

PROTOCOL MANUAL

MODEL
.....

DEST.
.....

VPL-PX32

WORLD

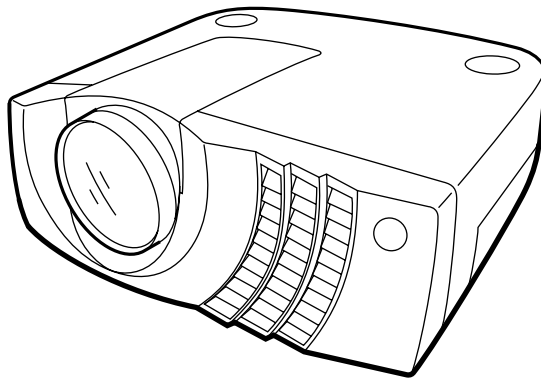
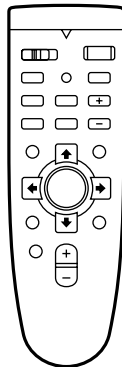
MODEL
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DEST.
.....

RM-PJM15

WORLD

VERSION 1.0



DATA PROJECTOR

SONY[®]

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1. Introduction

This protocol manual describes the basic configuration and basic operations of various commands used for projector. Projector can be controlled using the commands in the List of Commands provided in Section 9 “COMMANDS”. Using an external CONTROLLER , etc., inputs can be switched and the power can also be turned on and off. In the following paragraphs, “CONTROLLER” means an external device such as a PC which controls projector using these commands.

2. Communication Specifications

<RS-232C Communication Signal>

- 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

	START BIT	D0 (LSB)	D1	D2	D3	D4	D5	D6	D7 (MSB)	PARITY (EVEN)	STOP BIT	
--	--------------	-------------	----	----	----	----	----	----	-------------	------------------	-------------	--

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

3. Command Block Format

The code from B0 to B (n) + 2 as described below are transmitted.

①
B0
Start Code

②				
B1	B2	B3	B4	B5
Peripheral Index	Group Index		Device Index	
Receiver (To) Index				

③				
B6	B7	B8	B9	B10
Peripheral Index	Group Index		Device Index	
Sender (From) Index				

④		
B11	B12	B13
Cmd1	Cmd2	Cmd3
COMMAND		

⑤
B14
Data Length 1 (B16 + 2) (02 – 81 h)
Check Data Length

⑥	⑦
B15	B16
Data Length 2 (00 h)	Data Length 3 (00 – 7 Fh)
Total Data Length B16	
Data Length	

⑧	
Bn	Bm
Data (n)	Data (n + 1, 2, 3, 4...)
Data	

Bn = B16 + 1
Bm = B16 + Total Data Length

⑨
Bm + 1
Check SUM

⑩
Bm + 2
End Code

4. Data of Code

① Start Condition

Bn	NAME	DATE (hex)	NOTE
B0	Start Code	A5	Indicates the first packet

② INDEX Header

/*-- RECEIVER INDEX --*/

B1	PERIPHERAL INDEX	01	01: Projector
B2	GROUP INDEX UPPER BYTE	00	Group Index = 0001 hex
B3	GROUP INDEX LOWER BYTE	01	
B4	DEVICE INDEX UPPER BYTE	00	Device Index = 0001 hex
B5	DEVICE INDEX LOWER BYTE	01	

/*-- SENDER INDEX --*/

B6	PERIPHERAL INDEX	03	03: Controller
B7	GROUP INDEX UPPER BYTE	00	Group Index = 0001 hex
B8	GROUP INDEX LOWER BYTE	01	
B9	DEVICE INDEX UPPER BYTE	00	Device Index = 0001 - 0063 hex
B10	DEVICE INDEX LOWER BYTE	01 - 63	

/*-- Command --*/

B11	CMD1	Refer to attached	
B12	CMD2	Refer to attached	
B13	CMD3	00	Projector All
		80	LCD Projector All
		90	VPL-PX32

Note: CMD1 and CMD2 are assigned with different commands for each unit. Consequently, there is no compatibility of commands between units. For details of the commands, refer to the respective list of commands for the units. Since there is no index function of this unit, the receiver INDEX will be ignored even if the command is designated.

