

***DV4001/DV6001/VC6001***

***RS-232C Control Specification***

**Category** : *DVD Player*

**Document Version** : *1.0*

**Author(s)** : *Marantz America, Inc.*

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## 1. Introduction

### 1-1. Purpose

This document was written as a reference specification of products that are controlled by the host controller.

### 1-2. Scope

This document would be using by software or hardware engineers for production of the product.

### 1-3. Abbreviations

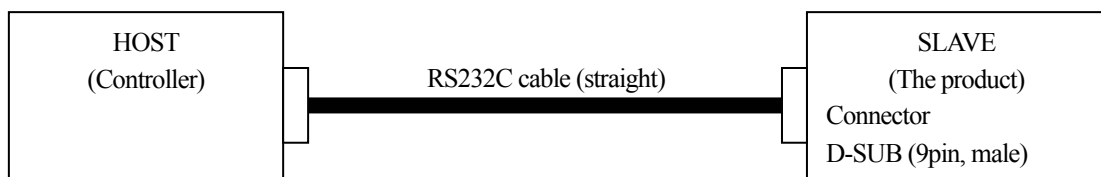
Abbreviation	Description

## 2. Global Description

### 2-1. Overview

A Host controller can control or watch out the product as a Slave very easily via the communication cable.

### 2-2. Block Diagram



\* The product connector is using D-SUB 9pin male.

\* RS232C cable must use D-SUB 9pin female to connect the products.

### 2-3. Interface connection specification of the product

uP Interface	Signal name	Connection device	D-Sub Pin	Connector
-	N.C.	-	1	<The product connector> RS232C D-SUB (9pin, Male)
UART	TxD (output)	RS232C Level shift driver	2	
	RxD (input)		3	
-	N.C.	-	4	 Stereo Mini Jack (Ø3.5mm)
-	<b>GND</b>	GND	5	
-	N.C.	-	6	
-	N.C.	-	7	
-	N.C.	-	8	
-	N.C.	-	9	

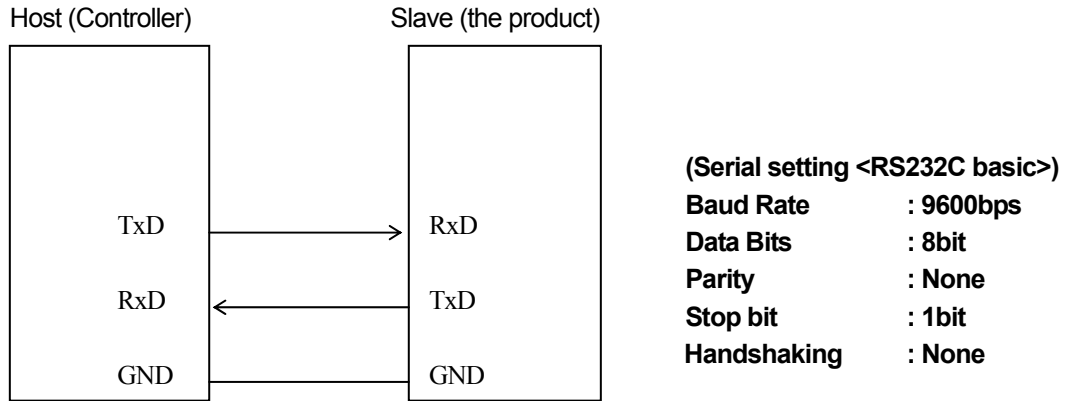
### 2-4. Assumptions and Dependencies

### 3. Detailed Description

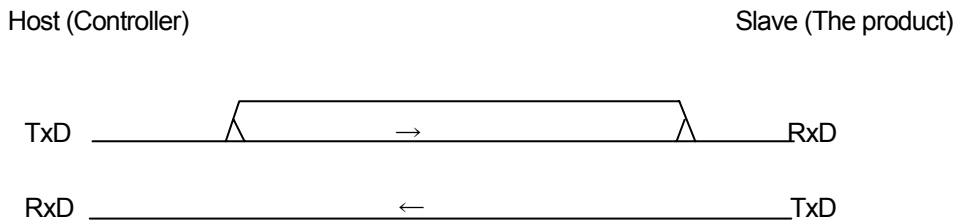
The interface specification between the product and a Host controller is described below.

