low-level byte) = Y as converted to an ASCII code

1.4 Protocol for data transmission and reception

This unit is based on half-duplex communication. The unit shall therefore transmit commands and receive answers according to the following procedure.

1.4.1 Basic procedure

1) The host shall select commands for this unit and transmit them to this unit. Command interval time is MIN 40μsec.

2) Having issued a command, the host shall receive an answer from this unit, then issue the next command.

3) The host shall analyze the RC, AC, and PC as answers given and decide whether the command has been normally executed.

4) The host shall give an answer to a command that gives operational instructions, then issue a status request command, and decide whether this unit has finished operating with

regard to the command that gives operational instructions.

5) The time from the start of command transmission to the end of command transmission should be max 40 msec.

6) The time from the completion of command transmission to the start of answer-back is MAX.~~60 m~~ 5sec.

7) This unit cannot receive any commands for about_5 seconds after the power switch is turnied on.

1.4.2 Communication errors

1) Having received a command, which results in a communication error (overrun, framing, or parity error) , this unit shall give NAK (15h) . (MAX 80ms from the start of command transmission)

2) If the host has received NAK from this unit, it shall retransmit the command that it has transmitted immediately beforehand.

3) Having received an answer, which results in a communication error (overrun, framing, or parity error) , the host shall respond with NAK.

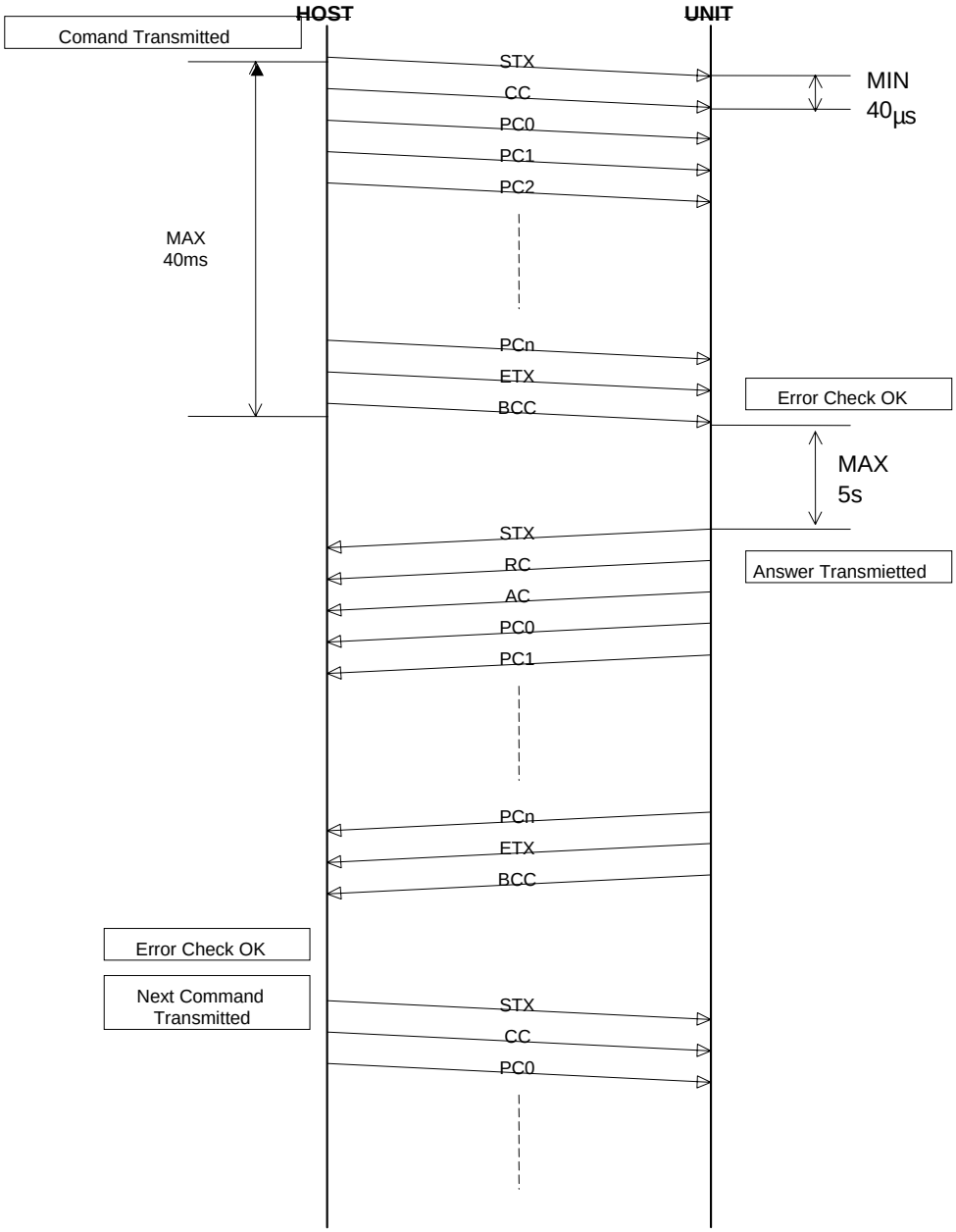
4) If it has received NAK from the host, this unit shall retransmit the answer it has transmitted immediately beforehand. (MAX 40ms)

5) When there is no answer from the unit within 6s, the host shall retransmit the command.