③ Sub Data Size

B14	Data Length 1	02 - 81	(B16 + 2) hex Data Size
-----	---------------	---------	-------------------------

Note: Error when 82 to FF hex codes are included.

④ Data Size 2

B15	Data Length 2	00	0: Fixed
-----	---------------	----	----------

Note: Error when 01 to FF hex codes are included.

⑤ Data Size 3

B16	Data Length 3	00 7F	Size of ⑥
-----	---------------	-------	-----------

Note: Error when 80 to FF hex codes are included.

⑥ Data

Bn - Bm	Data	XX	No Data in some cases
---------	------	----	-----------------------

$Bn = B16 + 1$

$Bm = B16 + \text{Total Data Length}$

⑦ Check SUM

Bm + 1	Check Sum	XX	Check sum of Data from ② to ⑥ (Calculate the XOR of the Data from ② to ⑥)
--------	-----------	----	--

XOR is the exclusive OR.

It is as follows when calculated by 1 bit.

Taking $A \text{ XOR } B = C$;

A	B	C
0	0	0
1	0	1
0	1	1
1	1	0

<Example of Calculation>

When 0XA5 (165) and 0XA5 (165) are calculated by XOR;

A5	10100101	(165)
A5	10100101	(165)
Answer	00000000	(0)

When 0XA5 (165) and 0X5A (90) are calculated by XOR;

Answer

A5	10100101	(165)
5A	01011010	(90)
Answer	11111111	(255)

⑧ End Condition

Bm + 2	END Code	5A	Indicates the last packet
--------	----------	----	---------------------------

5. Connection

<RS-232C Connection>

Communication is enabled by the use of a D-Sub 9 Pin cross (reverse) cable.

The pin assignment of D-Sub 9 Pin and D-Sub 25 Pin is as follows.

D-Sub 9 Pin	D-Sub 25 Pin	Name	
Shell = FG	1	FG	Grounding for safety protection or cable shield
3	2	TxD	Transmission data
2	3	RxD	Reception data
7	4	RTS	Transmission request
8	5	CTS	Transmission permission
6	6	DSR	Data set ready
5	7	SG	GND for signal
1	8	DCD	Data channel signal carrier detection
4	20	DTR	Data terminal ready
9	22	RI	Calling display (Presence/absence of calling signal)

Pins indicated as D-Sub 25 Pin are not used.

Assured cable length: 15 m (However, assurance may not be applicable for some cables.)

The software for controlling the projector from a PC is intended for performing transmission and reception for only the TxD and RxD lines.

Therefore there is no handshake normally performed by RS-232C.

6. Communication Procedure

6-1. Outline of Communication

All communication between CONTROLLER (PC, etc.) and DEVICE (PROJECTOR) is performed by the command block format. Communication is started by the issue of a command at CONTROLLER and ended when the return data is sent to CONTROLLER after DEVICE receives the command.

CONTROLLER is prohibited from sending several commands at one time. This means that after CONTROLLER sends one command, it cannot send other commands until DEVICE returns the return data. DEVICE sends the return data after processing the command. The time from when CONTROLLER sends the command until the return data is returned differs according to the contents of the command.

In some cases, CONTROLLER may receive data from DEVICE even though it has not sent a command. (For example, during SYS setting, SIRCS command, and switcher information when switcher is selected.)

Note: When Sircs Direct Command (CMD1 = 17 hex) is sent, return data may not be returned in some cases.

6-2. Reading the Command Tables

The command tables can be found in Section 9 (page 11).

CMD1 indicates the command category. The ACK from the projector is returned attached with the command category sent from the controller. However, when errors of the communication line occur, 10 hex (COMMON) will be returned.

CMD2 indicates the command processing method and processing results. 00 hex (SET) is set when setting data from the controller to the projector or when requesting for data processing. 01 hex (GET) is set when acquiring data. 2 hex (RETURN) is set when returning the ACK of the command received from the projector to the controller and when attaching data. 03 hex (ACK) is set when returning only the processing results.

However, F0 hex (COMM NAK) is set when the command the projector receives from the controller has a communication line error or checksum inconsistency.

The top of each category indicates the meaning of the data.