#### 3-1. Connection format

##### 3-1-1. Physical connection

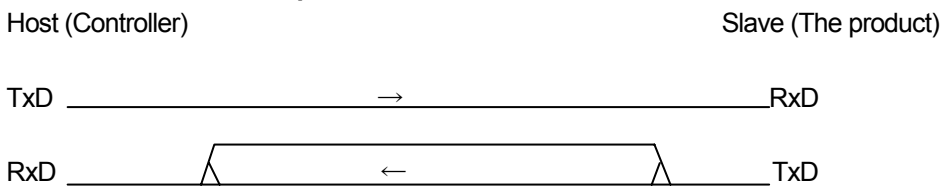


##### 3-1-1-1. Data transmission sequence from Host to Slave



1. Host starts a data transmission from TxD.
2. Host performs the data transmission of the number of required bytes, and ends a transmission.

##### 3-1-1-2. Data transmission sequence from Slave to Host



1. Slave starts a data transmission from TxD.
2. Slave performs the data transmission of the number of required bytes, and ends a transmission.

### 3-2. Transmission data format

#### 3-2-1. Transmission data format from Host to Slave

There are two kinds of transmission data form from Host shown below.

##### 3-2-1-1. Form1: Command

Command is a data that requests some status change.

Start character : '@'  
 COMMAND : see "Command list"  
 End character (CR) : 0Dh

start	command	end
'@'	"xxx:"+"..."	0Dh

##### 3-2-1-2. Form2: Status request

Status request is a data that requests a answer of some status.

Start character : '@'  
 Request status : see "Status request list"  
 Request character : '?'  
 End character (CR) : 0Dh

start	request status	end
'@'	"xxx:?"+"..."	0Dh

#### 3-2-2. Transmission data format from Slave to Host

There are two kinds of transmission data form from Slave shown below.

##### 3-2-2-1. Form1: ACK/NAK

ACK is a reply data from Slave when Slave got an acceptable command data from Host.  
 (ACK is sent to Host when Slave has no related status by the Command.)

Start character : '@', ACK : 06h, End character (CR) : 0Dh

start	ACK	CR
'@'	06h	0Dh

NAK is a reply data from Slave when Slave got an incorrect Command data, Status request data or some other data from Host.

Start character : '@', NAK : 15h, End character (CR) : 0Dh

start	NAK	CR
'@'	15h	0Dh

##### 3-2-2-2. Form2: Status answer and Auto status feedback

Status answers are reply data when Slave got an acceptable Request status or Command data from Host. Auto status feedbacks are sent to Host data when a Slave's status is changed.

Start character : '@'  
 Answer character : see "Status list"  
 End character (CR) : 0Dh

start	status	end
'@'	"xxx:"+"..."	0Dh

### 3-3. The transaction sequences and the regulations

#### 3-3-1. The transaction sequences

The transactions have three kinds of sequence.

- \*A transaction is a Command from Host then Slave will be an answer by Status answer, ACK or NAK.
- \*A transaction is a Status request from Host then Slave will be an answer by Status answer or NAK.
- \*A transaction is Auto status feedback from Slave when a Slave's status changed. (If the auto status feedback is enabled.)

#### 3-3-2. The transaction regulations

The transactions have some kinds of regulation.