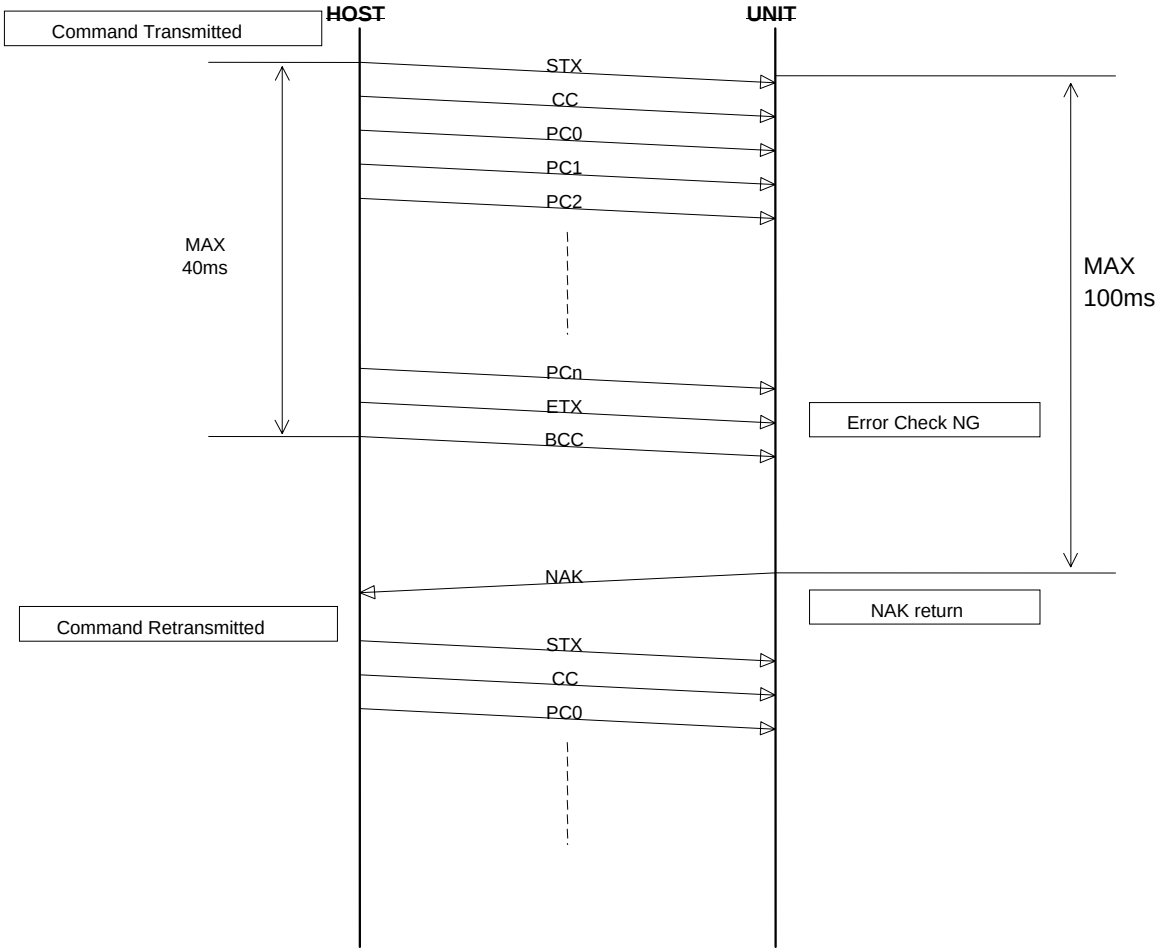
1.5 Command / Answer sequence

Shown below are the command sequence and the answer sequence of this unit.

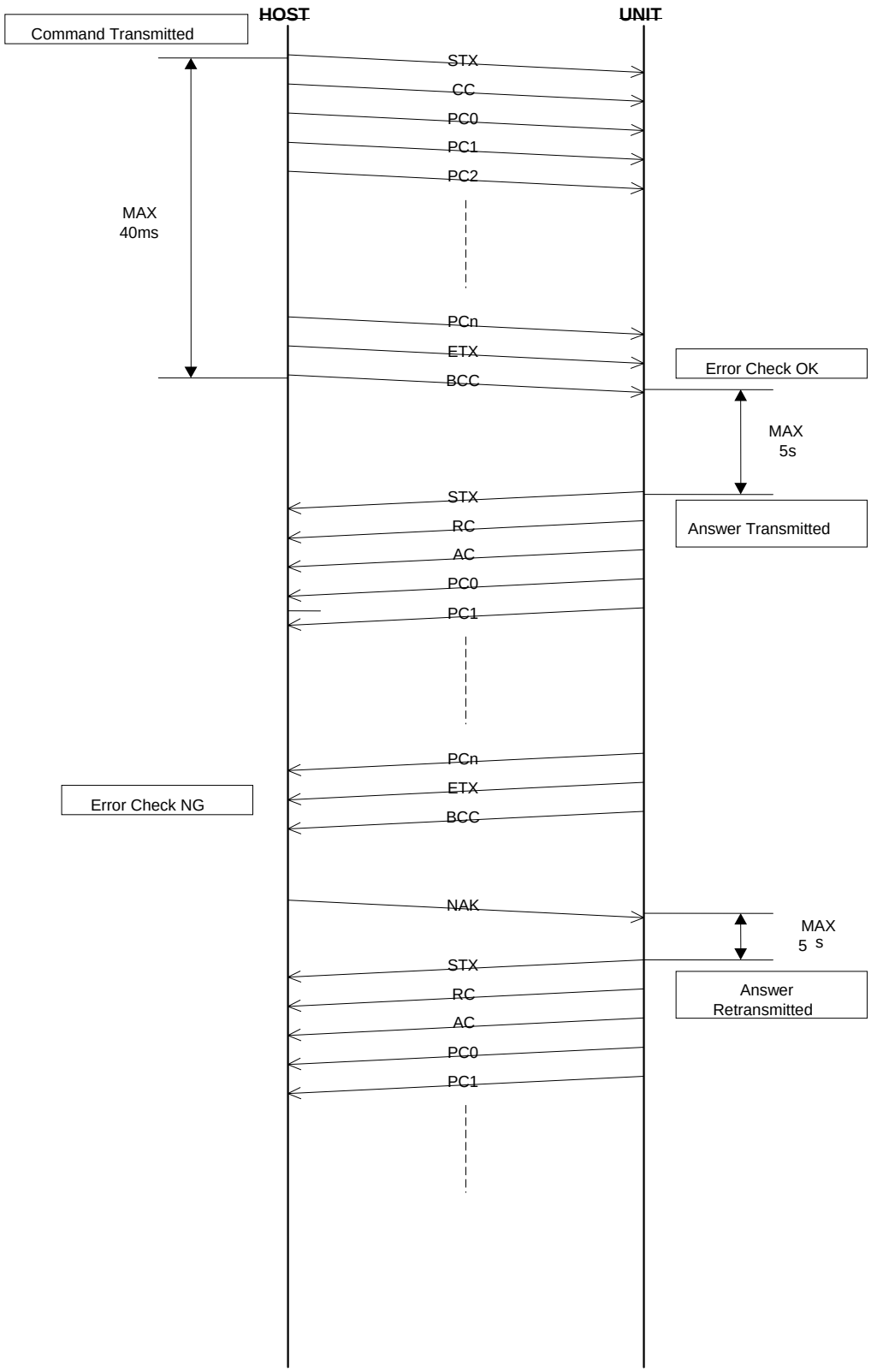
1) When a command is normally received (unit) and an answer is normally received (host) with an answer parameter