7. Communication Rules

- When sending a command from CONTROLLER, the return data (CMD1 = 10 hex or CMD1 = each category value, CMD2 = 03 hex) from PROJECTOR should be received first before sending the next command. Even if the next command is sent before receiving the return data, since PROJECTOR will not be able to receive that command, it does not return a response to CONTROLLER. Consequently, no error code is also sent.

The following lists the approximate waiting times for PROJECTOR to return the return data after CONTROLLER sends the command.

- When a communication error occurs, PROJECTOR ignores the data received until now, and set into the reception standby state.
- For undefined commands or commands determined as invalid by PROJECTOR, PROJECTOR will send the “NAK” return data to CONTROLLER .
- Take note that when data is written when the input signal of PROJECTOR is unstable, that data (value) will not be incorporated.
- When INDEX specified SIRCS direct command (CMD1 = 17 hex) is transmitted, leave an interval of 45 mSec until the next transmission. (Do not return the return data (ACK, NAK) when the SIRCS direct command is received.)

8. Approximate Return Waiting Times

CMD1	CMD2	DATA1	DATA2	TIME (mSec)
00	00	—	—	20
00	01	—	—	20
01	01	00	01, 02	20
01	00	00	05	20
01	01	00	05	20
03	00	00	—	25
03	00	01	—	20

Note: The times shown in this table are when communication is performed in the condition that it will not be interrupted by some reason.

9. Commands

A command is mainly classified into the following four categories. For more details of the command that can be set and acquired in each category, refer to Tables 1 to 7.

1. Adjust Category

FUNCTION	CMD1	CMD2	DATA1	DATA2	DATA3	DATA4	DATA5	DATA6	DATA7	DATA8	DATA9
ADJUST SET	Category Value 00h	00h	Refer to ADJ USER NO in Table 1.		OPTION 02h	Refer to SETTING VALUE in Table 1.		N/A			
ADJUST GET		01h			N/A						
ADJUST REPLY		02h			VALID 00h	LOWER Minimum setting value		UPPER Maximum setting value		Refer to SETTING VALUE in Table 1.	
ADJUST ACK/NAK		03h	ACK/NAK	DATA	N/A						

Table 1

FUNCTION	ADJ USER NO		SETTING VALUE			OPERATING STATUS		POWER STATUS							
	DATA1	DATA2	DATA4	DATA5	MEANING OF DATA	SET	GET	STANBY	START SEQUENCE	POWER ON	COOLING1	COOLING2	SAVING COOLING1	SAVING COOLING2	SAVING STANBY
INPUT	00h	01h	00h	00h	VIDEO	○	○	—	—	○	—	—	—	—	—
			00h	01h	S-VIDEO										
			00h	02h	INPUT A										
			00h	03h	INPUT B										
CONTRAST	00h	10h	00h	00h - 64h	CURRENT SETTING VALUE (0 - 100)	○	○	—	—	○	—	—	—	—	—
BRIGHTNESS	00h	11h	00h	00h - 64h	CURRENT SETTING VALUE (0 - 100)	○	○	—	—	○	—	—	—	—	—
COLOR	00h	12h	00h	00h - 64h	CURRENT SETTING VALUE (0 - 100)	○	○	—	—	○	—	—	—	—	—
HUE	00h	13h	00h	00h - 64h	CURRENT SETTING VALUE (0 - 100)	○	○	—	—	○	—	—	—	—	—
SHARPNESS	00h	14h	00h	00h - 64h	CURRENT SETTING VALUE (0 - 100)	○	○	—	—	○	—	—	—	—	—
RGBENHANCER	00h	15h	00h	00h - 64h	CURRENT SETTING VALUE (0 - 100)	○	○	—	—	○	—	—	—	—	—
VOLUME	00h	16h	00h	00h - 64h	CURRENT SETTING VALUE (0 - 100)	○	○	—	—	○	—	—	—	—	—
COLTEMP	00h	17h	00h	00h	LOW	○	○	—	—	○	—	—	—	—	—
			00h	01h	HIGH										
ASPECT	00h	20h	00h	01h	NORMAL 4:3	○	○	—	—	○	—	—	—	—	—
			00h	00h	WIDE 16:9										
SCANCONV	00h	21h	00h	01h	ON	○	○	—	—	○	—	—	—	—	—
			00h	00h	OFF										
PICTURE MUTING	00h	30h	00h	01h	ON	○	○	—	—	○	—	—	—	—	—
			00h	00h	OFF										
AUDIO MUTING	00h	31h	00h	01h	ON	○	○	—	—	○	—	—	—	—	—
			00h	00h	OFF										
INPUT A	00h	32h	00h	00h	COMPUTER	○	○	—	—	○	—	—	—	—	—
			00h	01h	COMPONENT										
			00h	02h	DTV-YPBPR										
			00h	03h	DTV-GBR										
GAIN RED	00h	80h	00h	00h - FFh	CURRENT SETTING VALUE (0 - 255)	○	○	—	—	○	—	—	—	—	—
GAIN GREEN	00h	81h	00h	00h - FFh	CURRENT SETTING VALUE (0 - 255)	○	○	—	—	○	—	—	—	—	—
GAIN BLUE	00h	82h	00h	00h - FFh	CURRENT SETTING VALUE (0 - 255)	○	○	—	—	○	—	—	—	—	—
BIAS RED	00h	83h	00h	00h - FFh	CURRENT SETTING VALUE (0 - 255)	○	○	—	—	○	—	—	—	—	—
BIAS GREEN	00h	84h	00h	00h - FFh	CURRENT SETTING VALUE (0 - 255)	○	○	—	—	○	—	—	—	—	—
BIAS BLUE	00h	85h	00h	00h - FFh	CURRENT SETTING VALUE (0 - 255)	○	○	—	—	○	—	—	—	—	—