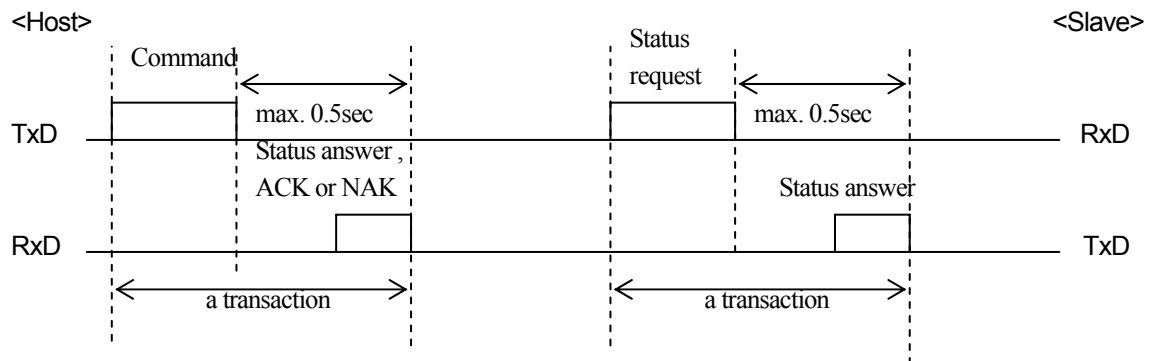
- \* An answer (ACK, NAK or Status answer) transmission from the Slave has to finish within 500ms when got a Command or a Status request from Host.
- \* Host must not transmit an another Command or Status request until "it receives a answer by a previous Command or Status request" or "it passes a term of waiting time from a finishing of previous transmission of a Command or a Status request".
- \* Slave has to finish a transaction under 500ms when it sends Auto status feedback data.

#### 3-3-3. Specification of Auto status feedback

There are some specific regulations about Auto status feedback.

- \* The product status has segmented into **four layers of 1, 2, 3 and 4**.
- \* The status of layer 1 is assigned most kindly status to Host. (The statuses of layer 2 are assigned kindly status, the statuses of layer 3 are not so need status to Host and the statuses of layer 4 are probably no wished statuses.)
- \* Each layer status can control transmit enable or disable by Host command. (The product default would be all disables.)
- \* Slave sends auto status feedback by itself when the status is changed and if the status feedback is enabled.
- \* The product defined and segmentation layers are taking in status list.