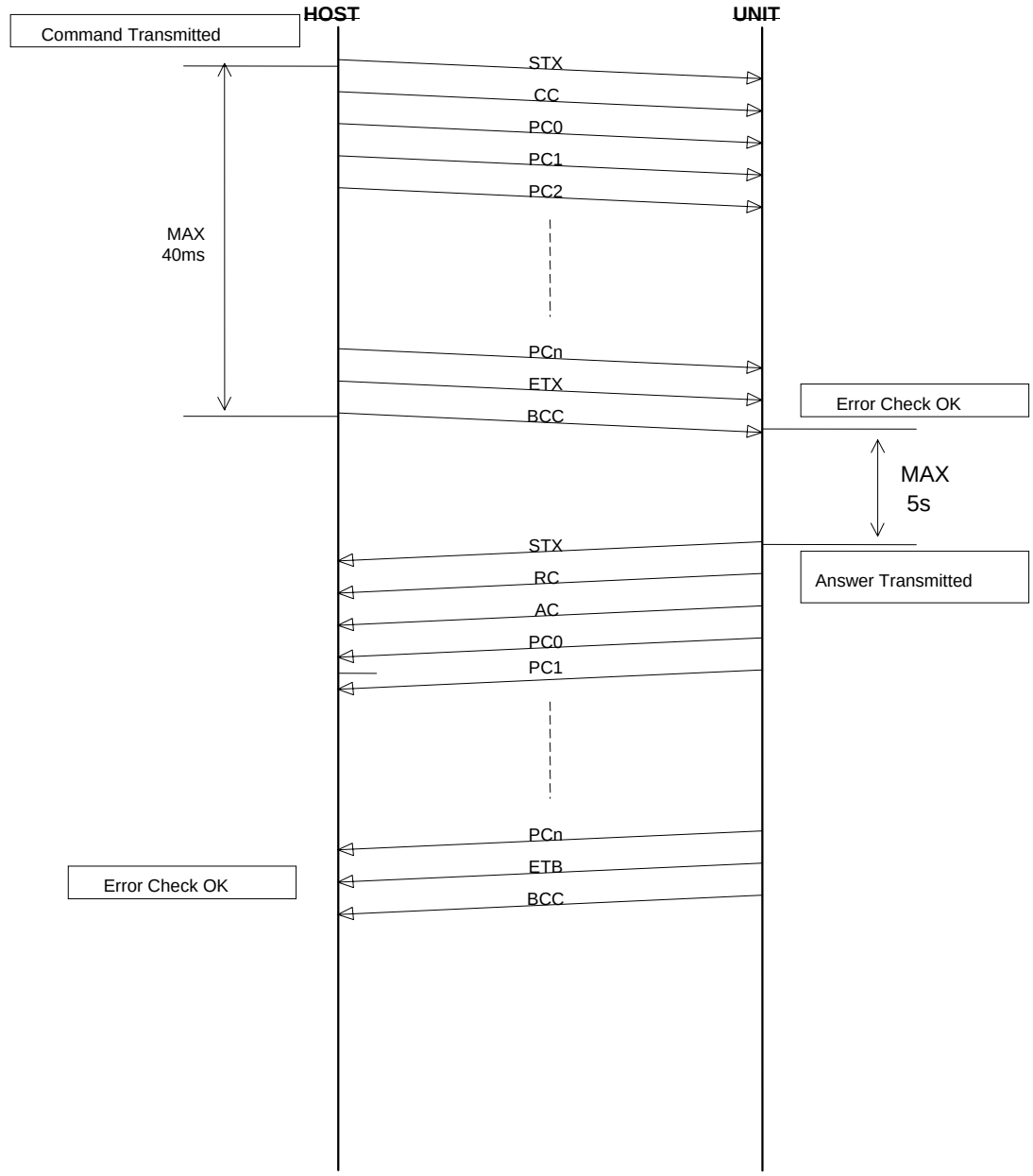
2) When a command is abnormally received (with or without an answer parameter)



3) When a command with an answer parameter is normally received (unit) and an answer is abnormally received (host)



4) When a command with an answer parameter is normally received (unit) and an answer is normally received with ETB (host)



1.6 List of command codes

Here is a list of command code types.