2. Du Category

FUNCTION	CMD1	CMD2	DATA1	DATA2	DATA3	DATA4	DATA5	DATA6	DATA7
DU SET	Category Value 01h	00h	Refer to DU USER NO in Table 2.		Refer to SIZE in Table 2.	Refer to SETTING VALUE in Table 2.			
DU GET		01h			Refer to SIZE in Table 2.	N/A			
DU REPLY		02h			Refer to SIZE in Table 2.	DATA			
DU ACK/NAK		03h	ACK/NAK	DATA	N/A				

Table 2

FUNCTION	DU USER NO		SIZE	SETTING VALUE/RETURN VALUE					OPERATING STATUS		POWER STATUS							
	DATA1	DATA2	DATA3	DATA4	DATA5	DATA6	DATA7	MEANING OF DATA	SET	GET	STANBY	START SEQUENCE	POWER ON	COOLING1	COOLING2	SAVING COOLING1	SAVING COOLING2	SAVING STANBY
ERROR STATUS	00h	01h	01h	00h	N/A			NO ERROR	—	○	○	○	○	○	○	○	○	○
				01h				LAMP ERROR										
				02h				FAN ERROR										
				04h				COVER ERROR										
				08h				TEMP ERROR										
				10h				D5V ERROR										
				20h				POWER ERROR										
				40h				WARNING ERROR										
POWER STATUS	00h	02h	01h	00h	N/A			STANBY	—	○	○	○	○	○	○	○	○	○
				01h				START UP										
				02h				STARTUP LAMP										
				03h				POWER ON										
				04h				COOLING1										
				05h				COOLING2										
				06h				SAVING COOLING1										
				07h				SAVING COOLING2										
				08h				SAVING STANBY										
CONTROL MODE SELECT	00h	05h	01h	00h	N/A			USER	○	○	—	—	○	—	—	—	—	—
				01h				SERVICE										
TOTAL LAMP TIMER	00h	13h	02h	0000h - FFFFh		N/A		TOTAL LAMP TIMER	—	○	—	—	○	○	○	○	○	○

3. SIRCS Category

FUNCTION	CMD1	CMD2	DATA1	DATA2	DATA3	DATA4	DATA5	DATA6
SIRCS	Category Value 17h	00h	Refer to Table 4.		Refer to Tables 5 and 6.	REPEAT	REPEAT NUMBER	

Table 3

REPEAT	
REPEAT	OPERATING STATUS
00h	Equivalent to the SircsCode transmitted in single-shot (Single pressing of a remote control)
01h	Equivalent to the SircsCode occurred continuously (Continuous pressing of a remote control) Continuous pressing is considered to be performed the number of <REPEAT NUMBER> times.