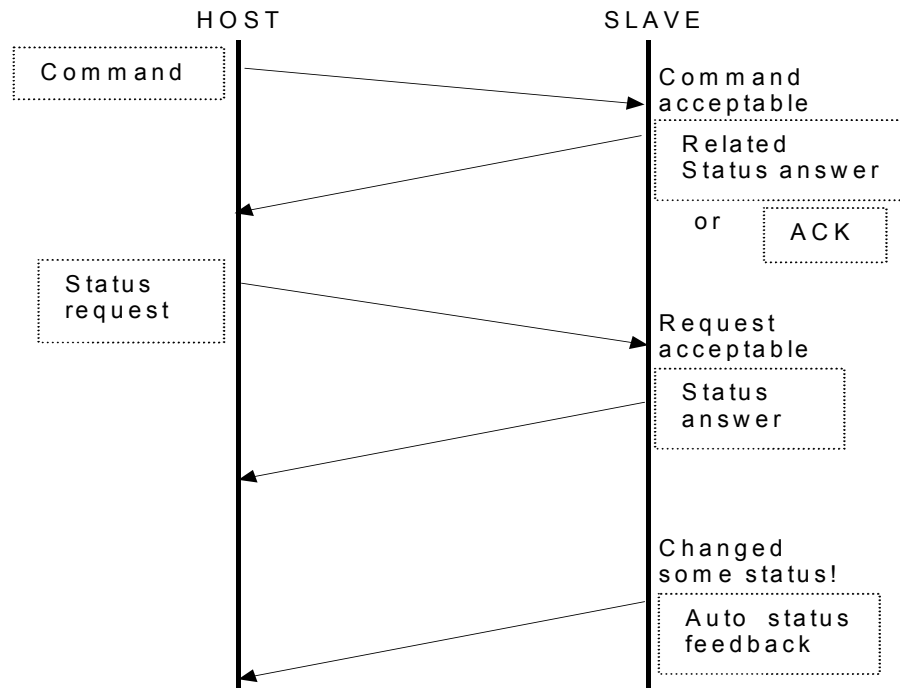
#### 3-3-4. Example of the transactions



Example of the transactions

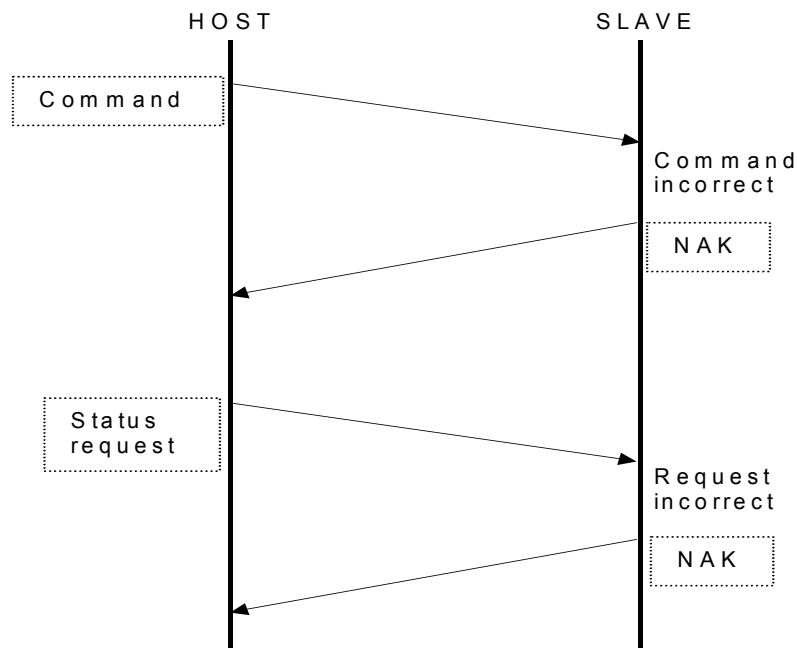
3-3-5. Examples of the handshaking flowchart

3-3-5-1. Example of successful handshaking



The product can reply ACK instead of related status, if the product can not send the related status immediately.

3-3-5-2. Examples of handshaking error



#### 4. Recommendations of Command, Status and Layer definition

- All Commands, Statuses and Layers will be defined other specific document.
- **[MANDATORY]** The product **MUST** have Commands and the Statuses same as a remote controller buttons (IR controller) of the product.
- All Commands are required working by discrete as ON/OFF commands. (It means that do not support TOGGLE command only.)
- All Commands and Statuses are defined same character size except ACK/NAK on the product. ( Recommended character length : 3~6 characters )
- It permits attaching 0x0A character to a reply characters from the product. In this case, must suppose that the object is followed altogether.
- Recommend to supports numbers or values direct setting command, if it has variable numbers or values.