2Xh: POWER control command

3Xh: Command related to the acquisition of player information (such as status and name)

4Xh~5Xh: Operation instruction command to the player

61h~7Xh: Enhanced Operation instruction command to the player

No.	Command	Code (ASCII)	Operation
1	Power ON	20h ([SP])	Power-on request from the standby state
2	Power OFF	21h (!)	Power-off request
3	Request System Status	30h (0)	Acquires system status (such as the entire player and transfer unit) .
4	Request CPU Version	31h (1)	Acquires the CPU version.
5	Request Error Status	32h (2)	Acquires the error code when an error is occurred.
6	Request Disc Status	33h (3)	**Disk number information is obtained.**
7	Play	40h (@)	Starts playback.
8	Stop	41h (A)	Stops playback.
9	Pause	42h (B)	Requests a pause.
10	Skip	43h (C)	Moves to another group or title or chapter or track
11	Slow /Search	44h (D)	Scan
12	Setup	45h (E)	Common procedures of initial setting
13	Top Menu	46h (F)	Playback top menu screen
14	Menu	47h (G)	Playback Menu screen
15	Return	48h (H)	Return
16	Audio	49h (I)	Audio setting
17	Subtitle	4Ah (J)	Subtitle setting
18	Angle	4Bh (K)	Angle setting
19	Direct Select	4Ch (L)	Music search mode
20	Cursor	4Dh (M)	Moves cursor screen
21	Enter	4Eh (N)	Decision
22	SACD Layer Select	4Fh (O)	SACD Layer search mode
23	Disc Select	50h (P)	Disc search mode
24	Disc Skip	51h (Q)	Moves to another Disc
25	OPEN/CLOSE	61h (a)	Disk tray open / closing
26	NTSC/PAL	62h (b)	Change the video output format
27	HDMI Select	63h (c)	HDMI output mode
28	HDMI Format	64h (d)	HDMI output format
29	PROGRAM/DIRECT	65h (e)	Program mode setting
30	CLEAR	66h (f)	Program Entry Track Clear
31	CALL	67h (g)	Program Entry Track Call
32	DISPLAY	68h (h)	Display information screen
33	REPEAT	69h (i)	Repeat mode setting
34	PAGE +/-	6Ah (j)	PAGE setting
35	RANDOM	6Bh (k)	Random mode setting
36	MARKER	6Ch (l)	Maker mode screen
37	ZOOM	6Dh (m)	Zoom setting
38	DIMMER	6Eh (n)	Dimmer setting
39	PICTURE ADJUST	6Fh (o)	Picture menu screen
40	PURE DIRECT	70h (p)	Puredirect menu screen & Puredirect setting
41	AUTO TRANSFER MODE	71h (q)	Status information auto toransfer mode setting
42	FUNCTION	72h (r)	I carry out a function peculiar to a disk
43	MAIN/SUB	73h (s)	I perform a change of a main stream / sub stream / main&sub stream(picture-in-picture).
44	Mode	74h (t)	I call various functions.

1.7 List of answer codes

No.	Status	Code (ASCII)	Description
1	Command OK	20h (SP)	Accepts the command.
2	Invalid	30h (0)	Invalid command.
3	Format Error	31h (1)	Inappropriate command format.
4	Order Track None	32h (2)	The track , the group ,the title or the chapter you specified does not exist.
5	Order Time None	33h (3)	The time you specified does not exist.

1.8 List of status codes

Here is a list of answer code types.

3Xh : Status of the entire system

4Xh : Status of each action mode

No.	Status	Code (ASCII)	Description
1	Stand-by	30h (0)	Stand-by
2	Disc Loading	31h (1)	Under disc loading.
3	Disc Loading Complete	32h (2)	Disc Loading complete.
4	Tray Opening	33h (3)	Disc tray open.
5	Tray Closing	34h (4)	Disc tray close.
6	No Disc	41h (A)	Disc not present
7	Stop	42h (B)	Stop
8	Play	43h (C)	Under disc playing.
9	Pause	44h (D)	Playback in process.
10	Scan Play	45h (E)	Scanning in process.
11	Slow Search Play	46h (F)	Slow scanning in process.
12	Setup	47h (G)	Setup mode
13	Play Back Control	48h (H)	Play Back Control scannig in process
14	DVD Resume Stop	49h (I)	Resume stop condition
15	DVD Menu	4Ah (J)	DVD menu playback in process
~~16~~	~~Digital Interface Receive Mode (DAC MODE)~~	~~4Bh (K)~~	~~Under DAC Mode~~

1.9 **Command specification**

- When this unit is set to be compatible with all commands and fails to accept a command (due to a communication error, for example) , it returns NAK (15h) as an answer.

1.9.1 Power ON

This requests a power-on from the standby state.
~~- On receiving this command, this unit gives a power-on instruction to all players connected by a daisy chain.~~

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' SP ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCL (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' SP ')							
2	Answer code							
3~16	Master player type “ DVD-3800BD ” (ASCII CODE) or “ DVD-2500BT ” (ASCII CODE)or “ BD8002 ” (ASCII CODE)							
17	ETX (03h)							
18	BCCH (high-level)							
19	BCCL (low-level)							

2) Special condition
- When power condition is “STANDBY”, can accept “OPEN /CLOSE KEY”, “PLAY KEY”, and “POWER ON KEY” on the front panel and on the IR remote controler.
- I will keep two space before a model name later.

1.9.2 Power OFF

This requests a transfer from power-on to a standby state.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' ! ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCL (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' ! ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCL (low-level)							

2) Special condition

- None.

1.9.3 Request System Status

This status requests the DVD playing information .