Table 4

CATEGORY		
BIT	DATA1	DATA2
15BIT	40h	54h
20BIT	85h	5Ah

Table 5
List of SIRCS CODE
(1) 15BIT Category

	x0	x1	x2	x3	x4	x5	x6	x7	x8	x9	xA	xB	xC	xD	xE	xF
0x																
1x			VOLUME + UP	VOLUME - DOWN	AUDIO MUTING	POWER ON/OF			CONTRAST + HIGH	CONTRAST - LOW	COLOR + HIGH	COLOR - LOW			BRITNESS + BRIGHT	BRITNESS - DARK
2x	HUE + PURPLISH	HUE - GREENISH	SHARPNESS + SHARP	SHARPNESS - SOFT	PICTURE MUTING	STATUS ON	STATUS OFF			MENU	VIDEO	INPUT A	INPUT B		POWER ON	POWER OFF
3x				CURSOR →	CURSOR ←	CURSOR ↑	CURSOR ↓									
4x		ADJ R	ADJ G	ADJ B				RGB SIZE	RGB SHIFT							
5x			W/B GAIN	W/B BIAS				INPUT SELECT	BLANKING		ENTER				MEMORY	S VIDEO
6x																
7x												RESET			PATTERN	

Table 6
(2) 20BIT Category

	x0	x1	x2	x3	x4	x5	x6	x7	x8	x9	xA	xB	xC	xD	xE	xF
0x																
1x																
2x																
3x																
4x																
5x																
6x	APA	DOT PHASE					HELP		FUNCTION1	FUNCTION2	DIGITAL ZOOM+	DIGITAL ZOOM-				
7x																

4. Memory Category

FUNCTION	CMD1	CMD2	DATA1	DATA2
MEMORY SET	Category Value 03h	00h	Refer to SETTING VALUE in Table 7.	Refer to SETTING VALUE in Table 7.

Table 7

FUNCTION	SETTING VALUE			OPERATING STATUS		POWER STATUS							
	DATA1	DATA2	MEANING OF DATA	SET	GET	STANBY	START SEQUENCE	POWER ON	COOLING1	COOLING2	SAVING COOLING1	SAVING COOLING2	SAVING STANBY
MEMORY	RESET 00h	01h	Channel Memory	○	—	—	—	○	—	—	—	—	—
		02h	Status Memory										
		03h	Set Memory										
	SAVE 01h	04h	W/B ALL	○	—	—	—	○	—	—	—	—	—
		05h	W/B LOW										
		06h	W/B HIGH										

<ACK>

FUNCTION	CMD1	CMD2	DATA1	DATA2
ACK	EACH CATEGORY VALUE	ACK 03h	ACK/NAK	DATA
			00 ACK	00 DUMMY
			01 NAK	01 UNDEFINED COMMAND 04 SIZE ERROR 05 SELECT ERROR 06 RANGE OVER 0A NOT APPLICABLE
	COMMON 10h	COMM NAK F0h	COMM ERROR	
			10 CHECK SUM ERROR 20 FRAMING ERROR 30 PARITY ERROR 40 OVER RUN ERROR 50 OTHER COMM ERROR	

Examples of command transmission

(1) Command of "POWER ON" Sircs

<Transmitting command>

START CODE
A5h

Receiver (To) INDEX				
PERIPHERAL INDEX	GROUP INDEX		DEVICE INDEX	
01h	00h	01h	00h	01h

Sender (From) INDEX				
PERIPHERAL INDEX	GROUP INDEX		DEVICE INDEX	
03h	00h	01h	00h	01h

CMD1	CMD2	CMD3
CATEGORY	SET	
17h	00h	80h

CHECK DATA	DATA LENGTH	
08h	00h	06h

DATA1	DATA2	DATA3	DATA4	DATA5	DATA6
PJ SIRCS CODE		SIRCS CODE	REPEAT	REPEAT NUMBER	
40h	54h	2Eh	00h	00h	00h

CHECK SUM
A1h

END CODE
5Ah

(2) Command to set "INPUT A" to "COMPUTER"

<Transmitting command>

START CODE
A5h

Receiver (To) INDEX				
PERIPHERAL INDEX	GROUP INDEX		DEVICE INDEX	
01h	00h	01h	00h	01h

