

**SONY®**

VIDEO PROJECTOR

**VPL-HW15**

**VPL-HW20**

**VPL-HW20A**

PROTOCOL MANUAL  
1st Edition (Revised 2)

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# 1. Overview

## 1-1. Introduction

The projector is remotely controllable over RS-232C. It is useful for setting up the projector away from the operator.

This protocol manual describes the specifications such as packet format and procedures for controlling the projector.

In the following sections below, the term “CONTROLLER” is used as a device which controls the projector. CONTROLLER can be a PC or other specific device that is able to handle RS-232C.

Although most of commands are available for RS-232C.

## 1-2. Glossary of Terms

Table 1-1 Glossary of Terms

Terms	Abbreviated	Description
CONTROLLER	–	Command initiator such as PCs.
PROJECTOR	–	Front projector.

## 1-3. Protocol Stack Structure

The protocol stack structure diagram is shown below. Though the stack is drawn for RS-232C, the following portions are common.

Table 1-2 Common Portions in Protocol Stack

Layer Name	Description
Sub Command	Value is assigned for projector's functions. Refer to the section 2-1 for detail description.
Simplified Command	Packet format for sending/receiving “Sub Command”. Refer to the section 3-4-1 for detail description.

(1) RS-232C

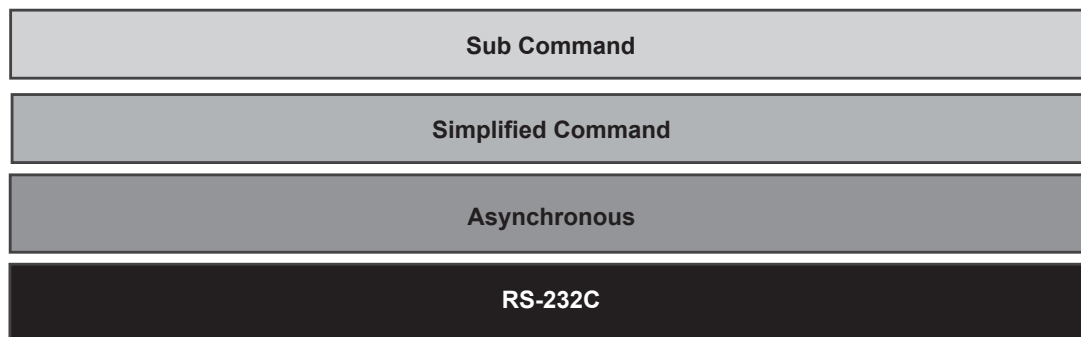


Fig. 1-1 RS-232C Protocol Stack

“RS-232C” layer is physical portion and “Asynchronous” is the traditional protocol layer as shown in the section 3-2.

## 2. Common Commands

### 2-1. Sub Commands

Sub Command is the value which is used by Simplified Command. Value is assigned for executing function. For example, if you want to change the picture mode, the appropriate value assigned for the desired picture mode should be chosen.

#### 2-1-1. ITEM List

Item list tables are described below. Tables are shown per function category.

Table 2-1 ITEM List For Picture

<Table 1>			<Table 2>			Remarks
Item Number			Data			
Item	Upper byte	Lower byte	Data	Upper byte	Lower byte	
Picture Mode	00h	02h	Dynamic	0000h		Set/Get
			Standard	0001h		
			Cinema	0002h		
			User1	0003h		
			User2	0004h		
			User3	0005h		
Contrast	00h	10h	0000h to 0064h (0 to 100)			
Brightness	00h	11h	0000h to 0064h (0 to 100)			
Color	00h	12h	0000h to 0064h (0 to 100)			
Hue	00h	13h	0000h to 0064h (0 to 100)			
Sharpness	00h	14h	0000h to 0064h (0 to 100)			
Color Temp.	00h	17h	High	0000h		
			Mid	0001h		
			Low	0002h		
			Custom1	0003h		
			Custom2	0004h		
			Custom3	0005h		
			Custom4	0006h		
Lamp Control	00h	1Ah	Low	0000h		
			High	0001h		
Black Level Adj.	00h	1Ch	Off	0000h		
			Low	0001h		
			High	0002h		
Advanced Iris	00h	1Dh	Off	0000h		
			Manual	0001h		
			Auto1	0002h		
			Auto2	0003h		
Real Color Processing	00h	1Eh	Off	0000h		
			User1	0001h		
			User2	0002h		
			User3	0003h		