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' 0 ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCL (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' 0 ')							
2	Answer code							
3	Disc type code (*1)							
4	Audio format code (*2)							
5	Audio channel code (*3)							
6	Dialog code (*4)							
7	Subtitle code (*5)							
8	Angle code (*6)							
9	Status code							
10	Play mode code (*7)							
11	Group or Title number information (100 digits)							
12	Group or Title number information (10 digits)							
13	Group or Title number information (1 digits)							
14	Track or Chapter number information (1000 digits)							
15	Track or Chapter number information (100 digits)							
16	Track or Chapter number information (10 digits)							
17	Track or Chapter number information (1 digits)							
18	Time mode (*8)							
19	Elapsed time (hour, 10 digits)							
20	Elapsed time (hour, 1 digits)							
21	Elapsed time (minutes, 10 digits)							
22	Elapsed time (minutes, 1 digits)							
23	Elapsed time (second, 10 digits)							
24	Elapsed time (second, 1 digits)							
25	ETX (03h)							
26	BCCH (high-level)							
27	BCCL (low-level)							

(*1) Disc type code (*2) Audio format code (*3) Audio channel code (*4) Dialog code

Code	Disc Type
31h (1)	DVD VIDEO
32h (2)	DVD AUDIO
33h (3)	VCD
34h (4)	CD-DA
35h (5)	CD-ROM
36h (6)	UNKNOWN
37h (7)	SACD
38h (8)	DVD VR
39h (9)	BDMV
3Ah (:)	BDAV

Code	Audio Format
31h (1)	DOLBY DIGITAL
32h (2)	DTS
33h (3)	MPEG
34h (4)	LPCM
35h (5)	PPCM
36h (6)	UNKNOWN
37h (7)	DSD
38h (8)	DD+
39h (9)	DTS-HD
3Ah (:)	DOLBY TrueHD
3Bh (;)	MP3
3Ch (<)	AAC
3Dh (=)	WMA

Code	Audio Channel
31h (1)	1 ch
32h (2)	2 ch
33h (3)	2.1 ch
34h (4)	3 ch
35h (5)	3.1 ch
36h (6)	4 ch
37h (7)	4.1 ch
38h (8)	5 ch
39h (9)	5.1 ch
3Ah (:)	6 ch
3Bh (;)	L /R (CD/VCD/MP3)
3Ch (<)	R (CD/CD)
3Dh (=)	L (CD/VCD)
3Eh (>)	UNKNOWN
3Fh (?)	6.1ch
40h (@)	7 ch
41h (A)	7.1ch

Code	Dialog
31h (1)	JPN
32h (2)	ENG
33h (3)	FRA
34h (4)	DEU
35h (5)	ITA
36h (6)	ESP
37h (7)	NLD
38h (8)	CHI
39h (9)	RUS
3Ah(:)	KOR
3Bh(;)	UNKNOWN

42h (B)	8ch

(*5) Subtitle code

Code	Subtitle
31h (1)	JPN
32h (2)	ENG
33h (3)	FRA
34h (4)	DEU
35h (5)	ITA
36h (6)	ESP
37h (7)	NLD
38h (8)	CHI
39h (9)	RUS
3Ah (:)	KOR
3Bh (;)	UNKNOWN

(*6) Angle code

Code	Angle
31h (1)	1
32h (2)	2
33h (3)	3
34h (4)	4
35h (5)	5
36h (6)	6
37h (7)	7
38h (8)	8
39h (9)	9

(*7) Play mode code

Code	Play Mode
31h (1)	NORMAL
32h (2)	PROGRAM
33h (3)	RANDOM

(*8) Time Mode code

Code	Time Mode
31h (1)	SINGLE ELAPSED
32h (2)	SINGLE REMAIN
33h (3)	TOTAL ELAPSED
34h (4)	TOTAL REMAIN
35h (5)	CHAPTER ELAPSED
36h (6)	CHAPTER REMAIN
37h (7)	TITLE ELAPSED
38h (8)	TITLE REMAIN
39h (9)	TRACK ELAPSED
3Ah (:)	TRACK REMAIN
3Bh (;)	GROUP ELAPESD
3Ch (<)	GROUP REMAIN

2) Special conditions

- When the disc does not set to DVD mechanism and disc loading process does not finish, group number, title number, track number, and chapter number are set ('0').
- When the disc does not set to DVD mechanism and disc loading process does not finish, elapsed time information are set ('0').
- When power condition is “STANDBY”, can accept “REQUEST SYSTEM STATUS”, “POWER ON KEY”, “REQUEST CPU VERSION”, and “REQUEST ERROR STATUS”. Incase of another command, returns “COMMAND FORMAT ERROR ('1')“ in the “ANSWER CODE”

Note : When you need these data, you should send this command.

1.9.4 Play

The unit begins to play back the disc.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' @ ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCL (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' @ ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCL (low-level)							

~~2) - Special conditions~~

- ~~When status code is 4Bh (DIR mode) , this command is not accepted.~~

1.9.5 Stop

This stops playing back the disc.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' A ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCL (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' A ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCL (low-level)							

~~2) Special conditions~~

- ~~When status code is 4Bh (DIR mode), this command is not accepted.~~

1.9.6 Pause

This pauses the disc.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' B ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCL (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' B ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCL (low-level)							

2) Special conditions

- This command is valid only when the status data is Play (E) .
- This command is valid as step mode, when the status data is Pause (F) .
- ~~When status code is 4Bh (DIR mode) , this command is not accepted.~~

1.9.7 Skip

This selects previous track or next track.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' C ')							
2	Skip code (Forward : ' + '/ Reverse : ' - ')							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCL (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' C ')							
2	Answer code							
3	Group number or title numbsr (100digit)							
4	Group number or title numbsr (10digit)							
5	Group number or title numbsr (1digit)							
6	Chapter or track number (1000digit)							
7	Chapter or track number (100digit)							
8	Chapter or track number (10digit)							
9	Chapter or track number (1digit)							
10	ETX (03h)							
11	BCCH (high-level)							
12	BCCL (low-level)							

2) Special conditions

- This command is valid only , when mode status data is Play (E) or Pause (F) .
- The unit can skip to a maximum track with Forward (+) and to a minimum track with Reverse (–) and when it goes to more than those track, the Order Track None (2) answer code is issued.

