BASIC SERIAL COMMAND

FUNCTIONAL SPECIFICATIONS

LC-XB28

— CONTENTS —

1. Overview

1.1. This specification defines projector control commands for LC-XB28.

1.2. The projector control commands are used to control a projector through RS-232C from a computer.

2. Serial Interface Specification

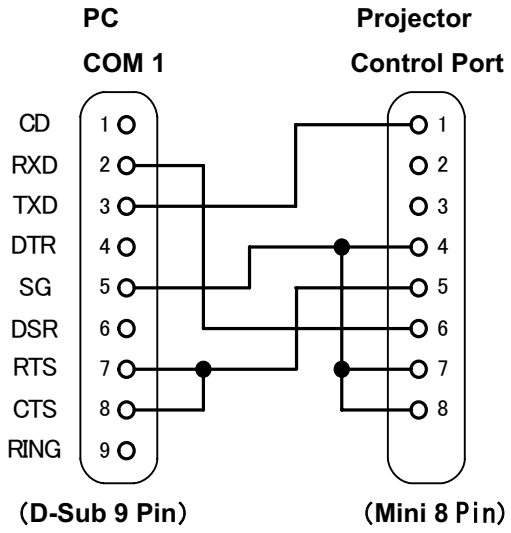
Item	Specification
Synchronous system	Asynchronous
Transmission Speed	9600 / 19200
Data Length	8 bit
Parity	None
Stop Bit	1
Flow Control	None

2.1. Transmission speed: initial setting value is 19200.

2.2. Transmission speed can be changed by service mode.

3. Connection

Dedicated serial cable that comes with the projector must be used for a connection to a computer and a projector.



4. Notes for Communication

4.1. The projector command is defined one command/one line that starts with “C” and ends with carriage return (0x0D).

4.2. When a projector receives carriage return（0x0D）, it starts to decode.

4.3. There are two types of commands, Functional Execution Commands and Status Read Commands;

Example of Functional Execution Command : “C05” [CR]

Example of Status Read Command : “CR0” [CR]

4.4. It clears the information of buffer for the reasons stated below;

4.4.1. When receiving LF（0xoA）or EOF（0x1A）

4.4.2. When it takes more than one second to receive one command

(From receiving the first data till carriage return)

4.5. For Control Command pipelining, wait the interval stated below after the response.

4.5.1. Command such as「VOLUME +/-」 → 100ms

4.5.2. Other Commands→ 500ms

4.6. For Status Read Command pipelining, wait at least interval of 500ms.

4.7. Send the next Command after receiving Response. If no Response is returned after 5 seconds, send the next Command.

4.8. It takes about 7 seconds from AC power ON till the status that a projector moves to Standby for internal initialization. Any Commands cannot be executed during this time.

4.9. During the 7 seconds from Standby status till Power ON execution, Response OK is returned when Command regarding internal initialization and processing Lamp lighting are received, but the Command is terminated.

Yet, for Status Read Command, the Command is executed if 500ms is passed after receiving Power ON Command OK Response.

4.10. About processing Countdown and Cooling down

When receiving a Command while processing Power ON execution Countdown and Cooling down after Power OFF execution, Response OK is returned, but the Command is terminated.

Yet, Status Read Command can be executed.

4.11. About operation of INPUT switching

After receiving INPUT switching Command, during the 5 seconds of starting switching operation to finishing it, Response OK is returned if a Command is received. Yet the Command is terminated. The Status Read Command is executed if 500ms is passed after receiving INPUT switching reception OK Response.

4.12. The number of characters of response for Status Read Commands depends on commands.

Please see [10-3 Status Read Command] or [Status Read Command Table].

4.13. Characters for commands must be Capital (A - Z).

5. Functional Execution Command Table

Command	Item	Command	Item
C00	POWER ON	C20	BRIGHTNESS +
C01	POWER OFF（Quick Power OFF）	C21	BRIGHTNESS -
C02	POWER OFF	C22	———
C03	———	C23	———
C04	———	C24	———
C05	COMPUTER 1	C25	COMPUTER 2 RGB
C06	COMPUTER 2	C26	———
C07	VIDEO	C27	IMAGE（Toggle）
C08	———	C28	ON START Enable
C09	VOLUME +	C29	ON START Disable
C0A	VOLUME -	C2A	POWER MANAGEMENT READY
C0B	AUDIO MUTE ON	C2B	POWER MANAGEMENT OFF
C0C	AUDIO MUTE OFF	C2C	———
C0D	VIDEO MUTE ON	C2D	———
C0E	VIDEO MUTE OFF	C2E	POWER MANAGEMENT SHUT DOWN
C0F	SCREEN NORMAL SIZE（4:3）	C2F	———
C10	SCREEN WIDE SIZE（16:9）	C30	D.ZOOM +
C11	IMAGE STANDARD	C31	D.ZOOM -
C12	IMAGE REAL	C32	VIDEO AUTO
C13	IMAGE CINEMA	C33	VIDEO VIDEO
C14	IMAGE 1	C34	VIDEO S-VIDEO
C15	IMAGE 2	C35	———
C16	IMAGE 3	C36	———
C17	IMAGE 4	C37	———
C18	IMAGE BLACKBOARD (GREEN[)	C38	———
C19	———	C39	———
C1A	———	C3A	POINTER RIGHT
C1B	———	C3B	POINTER LEFT
C1C	MENU ON	C3C	POINITER UP
C1D	MENU OFF	C3D	POINITER DOWN
C1E	DISPLAY CLEAR	C3E	MOUSE RIGHT CLICK
C1F	———	C3F	ENTER

“———” means “no function”.