<Table 1>			<Table 2>			Remarks
Item Number			Data			
Item	Upper byte	Lower byte	Data	Upper byte	Lower byte	
Film Mode	00h	1Fh	Off	0000h		Set/Get
			Auto	0002h		
Gamma Correction	00h	22h	Off	0000h		
			Gamma 1	0001h		
			Gamma 2	0002h		
			Gamma 3	0003h		
			Gamma 4	0004h		
			Gamma 5	0005h		
			Gamma 6	0006h		
NR	00h	25h	Off	0000h		
			Low	0001h		
			Middle	0002h		
			High	0003h		
Block NR	00h	26h	Off	0000h		
			Low	0001h		
			Middle	0002h		
			High	0003h		
Mosquito NR	00h	27h	Off	0000h		
			Low	0001h		
			Middle	0002h		
			High	0003h		
Color Space	00h	3Bh	Normal	0000h		
			Wide	0001h		
USER GAIN RED	00h	50h		FFE2h to 001Eh (-30 to 30)		
USER GAIN GREEN	00h	51h		FFE2h to 001Eh (-30 to 30)		
USER GAIN BLUE	00h	52h		FFE2h to 001Eh (-30 to 30)		
USER BIAS RED	00h	53h		FFE2h to 001Eh (-30 to 30)		
USER BIAS GREEN	00h	54h		FFE2h to 001Eh (-30 to 30)		
USER BIAS BLUE	00h	55h		FFE2h to 001Eh (-30 to 30)		
Iris Sensitivity	00h	56h	Recommend	0000h		
			Fast	0001h		
			Slow	0002h		
Iris Manual	00h	57h		0000h to 0064h (0 to 100)		
xvColor	00h	5Ah	Off	0000h		
			On	0001h		

Table 2-2 ITEM List For Screen

<Table 1>			<Table 2>			Remarks
Item Number			Data			
Item	Upper byte	Lower byte	Data	Upper byte	Lower byte	
Wide Mode	00h	20h	Full	0000h		Set/Get
			Normal	0001h		
			Wide Zoom	0002h		
			Zoom	0003h		
			Full1	0007h		
			Full2	0008h		
Over Scan	00h	23h	Off	0000h		
			On	0001h		
Screen Area	00h	24h	Full	0000h		
			Through	0001h		

Table 2-3 ITEM List For Setup

<Table 1>			<Table 2>			Remarks
Item Number			Data			
Item	Upper byte	Lower byte	Data	Upper byte	Lower byte	
Input	00h	01h	Video	0000h		Set/Get
			S Video	0001h		
			Input A	0002h		
			Component	0003h		
			HDMI1	0004h		
			HDMI2	0005h		
Picture Muting	00h	30h	Off	0000h		
			On	0001h		
Input-A Signal Sel	00h	32h	Auto	0000h		
			Computer	0001h		
			Component	0002h		
			Video GBR	0003h		



Table 2-4 ITEM List For Status

<Table 1>			<Table 2>			Remarks
Item Number			Data			
Item	Upper byte	Lower byte	Data	Upper byte	Lower byte	
Status Error	01h	01h	NO ERROR	0000h		Get only
			LAMP ERROR	0001h		
			FAN ERROR	0002h		
			COVER ERROR	0004h		
			TEMP ERROR	0008h		
			D5V ERROR	0010h		
			POWER ERROR	0020h		
			TEMP WARNING	0040h		
			NVM Data ERROR	0080h		
Status Power	01h	02h	STANBY	0000h		
			START UP	0001h		
			STARTUP LAMP	0002h		
			POWER ON	0003h		
			COOLING1	0004h		
			COOLING2	0005h		
			SAVING COOLING1	0006h		
			SAVING COOLING2	0007h		
			SAVING STABY	0008h		
Lamp Timer	01h	13h	USE TIME	0000h-FFFFh *1		
Status Error (2)	01h	25h	NO ERROR	0000h		
			HIGHLAND WARNING	0020h		

\*1 Example) In case the lamp timer indicates 1000H, return values are [03h] upper byte and [E8h] lower byte.