1.9.8 Slow /Search

This scans and plays the disc.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' D ')							
2	Skip code (Forward : ' + '/ Reverse : ' - ')							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCL (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' D ')							
2	Answer code							
3	Search speed							
4	ETX (03h)							
5	BCCH (high-level)							
6	BCCL (low-level)							

Search speed

Code	Search Speed
31h (1)	SLOW X 1/8 (FWD)
32h (2)	SLOW X 1/6 (FWD)
33h (3)	SLOW X 1/4 (FWD)
34h (4)	SLOW X 1/2 (FWD)
35h (5)	SLOW X 1/8 (RVS)
36h (6)	SLOW X 1/6 (RVS)
37h (7)	SLOW X 1/4 (RVS)
38h (8)	SLOW X 1/2 (RVS)
39h (9)	FF X 64
3Ah (:)	FF X 32
3Bh (;)	FF X 16
3Ch (<)	FF X 8
3Dh (=)	FF X 6
3Eh (>)	FF X 4
3Fh (?)	FF X 2
40h (@)	FR X 64
41h (A)	FR X 32
42h (B)	FR X 16
43h (C)	FR X 8
44h (D)	FR X 6
45h (E)	FR X 4
46h (F)	FR X 2
47h (G)	NORMAL

2) Special conditions

- This command is valid only when the mode status is Play (E) or Pause (F) .
- To make the search speed what you want , it needs to send some this command.
  Example : Now it 's plaing . If you make the search speed to FF X 6 , it needs to send this command 3 times.
  The operation matrix is shown as next page.
- ~~When status code is 4Bh (DIR mode) , this command is not accepted.~~

Operation matrix

DISC			DVD-VIDEO /DVD-AUDIO /MP3 /VideoCD/DVD-VR/BD		CDDA/SACD	
Now Operation			Slow /Search command		Slow /Search command	
			' + '	' - '	' + '	' - '
FF		2X	FF 4X	FR 2X	FF 4X	FR 2X
		4X	FF 6X		FF 6X	
		6X	FF 8X		FF 8X	
		8X	FF 16X		FF 2X	
		16X	FF 32X			
		32X	FF 64X			
		64X	FF 2X			
Playing (1X)			FF 2X	FR 2X	FF 2X	FR 2X
FR		2X	FF 2X	FR 4X	FF 2X	FR 4X
		4X		FR 6X		FR 6X
		6X		FR 8X		FR 8X
		8X		FR 16X		FR 2X
		16X		FR 32X		
		32X		FR 64X		
		64X		FR 2X		
DISC			DVD-VIDEO/DVD-VR/BD		VideoCD	
Pausing			SLOW FWD 1/8	SLOW RVS 1/8	SLOW FWD1/6	ignore
SLOW	FWD	1/8	SLOW FWD 1/6	SLOW RVS 1/8	ignore	
		1/6	SLOW FWD 1/4		SLOW FWD1/4	
		1/4	SLOW FWD 1/2		SLOW FWD1/2	
		1/2	SLOW FWD 1/8		SLOW FWD1/6	
	RVS	1/8	SLOW FWD 1/8	SLOW RVS 1/6	ignore	
		1/6		SLOW RVS 1/4		
		1/4		SLOW RVS 1/2		
		1/2		SLOW RVS 1/8		
Others			ignore		ignore	

1.9.9 Setup

This operation the initial setting .

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' E ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCL (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' E ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCL (low-level)							

2) Special conditions

- This command is valid only when the mode status is Stop (B) .
- ~~When status code is 4Bh (DIR mode), this command is not accepted.~~

1.9.10 Top Menu

This playback title menu in the DVD disc..

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' F ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCL (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' F ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCL (low-level)							

2) Special condition

- This command is valid only when disc type code is DVD-Video (1) or DVD-Audio (2) .
- ~~When status code is 4Bh (DIR mode) , this command is not accepted.~~

1.9.11 Menu

This plays root menu in the DVD disc.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code ('G ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCL (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code ('G ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCL (low-level)							

2) Special condition

- This command is valid only when disc type code is DVD-Video (1) .
- ~~When status code is 4Bh (DIR mode) , this command is not accepted.~~

1.9.12 Return

This returns previous setup menu screen.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code ('H ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCL (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code ('H ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCL (low-level)							

2) Special condition

- This command is valid only when setup menu or display menu is displayed.
- ~~When status code is 4Bh (DIR mode), this command is not accepted.~~

1.9.13 Audio

This selects dialog in the BD/DVD disc.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' | ')							
2	Audio skip code (Forward : ' + '/ Reverse : ' - ')							
3	Audio stream code(' + ':Primary /' - ' Secondary)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCL (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' | ')							
2	Answer code							
3	Current audio stream channel (digit 10)							
4	Current audio stream channel (digit 1)							
5	Total audio stream channel (digit 10)							
6	Total audio stream channel (digit 1) Ver3.09add							
7	Audio format (*1)							
8	Audio channel (*2)							
9	Dialog (*3)							
10	ETX (03h)							
11	BCCH (high-level)							
12	BCCL (low-level)							

(*1) Audio format code

Code	Audio Format
31h (1)	Dolby Digital
32h (2)	DTS
33h (3)	MPEG
34h (4)	LPCM
35h (5)	PPCM
36h (6)	UNKNOWN
37h (7)	DSD
38h (8)	DD+
39h (9)	DTS-HD
3Ah (:)	DOLBY TrueHD
3Bh (;)	MP3
3Ch (<)	AAC
3Dh (=)	WMA

(*2) Audio channel code

Code	Audio Channel
31h (1)	1 ch
32h (2)	2 ch
33h (3)	2.1 ch
34h (4)	3 ch
35h (5)	3.1 ch
36h (6)	4 ch
37h (7)	4.1 ch
38h (8)	5 ch
39h (9)	5.1 ch
3Ah (:)	6 ch
3Bh (;)	L/R (CD /VCD /MP3)
3Ch (<)	R (CD /VCD)
3Dh (=)	L (CD /VCD)
3Eh (>)	UNKNOWN
3Fh (?)	6.1ch
40h (@)	7 ch
41h (A)	7.1ch
42h (B)	8ch