Sender (From) INDEX				
PERIPHERAL INDEX	GROUP INDEX		DEVICE INDEX	
03h	00h	01h	00h	01h

CMD1	CMD2	CMD3
CATEGORY	SET	
00h	00h	80h

CHECK DATA	DATA LENGTH	
07h	00h	05h

DATA1	DATA2	DATA3	DATA4	DATA5
ADJ USER NO		OPTION	DATA	
00h	32h	02h	00h	00h

CHECK SUM
B0h

END CODE
5Ah

<Receiving command: ACK>

START CODE				
A5h				

Receiver (To) INDEX				
PERIPHERAL INDEX	GROUP INDEX		DEVICE INDEX	
03h	00h	01h	00h	01h

Sender (From) INDEX				
PERIPHERAL INDEX	GROUP INDEX		DEVICE INDEX	
01h	00h	01h	00h	01h

CMD1	CMD2	CMD3
CATEGORY	ACK/NAK	
00h	03h	80h

CHECK DATA	DATA LENGTH	
04h	00h	02h

DATA1	DATA2
ACK	DUMMY
00h	00h

CHECK SUM
87h

END CODE
5Ah

(3) Signals acceptable to "INPUT A"

<Transmitting command>

START CODE				
A5h				

Receiver (To) INDEX				
PERIPHERAL INDEX	GROUP INDEX		DEVICE INDEX	
01h	00h	01h	00h	01h

Sender (From) INDEX				
PERIPHERAL INDEX	GROUP INDEX		DEVICE INDEX	
03h	00h	01h	00h	01h

CMD1	CMD2	CMD3
CATEGORY	GET	
00h	01h	80h

CHECK DATA	DATA LENGTH	
04h	00h	02h

DATA1	DATA2
ADJ USER NO	
00h	32h

CHECK SUM
B7h

END CODE
5Ah

<Receiving command: ADJUST REPLY>

START CODE
A5h

Receiver (To) INDEX				
PERIPHERAL INDEX	GROUP INDEX		DEVICE INDEX	
03h	00h	01h	00h	01h

Sender (From) INDEX				
PERIPHERAL INDEX	GROUP INDEX		DEVICE INDEX	
01h	00h	01h	00h	01h

CMD1	CMD2	CMD3
CATEGORY	REPLY	
00h	02h	80h

CHECK DATA	DATA LENGTH	
0Bh	00h	09h

DATA1	DATA2	DATA3	DATA4	DATA5	DATA6	DATA7	DATA8	DATA9
ADJ USER NO		FIXED	LOWER		UPPER		DATA	
00h	32h	00h	00h	00h	00h	03h	00h	00h

CHECK SUM
B3h

END CODE
5Ah

(4) Command to get "CURRENT ERROR"

<Transmitting command>

START CODE				
A5h				

Receiver (To) INDEX				
PERIPHERAL INDEX	GROUP INDEX		DEVICE INDEX	
01h	00h	01h	00h	01h

Sender (From) INDEX				
PERIPHERAL INDEX	GROUP INDEX		DEVICE INDEX	
03h	00h	01h	00h	01h

CMD1	CMD2	CMD3
CATEGORY	GET	
01h	01h	80h

CHECK DATA	DATA LENGTH	
05h	00h	03h

DATA1	DATA2	DATA3
DU USER NO		DATA SIZE
00h	01h	01h

CHECK SUM
84h

END CODE
5Ah

<Receiving command: DU REPLY>

START CODE				
A5h				

Receiver (To) INDEX				
PERIPHERAL INDEX	GROUP INDEX		DEVICE INDEX	
03h	00h	01h	00h	01h

Sender (From) INDEX				
PERIPHERAL INDEX	GROUP INDEX		DEVICE INDEX	
01h	00h	01h	00h	01h

CMD1	CMD2	CMD3
CATEGORY	REPLY	
01h	02h	80h

CHECK DATA	DATA LENGTH	
06h	00h	04h

DATA1	DATA2	DATA3	DATA4
DU USER NO		DATA SIZE	DATA
00h	01h	01h	00h

CHECK SUM
83h

END CODE
5Ah