Table 2-5 ITEM List For Infrared Remote Command

<Table 1>			<Table 2>			Remarks
Item Number			Data			
Item	Upper byte	Lower byte	Data	Upper byte	Lower byte	
Infrared Remote Command (15 bit category)	17h	Refer to the section 2-1-2*1.		00h	00h	Set Only
Infrared Remote Command (20 bit category)	19h	Refer to the section 2-1-2*1. (Table 2-6 to Table 2-9)		00h	00h	
Infrared Remote Command (20 bit category)	1Bh	Refer to the section 2-1-2*1. (Table 2-10)		00h	00h	

\*1: By using this Item Number, it is possible to simulate the infrared remote controller.  
Choose your desired Code from the table in the section 2-1-2 and use it as the Lower byte of Item Number.

**Note**

Depending on the category, different value (Upper byte) is assigned.

## 2-1-2. Infrared Remote Command Code

Tables are shown per function category.

- 15 bit PROJECTOR: Table 2-6 to Table 2-9
- 20 bit PROJECTOR-E: Table 2-6 to Table 2-9
- 20 bit PROJECTOR-EE: Table 2-10

**Table 2-6 Infrared Remote Command Code For Picture**

CATEGORY		Code	Name
15 bit PROJECTOR	20 bit PROJECTOR-E		
○	–	07	BLACK LEVEL
○	–	18	CONTRAST +HIGH
○	–	19	CONTRAST –LOW
○	–	1A	COLOR +HIGH
○	–	1B	COLOR –LOW
○	–	1E	BRIGHTNESS +BRIGHT
○	–	1F	BRIGHTNESS –DARK
○	–	20	HUE +GREENISH
○	–	21	HUE –PURPLISH
○	–	22	SHARPNESS +SHARP
○	–	23	SHARPNESS –SOFT
–	○	08	RCP
–	○	09	ADJUST PICTURE TOGGLE
–	○	4B	COLOR SPACE TOGGLE
–	○	51	PICTURE MODE DYNAMIC
–	○	52	PICTURE MODE STANDARD
–	○	53	PICTURE MODE CINEMA
–	○	54	PICTURE MODE USER1
–	○	55	PICTURE MODE USER2
–	○	56	PICTURE MODE USER3
–	○	5B	PICTURE MODE TOGGLE
–	○	5C	COLOR TEMP TOGGLE
–	○	5E	GAMMA COLLECTION TOGGLE
–	○	5F	IRIS MODE TOGGLE

Table 2-7 Infrared Remote Command Code For Screen

CATEGORY		Code	Name
15 bit PROJECTOR	20 bit PROJECTOR-E		
○	–	47	PITCH
○	–	48	SHIFT
–	○	60	APA
–	○	61	PHASE
–	○	6E	WIDE MODE TOGGLE

Table 2-8 Infrared Remote Command Code For Setup

CATEGORY		Code	Name
15 bit PROJECTOR	20 bit PROJECTOR-E		
○	–	15	POWER ON/OFF*1
○	–	24	PICTURE MUTING
○	–	25	STATUS ON
○	–	26	STATUS OFF
○	–	29	MENU
○	–	2A	VIDEO
○	–	2B	INPUT A
○	–	2C	COMPONENT
○	–	2E	POWER ON*1
○	–	2F	POWER OFF
○	–	33	CURSOR →
○	–	34	CURSOR ←
○	–	35	CURSOR ↑
○	–	36	CURSOR ↓
○	–	57	INPUT SELECT
○	–	5A	ENTER
○	–	5F	S VIDEO
○	–	6F	HDMI 1
○	–	70	HDMI 2
○	–	7B	RESET

\*1: Send the command twice when this unit is in standby mode (Low) state.

Table 2-9 Infrared Remote Command Code For Installation

CATEGORY		Code	Name
15 bit PROJECTOR	20 bit PROJECTOR-E		
–	○	00	V KEYSTONE+
–	○	01	V KEYSTONE–
–	○	3A	V KEYSTONE
–	○	78	LENS CONTROL

Table 2-10 Infrared Remote Command Code for 20 bit PROJECTOR-EE

CATEGORY	Code	Name
<b>20 bit PROJECTOR-EE</b>		
○	6E	OPTIONS
○	6F	EXIT
○	70	SYNC MENU ON/OFF
○	71	PLAY
○	72	STOP
○	73	PAUSE
○	74	FAST REWIND
○	75	FAST FORWARD
○	76	PREVIOUS
○	77	NEXT

## 2-2. Reply

<Table 3>			
Item Number		Data	
Item	Data	Upper byte	Lower byte
ACK	COMPLETE	00h	00h
NAK	UNDEFINED COMMAND	01h	01h
	SIZE ERROR		04h
	SELECT ERROR		05h
	RANGE OVER		06h
	NOT APPLICABLE		0Ah
	CHECK SUM ERROR	F0h	10h
	FRAMING ERROR		20h
	PARITY ERROR		30h
	OVER RUN ERROR		40h
	OTHER COMM ERROR		50h

### Error description

#### Check Sum Error

A check sum error occurred.