(*3) Dialog code

Code	Dialogl
31h (1)	JPN
32h (2)	ENG
33h (3)	FRA
34h (4)	DEU
35h (5)	ITA
36h (6)	ESP
37h (7)	NLD
38h (8)	CHI
39h (9)	RUS
3Ah (:)	KOR
3Bh (;)	UNKNOWN

~~2) Special conditions~~

- ~~When status code is 4Bh (DIR mode), this command is not accepted.~~

1.9.14 Subtitle

This selects subtitle language in the BD/ DVD disc.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' J ')							
2	Subtitle skip code (Forward : ' + '/ Reverse : ' - ')							
3	Subtitle stream code (31h(1):Primary / 32h(2):Primary Style / 33h(3):Secondary) Ver3.09 add							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCL (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' J ')							
2	Answer code							
3	Current subtitle stream channel (digit 100)							
4	Current subtitle stream channel (digit 10)							
5	Current subtitle stream channel (digit 1)							
6	Total subtitle stream channel (digit 100)							
7	Total subtitle stream channel (digit 10)							
8	Total subtitle stream channel (digit 1) Ver3.09add							
9	Subtitle language (*1)							
10	ETX (03h)							
11	BCCH (high-level)							
12	BCCL (low-level)							

(*1) Subtitle language code

Code	Dialogl
31h (1)	JPN
32h (2)	ENG
33h (3)	FRA
34h (4)	DEU
35h (5)	ITA
36h (6)	ESP
37h (7)	NLD
38h (8)	CHI
39h (9)	RUS
3Ah (:)	KOR
3Bh (;)	UNKNOWN

2) Special condition

- ~~When status code is 4Bh (DIR mode) , this command is not accepted.~~
- When the value of the "current subtitle stream channel(both digit10 and digit1)" is zero, it means the subtitle is OFF.

1.9.15 Angle

This selects angle in the DVD disc.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' K ')							
2	Angle skip code (Forward : ' + '/ Reverse : ' - ')							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCL (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' K ')							
2	Answer code							
3	Current angle stream channel							
4	Total angle stream channel							
5	ETX (03h)							
6	BCCH (high-level)							
7	BCCL (low-level)							

~~2) Special conditions~~

- ~~When status code is 4Bh (DIR mode), this command is not accepted.~~

1.9.16 Direct Select

This directly selects specify track in the disc.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' L ')							
2	Search mode code (*1)							
3	Track number (1000 digits)							
4	Track number (100 digits)							
5	Track number (10 digits)							
6	Track number (1 digit)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

(*1) Search mode code

Code	Search Mode
31h (1)	Select group or title number
32h (2)	Select track or chapter number

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' L ')							
2	Answer code							
3	Group number or title number (100 digit)							
4	Group number or title number (10 digit)							
5	Group number or title number (1 digit)							
6	Chapter number or track number (1000 digit)							
7	Chapter number or track number (100 digit)							
8	Chapter number or track number (10 digit)							
9	Chapter number or track number (1 digit)							
10	ETX (03h)							
11	BCCH (high-level)							
12	BCCH (low-level)							

~~2) Special conditions~~

- ~~When status code is 4Bh (DIR mode) , this command is not accepted.~~

1.9.17 Cursor

This moves highlight area of initial setting screen.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' M ')							
2	Cursor code (*1)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

(*1) Cusor code

Code	Cursor
31h (1)	LEFT
32h (2)	UP
33h (3)	RIGHT
34h (4)	DOWN

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' M ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCH (low-level)							

~~2) Special conditions~~

~~• When status code is 4Bh (DIR mode), this command is not accepted.~~

1.9.18 Enter

This decides selected item in the setup menu etc..

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' N ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code ('N ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCH (low-level)							

~~2) Special conditions~~

- ~~When status code is 4Bh (DIR mode), this command is not accepted.~~

1.9.19 SACD Layer Selsect

This selects the layer of SACD.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' O ')							
2	Layer code (*1)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

(*1) Layer code

Code	Layer
31h (1)	2ch Layer
32h (2)	Multi ch Layer
33h (3)	CD Layer

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' O ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCH (low-level)							

~~2) Special conditions~~

- ~~When status code is 4Bh (DIR mode), this command is not accepted.~~

1.9.20 Disc Select

It changes to the selected disk (for DVD changer).

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' P ')							
2	Disc code (*1)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

(*1) Disc code

Code	Select Disc
31h (1)	Disc1
32h (2)	Disc2
33h (3)	Disc3
34h (4)	Disc4
35h (5)	Disc5

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' P ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCH (low-level)							

~~2) Special conditions~~

- ~~When status code is 4Bh (DIR mode), this command is not accepted.~~

1.9.21 Disc Skip

It changes to the following disk (for DVD changer).

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' Q ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' Q ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCH (low-level)							

~~2) Special conditions~~

~~a. When status code is 4Bh (DIR mode), this command is not accepted.~~

1.9.22 Request CPU Version

This gets CPU version number.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' 1 ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' 1 ')							
2	Answer code							
3	System µ-con version number (1000 digit)							
4	System µ-con version number (100 digit)							
5	System µ-con version number (10 digit)							
6	System µ-con version number (1 digit)							
7	Drive µ-con version number (1000 digit)							
8	Drive µ-con version number (100 digit)							
9	Drive µ-con version number (10 digit)							
10	Drive µ-con version number (1 digit)							
11	Panel µ-con version number (1000 digit)							
12	Panel µ-con version number (100 digit)							
13	Panel µ-con version number (10 digit)							
14	Panel µ-con version number (1 digit)							
15	ETX (03h)							
16	BCCH (high-level)							
17	BCCH (low-level)							

2) Special condition

- This command is valids only when system status is except 'System Initialize (1) '.