## 5. Commands

### 5-1. Regular Commands

Command			Reply	
Function	Operation	Command	Command	Function Status
POWER	TOGGLE	PWR:0	TOGGLE	TOGGLE
	OFF	PWR:1	PWR:1	POWER OFF
	ON	PWR:2	PWR:2	POWER ON
TRAY	TOGGLE	TRY:0	TOGGLE	TOGGLE
	OPEN	TRY:1	TRY:1	TRAY OPEN
	CLOSE	TRY:2	TRY:2	TRAY CLOSE
DIMMER	TOGGLE	DIM:0	TOGGLE	TOGGLE
	DIMMER 1	DIM:1	DIM:1	Bright
	DIMMER 2	DIM:2	DIM:2	Little dark
	DIMMER 3	DIM:3	DIM:3	Dark
REPEAT	TOGGLE	REP:0	TOGGLE	TOGGLE
	REPEAT OFF	REP:1	REP:1	REPEAT OFF
	REPEAT 1	REP:2	REP:2	TRACK/CHAPTER
	REPEAT 2	REP:3	REP:3	TITLE/GROUPE
	REPEAT 3	REP:4	REP:4	ALL
PLAY MODE	STOP	PMD:1	PMD:0 PMD:1	RESUME STOP STOP
	PAUSE	PMD:2	PMD:2	PAUSE
	PLAY	PMD:3	PMD:3	PLAY
	SLOW FWD	PMD:4	PMD:5	SLOW FWD
	SLOW REV	PMD:5	PMD:6	SLOW REV
	FAST FWD	PMD:6	PMD:7	FAST FWD
	FAST REV	PMD:7	PMD:8	FAST REV
GO TO TRACK	NEXT	GOT:0	NO REPLY	
	PREV	GOT:1	NO REPLY	
RANDOM	TOGGLE	RDM:0	TOGGLE	TOGGLE
	RANDOM OFF	RDM:1	RDM:1	RANDOM OFF
	RANDOM ON	RDM:2	RDM:2	RANDOM ON
	RANDOM REPEAT	RDM:3	RDM:3	RANDOM REPEAT
NUMERIC KEY	0	NUM:0	NO REPLY	
	1	NUM:1		
	2	NUM:2		
	3	NUM:3		
	4	NUM:4		
	5	NUM:5		
	6	NUM:6		
	7	NUM:7		
	8	NUM:8		
	9	NUM:9		

Command			Reply	
Function	Operation	Command	Command	Function Status
SOUND MODE	TOGGLE	SMD:0	TOGGLE	TOGGLE
	SOUND MODE 1	SMD:1	SMD:1	STEREO
	SOUND MODE 2	SMD:2	SMD:2	VIRTUAL
	SOUND MODE 3	SMD:3	SMD:3	LT/RT (DV4001) MULCH CH (DV6001/VC6001)
A-B REPEAT	STEP	A-B:0	A-B:1	OFF
			A-B:2	SET A
			A-B:3	SET A-B
ASPECT	4:3 PAN SCAN	ASP:0	ASP:0	4:3 PAN SCAN
	4.3 LETTER BOX	ASP:1	ASP:1	4.3 LETTER BOX
	16:9WIDE	ASP:2	ASP:2	16:9WIDE
SUBTITLE	TOGGLE	SBT:0	SBT:**/**	TOGGLE Select subtitle: **/** is number of subtitle on the disc. 00/** means subtitle off
ANGLE	TOGGLE	ANG:0	ANG:**/**	TOGGLE Select angle: **/** is number of angle on the disc
ZOOM	TOGGLE	ZOM:0	TOGGLE	TOGGLE
	ZOOM OFF	ZOM:1	ZOM:1	ZOOM OFF
	ZOOM 1	ZOM:2	ZOM:2	X2
	ZOOM 2	ZOM:3	ZOM:3	X3
	ZOOM 3	ZOM:4	ZOM:4	X4
	ZOOM 4	ZOM:5	ZOM:5	X 1/2
	ZOOM 5	ZOM:6	ZOM:6	X1/3
	ZOOM 6	ZOM:7	ZOM:7	X1/4
AUDIO EX	TOGGLE	AEX:0	TOGGLE	TOGGLE
	OFF	AEX:1	AEX:1	OFF
	ON	AEX:2	AEX:2	ON
ENTER		ENT:0	NO REPLY	ENTER
CURSOR	UP	CUR:0	NO REPLY	UP
	DOWN	CUR:1	NO REPLY	DOWN
	RIGHT	CUR:2	NO REPLY	RIGHT
	LEFT	CUR:3	NO REPLY	LEFT
RETURN (Go Up)	TOGGLE	RTN:0	NO REPLY	RETURN
MENU	TOGGLE	MNU:0	NO REPLY	MENU
TOP MENU	TOGGLE	MN:0	NO REPLY	TOP MENU
SET UP	TOGGLE	SUP:0	SUP:0	TOGGLE
	SET UP ON	SUP:2 (DV4001) SUP:1 (DV6001/VC6001)	SUP:2 (DV4001) SUP:1 (DV6001/VC6001)	SET UP ON
	SET UP OFF	SUP:1 (DV4001) SUP:2 (DV6001/VC6001)	SUP:1 (DV4001) SUP:2 (DV6001/VC6001)	SET UP OFF