#### Framing Error

A framing error occurred.

#### Parity Error

A parity error occurred.

#### Over Run Error

An overrun error occurred.

#### Other Comm Error

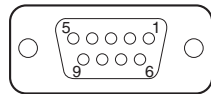
Another error occurred.

### 3. RS-232C

#### 3-1. Connection

The RS-232C pin assignment is shown below.

**REMOTE:** RS-232C (D-sub 9-pin, Female)



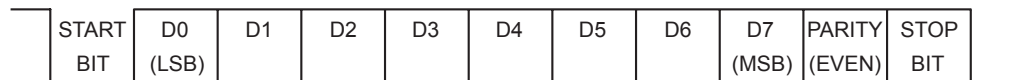
– EXT VIEW –

Pin No.	Signal name	Function
1	N.C.	–
2	RxD	Receive Data
3	TxD	Transmit Data
4	N.C.	–
5	GND	Signal Ground
6	N.C.	–
7	N.C.	–
8	N.C.	–
9	N.C.	–

#### 3-2. Communication Specifications

- Full duplex communication channels (Flow control not performed.)
- Start-stop synchronism system
- Baud rate: 38.4 kbps (bits per second)
- The bit configuration is defined as follows.

1 START Bit + 8 DATA Bits + 1 PARITY Bit + 1 STOP Bit



EVEN Parity ..... Total number of “1”s from D0 to D7 is an even number. ⇒ 0  
 ..... Total number of “1”s from D0 to D7 is an odd number. ⇒ 1

### 3-3. Communication Procedure

RS-232C communication sequence is shown below. Each command must be issued by CONTROLLER and PROJECTOR responses to it.