1.9.23 Request Error status

This gets error status. If error occurs, it becomes stop mode.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' 2 ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' 2 ')							
2	Answer code							
3	1 st error code							
4	2 nd error code							
5	ETX (03h)							
6	BCCH (high-level)							
7	BCCH (low-level)							

2) Special condition

- If error does not occur, set ' 0 ' to byte3 and byte4.

3) Special condition

- Error code is the following.
- After error occurs, it receives only 'OPEN /CLOSE KEY '.

Error code

No.	Error code		Detail
	1 st	2 nd	
1	0x20	0x00	Loading error
2	0x21	0x00	Loading switch error
3	0x22	0x00	Forcus servo error
4	0x23	0x00	Tracking servo error
5	0x24	0x00	Can 't adjust offset value for servo circuit
6	0x25	0x00	Can 't adjust gain value for servo circuit
7	0x26	0x00	Focusing failed in playing or searching or pauseing
8	0x27	0x00	During spinup, data of disc does not read
9	0x28	0x00	During play, data of disc does not read
10	0x29	0x00	Cannot read within a preset time period in TOC reading.
11	0x2A	0x00	Subcode data does not read
12	0x2C	0x00	Command error occurs
13	0x2D	0x00	Focusing failed in scanning

1.9.24 Request Disc status

This obtains the information on the disk number reproduced now and each disk.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' 3 ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' 3 ')							
2	Answer code							
3	Current disc number code(*1)							
4	Disc1 type code(*2)							
5	Disc2 type code(*2)							
6	Disc3 type code(*2)							
7	Disc4 type code(*2)							
8	Disc5 type code(*2)							
9	ETX (03h)							
10	BCCH (high-level)							
11	BCCH (low-level)							

(*1)Current disc number code

Code	Disc Number
31h (1)	Disc 1
32h (2)	Disc 2
33h (3)	Disc 3
34h (4)	Disc 4
35h (5)	Disc 5

(*2)Disc type code

Code	Audio Format
31h (1)	DVD VIDEO
32h (2)	DVD AUDIO
33h (3)	VCD
34h (4)	CD-DA
35h (5)	CD-ROM
36h (6)	UNKNOWN
37h (7)	SACD
38h (8)	DVD VR ~~NO DISC~~
39h (9)	BD

1.10 Extention Command specification

- These Commands are extended to make it more convenient than Version 1.0.
- It makes control as same buttons of REMOTE CONTROLLER.

1.10.1 OPEN／CLOSE

This command can control Disc Tray.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' a ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' a ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCH (low-level)							

1.10.2 NTSC／PAL

This command can change the video output format.

Byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' b ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' b ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCH (low-level)							

1.10.3 HDMI Selsect

This command can change the YCbCr format or RGB format of HDMI.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' c ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' c ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCH (low-level)							

1.10.4 HDMI Format

This command can change the resolution of HDMI/DVI.

Byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' d ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' d ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCH (low-level)							

1.10.5 PROGRAM／DIRECT

This command can change the Play Mode.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' e ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' e ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCH (low-level)							

1.10.6 CLEAR

This command can erase the programmed tracks.

Byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' f ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' f ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCH (low-level)							

1.10.7 CALL

This command can displayed Programmed tracks on VFD.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' g ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' g ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCH (low-level)							

1.10.8 DISPLAY

This command can show the information on screen display.

Byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' h ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' h ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCH (low-level)							

1.10.9 REPEAT

This command can change the Repeat Mode.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' i ')							
2	Repeat code (*1)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

(*1) Repeat code

Code	Repeat Mode
31h (1)	REPEAT
32h (2)	A-B

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' i ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCH (low-level)							

1.10.10 PAGE +／－

This command can change the picture of DVD-Audio.

Byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' j ')							
2	Page code (*1)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' j ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCH (low-level)							

(*1) Rage code

Code	Page
31h (1)	+ (Plus)
32h (2)	— (Minus)

1.10.11 RANDOM

This command can change the Play Mode.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' k ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' k ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCH (low-level)							

1.10.12 MARKER

This command can show the Marker information on screen display.

Byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' l ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' l ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCH (low-level)							

1.10.13 ZOOM

This command can expand the picture.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' m ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' m ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCH (low-level)							

1.10.14 DIMMER

This command can change luminance on VFD.

Byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' n ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' n ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCH (low-level)							

1.10.15 PICTURE ADJUST

This command can show the picture adjust mode.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' o ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' o ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCH (low-level)							

1.10.16 PURE DIRECT

This command can select the mode or show the memory of pure direct.

Byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' p ')							
2	Pure Direct code (*1)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' p ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCH (low-level)							

(*1) Pure Direct code

Code	Pure Direct
31h (1)	SELECT
32h (2)	MEMORY

1.10.17 AUTO TRANSFER MODE

This command can select the Status Transfer Mode.

Byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' q ')							
2	Transfer Mode code (*1)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' q ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCH (low-level)							

(*1) Transfer Mode code

Code	Transfer Mode
31h (1)	One Time
32h (2)	Auto

1.10.18 FUNCTION

I carry out a function peculiar to a disk.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' r ')							
2	Function code (*2)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' r ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCH (low-level)							

(*2) Function code

Code	Transfer Mode
31h (1)	RED
32h (2)	GREEN
33h (3)	BULE
34h (4)	YELLOW

1.10.19 (Picture-in-Picture)

I perform a change of a Primary stream / Secondary stream / picture-in-picture.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' s ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' s ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCH (low-level)							

1.10.20 Mode

I call various functions.

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Command code (' t ')							
2	Reserve (00h)							
3	Reserve (00h)							
4	Reserve (00h)							
5	Reserve (00h)							
6	Reserve (00h)							
7	ETX (03h)							
8	BCCH (high-level)							
9	BCCH (low-level)							

1) Answers returned

byte \ bit	7	6	5	4	3	2	1	0
0	STX (02h)							
1	Reply code (' t ')							
2	Answer code							
3	ETX (03h)							
4	BCCH (high-level)							
5	BCCH (low-level)							