Command			Reply	
Function	Operation	Command	Command	Function Status
DISPLAY	TOGGLE	DSP:0	TOGGLE	TOGGLE
	DISPLAY OFF	DSP:1	DSP:1	DISPLAY OFF
	DISPLAY ON	DSP:2	DSP:2	DISPLAY ON
SCREEN SAVER	TOGGLE	SAV:0	TOGGLE	TOGGLE
	OFF	SAV:1	SAV:1	OFF
	ON	SAV:2	SAV:2	ON
PROGRAM	PROGRAM OFF	PRG:1	PRG:1	OFF
	PROGRAM ON	PRG:2	PRG:2	ON
SLEEP TIME	15MINS	SLP:0	SLP:1	15MINS
	30MINS	SLP:1	SLP:2	30MINS
	45MINS	SLP:2	SLP:3	45MINS
	60MINS	SLP:3	SLP:4	60MINS
DIGITAL AUDIO	OFF	DIG:0	DIG:0	OFF
	ALL	DIG:1	DIG:1	ALL
	PCM ONLY	DIG:2	DIG:2	PCM
LPCM SETTING	48kHz	PCM:0	PCM:0	48kHz
	96kHz	PCM:1	PCM:1	96kHz
NIGHT MODE	OFF	DRC:0	DRC:0	OFF
	ON	DRC:1	DRC:1	ON
CD UPSAMPLING	OFF	UPS:0	UPS:0	OFF
	88.2kHz	UPS:1	UPS:1	88.2kHz
	176.4kHz	UPS:2	UPS:2	176.4kHz
TV TYPE	NTSC	TVS:0	TVS:0	NTSC
	PAL	TVS:1	TVS:1	PAL
	MULTI	TVS:2	TVS:2	MULTI
SCAN	TOGGLE	SCN:0	SCN:0	SCAN MENU ON
			SCN:1	SCAN MENU OFF
AUDIO	TOGGLE	AUD:0	NO REPLY	Operation is same as RC unit
HDMI AUDIO	TOGGLE	HDA:0	HDA:1	ON (DV4001) AUTO (DV6001/VC6001)
			HDA:2	MULTI PCM (DV6001/VC6001)
			HDA:3	2ch PCM (DV6001/VC6001)
			HDA:4	OFF
HDMI/DVI ON/OFF	TOGGLE	HDM:0	HDM:0	TOGGLE
	OFF	HDM:1	HDM:2	OFF
	ON	HDM:2	HDM:1	ON
DISC (VC6001 Only)	Disc 1	DSC:1	NO REPLY	Select Disc 1
	Disc 2	DSC:2		Select Disc 2
	Disc 3	DSC:3		Select Disc 3
	Disc 4	DSC:4		Select Disc 4
	Disc 5	DSC:5		Select Disc 5
	Disk Skip (+)	DSC:6		Select Next Disc

Command			Reply	
Function	Operation	Command	Command	Function Status
<b>AUTO STATUS FEEDBACK</b>	AST:x (x =0 to F) bit 3: Layer4 (1=ENABLE, 0=DISABLE) bit 2: Layer3 (1=ENABLE, 0=DISABLE) bit 1: Layer2 (1=ENABLE, 0=DISABLE) bit 0: Layer1 (1=ENABLE, 0=DISABLE)  Example; AST:0 (0000→ All layer Off) AST:3 (0011→ Layer 1 & 2 On) AST:A (1010→ layer 2 & 4 On) AST:F (1111→ All layer On)			Same as command define