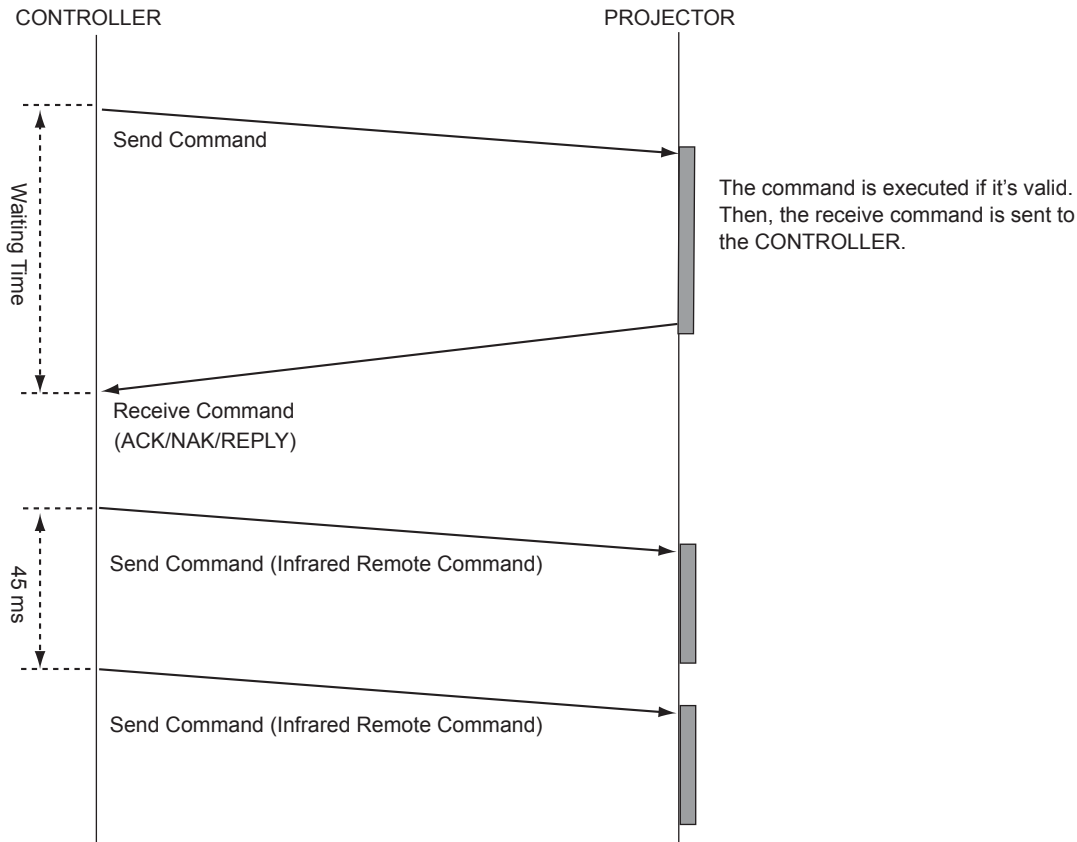


Fig. 3-1 Command Sequence

It is prohibited that CONTROLLER send another command before receiving the response to the previous command. Since PROJECTOR executes the command before sending the return data, CONTROLLER must wait a while before receiving the response. The waiting time depends on the commands. Approximate waiting time is shown below.

**30 to 2500 milliseconds**

**Note**

No response is sent for Infrared Remote Command. Therefore, it should be waited for 45 milliseconds before sending the next command.

### 3-4. Command Block Format

There is one type of block format for RS-232C as shown in the Fig. 1-1. In this section, the block format for Simplified Command is provided.

#### 3-4-1. Simplified Command

##### [Send]

The block format for sending request is shown below.

B0	START CODE	[A9h]
B1	ITEM NUMBER	Put the item number. Refer to the item list in the sections 2-1-1 and 2-1-2.
B2		
B3	TYPE	SET: 00h (Set data) GET: 01h (Get data)
B4	DATA	SET: Put the Data value described in the item list in the sections 2-1-1 and 2-1-2. GET: Unused. Set Dummy data [00h, 00h]
B5		
B6	CHECK SUM*1	Check Sum
B7	END CODE	[9Ah]

##### [Receive (without data)]

The block format for response which includes no return data is shown below. Response is always sent by PROJECTOR.

B0	START CODE	[A9h]
B1	ACK / NAK	Refer to the reply definition table in the section 2-2.
B2		
B3	TYPE	[03h]
B4	DUMMY DATA	This data does not mean any senses. Dummy Data [00h, 00h] is stored.
B5		
B6	CHECK SUM*1	Check Sum
B7	END CODE	[9Ah]

##### [Receive (with data)]

The block format for response which includes return data is shown below. Response is always sent by PROJECTOR.

B0	START CODE	[A9h]
B1	ITEM NUMBER	Refer to the item list in the sections 2-1-1 and 2-1-2.
B2		
B3	TYPE	[02h] Express data to be Reply data
B4	DATA	Data value described in the item list in the sections 2-1-1 and 2-1-2.
B5		
B6	CHECK SUM*1	Check Sum
B7	END CODE	[9Ah]

\*1: CHECK SUM: B1 to B5 are calculated by OR. Refer to the example below.

```
<Example of Calculation>
0xA9  1010  1001  0xA9  1010  1001
0xA9  1010  1001  0x9A  1001  1010
Answer 1010  1001  Answer 1011  1011
                                0xA9  0xBB
```

## 3-5. Packet Examples

### 3-5-1. Change “Wide Mode” to “Zoom”

START CODE = A9h  
ITEM NUMBER = 0020h (Wide Mode)  
SET/GET = 00h (SET)  
DATA = 0003h (Zoom)  
CHECK SUM = 23h  
END CODE = 9Ah

You will receive the packet below if the process is successfully completed.

START CODE = A9h  
ACK/NAK = 0000h (Complete)  
ACK = 03h  
DUMMY DATA = 0000h  
CHECK SUM = 03h  
END CODE = 9Ah

There’s another way to realize the same purpose. There is “WIDE MODE TOGGLE” key on the infrared remote controller. By using this key, wide mode can be changed. Issue the Infrared Remote Command for this key several times to set wide mode “Zoom”. Packet format will make as follows. Refer to the Table 2-7 for wide mode toggle.

START CODE = A9h  
ITEM NUMBER = 196Eh (WIDE MODE TOGGLE)  
SET/GET = 00h (SET)  
DATA = 0000h  
CHECK SUM = 7Fh  
END CODE = 9Ah

## 3-6. AMX Device Discovery

This model is equipped with the protocol that conforms to the Device Discovery stipulated by AMX. Contact AMX for details about the Device Discovery.



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9-968-699-03

Sony Corporation

Printed in Japan  
2010. 8 32  
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