## 5-2. Request Commands

Request command		Reply command (Status)		Auto Status feedback Layer
<b>POWER</b>	PWR:?	PWR:1	OFF	Layer1
		PWR:2	ON	
<b>TRAY</b>	TRY:?	TRY:1	OPENED	
		TRY:2	CLOSED	
<b>PLAY MODE</b>	PMD:?	PMD:0	RESUME STOP	
		PMD:1	STOP	
		PMD:2	PAUSE	
		PMD:3	PLAY	
		PMD:4	SLOW FWD	
		PMD:5	SLOW REV	
		PMD:6	FAST FWD	
<b>SOUND MODE</b>	SMD:?	SMD:1	STEREO	
		SMD:2	VERTUAL	
		SMD:3	LT/RT (DV4001) MULCH CH(DV6001)	
<b>A-B REPEAT</b>	A-B:?	A-B:1	OFF	
		A-B:2	SET A	
		A-B:3	SET A-B	
<b>ZOOM</b>	ZOM:?	ZOM:1	ZOOM OFF	
		ZOM:2	X2	
		ZOM:3	X3	
		ZOM:4	X4	
		ZOM:5	X 1/2	
		ZOM:6	X1/3	
<b>DISPLAY</b>	DSP:?	DSP:1	DISPLAY OFF	
		DSP:2	DISPLAY ON	
<b>SCAN</b>	SCN:?	SCN:1	OFF	
		SCN:2	ON	

Request command		Reply command (Status)		Auto Status feedback Layer
Kind of DISC	KOD:?	KOD:0	NO DISC	Layer2
		KOD:1	CD	
		KOD:2	VCD	
		KOD:3	DVD-Video	
		KOD:4	DVD-Audio	
		KOD:5	SACD	
REPEAT MODE	REP:?	REP:1	REPEAT OFF	
		REP:2	TRACK/CHAPTER	
		REP:3	TITLE/GROUPE	
		REP:4	ALL	
RANDOM	RDM:?	RDM:1	RANDOM OFF	
		RDM:2	RANDOM ON	
		RDM:3	RANDOM REPEAT	
ASPECT	ASP:?	ASP:0	4:3 PAN SCAN	
		ASP:1	4.3 LETTER BOX	
		ASP:2	16:9WIDE	
AUDIO EX	AEX:?	AEX:1	OFF	
		AEX:2	ON	
SET UP	SUP:?	SUP:1	SET UP ON	
		SUP:2	SET UP OFF	
PROGRAM	PRG:?	PRG:1	OFF	
		PRG:2	ON	
DIGITAL AUDIO	DIG:?	DIG:0	OFF	
		DIG:1	ALL	
		DIG:2	PCM ONLY	
LPCM SETTING	PCM:?	PCM:0	48kHz	
		PCM:1	96kHz	
CD UPSAMPLING	UPS:?	UPS:0	OFF	
		UPS:1	88.2kHz	
		UPS:2	176.4kHz	
HDMI AUDIO	HDA:?	HDA:1	ON (DV4001) AUTO (DV6001/VC6001)	
		HDA:2	MULTI PCM (DV6001/VC6001)	
		HDA:3	2ch PCM (DV6001/VC6001)	
		HDA:4	OFF	
HDMI ON/OFF	HDM:?	HDM:1	ON	
		HDM:2	OFF	
SCREEN SAVER	SAV:?	SAV:1	OFF	
		SAV:2	ON	
SLEEP TIME	SLP:?	SLP:0	15MINS	Layer3
		SL:1	30MINS	
		SLP:2	45MINS	
		SLP:3	60MINS	
		SLP:5	OFF	

Request command		Reply command (Status)		Auto Status feedback Layer
NIGHT MODE(DRC)	DRC:?	DRC:0	OFF	
		DRC:1	ON	
TV TYPE	TVS:?	TVS:0	NTSC	
		TVS:1	PAL	
		TVS:2	MULTI	
READ HOST I/F SOFTWARE VERSION	RSV:?	RSV:01	RS232 board sw version	
AUTO STATUS FEEDBACK	AST:?	Refer the REGULAR COMMAND list		

## 6. Revision history

Ver.	Date	Owner	Change description
1.0	12/08/06	Marantz America, Inc.	Issued Revision1.0