Command	Item	Command	Item
C40	―――	C80	―――
C41	―――	C81	―――
C42	―――	C82	―――
C43	FREEZE ON	C83	―――
C44	FREEZE OFF	C84	―――
C45	―――	C85	―――
C46	―――	C86	―――
C47	―――	C87	―――
C48	―――	C88	―――
C49	―――	C89	AUTO IMAGE
C4A	―――	C8A	PRESENTATION TIMER
C4B	―――	C8B	―――
C4C	―――	C8C	―――
C4D	―――	C8D	―――
C4E	―――	C8E	KEYSTONE ↑
C4F	―――	C8F	KEYSTONE ↓
C50	Computer 1 Analog RGB	C90	―――
C51	Computer 1 Scart	C91	―――
C52	―――	C92	―――
C53	―――	C93	―――
C54	Computer 1 Component	C94	―――
C55		C95	―――
C56	―――	C96	―――
C57	―――	C97	―――
C58	―――	C98	―――
C59	Page Up	C99	―――
C5A	Page Down	C9A	―――
C5B	―――	C9B	―――
C5C	―――	C9C	―――
C5D	―――	C9D	―――
C5E	―――	C9E	―――
C5F	―――	C9F	―――

“―――” means “no function”.

6. Status Read Command Table

Command	Function	Note
CR0	Status Read	
CR1	Input Mode Read	
CR2	———	
CR3	Lamp Time Read	
CR4	Setting Read	
CR5	———	
CR6	Temp Read	
CR7	———	
CR8	———	
CR9	———	
CRA	———	
CRB	———	
CRC	———	

"———" means "no function".

7. Functional Execution Command

7.1. Format

7.1.1. PC issues a command below format.

"C"Command [CR]

Command： 2 characters(See Basic Functional Execution Command Table)

7.1.2. A projector changes received data to decode and returns a result after being ready to receive next command.

[ACK] [CR]：（0x06、0x0D）When received Functional Execution Commands

"?" [CR]：When received data is not decodable, it returns

7.2. When the command pipelining is needed

When some functions need the command pipelining, the performance is the same as the remote control's performance

7.2.1. System: issue any commands every 100 ms after receiving response

7.2.2. When receiving the appropriate command, the function is executed for 120 ms from the moment.

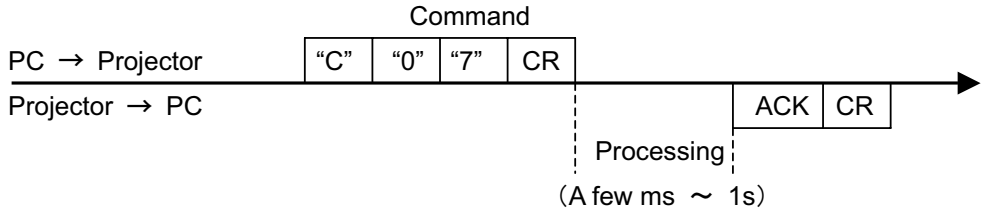
7.2.3. When receiving the same command continuously within 120 ms, the function is executed for another 120 ms from the moment.

7.2.4. When there is no incoming command after 120 ms, the execution of pipelining is stopped.

7.2.5. When the projector receives other incoming commands within 120ms, the execution of pipelining is stopped.

7.3. Transfer Example

Change to video mode with Basic Command.



7.4. Operation Requirements

When the projector's status in this below, functional execution commands are limited.

Status Read Commands are valid under the stated status below.

Status	Available Functional Execution Commands
Standby Mode	C00：POWER ON
Processing Countdown	C00：POWER ON （Countdown is terminated）
Processing Cooling Down	None
Cooling Down Due to Abnormal Temperature	None
Abnormal Temperature Status	None
Processing Mode Switch	None
Processing Power Save・Cooling Down	None
Power Save Status	C00：POWER ON C01：POWER OFF

Note) When the status is above, even if the projector receives other command, it returns **[ACK] [CR].**

7.5. POWER ON Command

Command	“C00” [CR]	
Details	Power ON When already Power ON, no operation is necessary.. When sending this command during processing Countdown, Countdown is terminated.	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.6. POWER OFF Command（Quick Power OFF）

Command	“C01” [CR]	
Details	Power OFF (Standby) When Power is OFF with ON-OFF button of the projector and remote control, “Power OFF” is displayed. However, as soon as this command is sent, Quick Power OFF is executed.	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.7. POWER OFF Command

Command	“C02” [CR]	
Details	Power OFF (Standby) This command works as same as when Power is OFF with ON-OFF button of the projector and remote control. （When command is sent once, “Power OFF？” is displayed. If this command is sent again while sending the first command, Power OFF is executed.）	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.8. Computer 1 Command

Command	“C05” [CR]	
Details	Select Computer 1 Input.	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.9. Computer 2 Command

Command	“C06” [CR]	
Details	Select Computer 2 Input.	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.10. Video Command

Command	“C07” [CR]	
Details	Select Video Input.	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.11. VOLUME + Command

Command	“C09” [CR]	
Details	Volume Up This command works the same as “VOLUME +” button of the projector and remote control.	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.12. VOLUME – Command

Command	“C0A” [CR]	
Details	Volume Down This command works the same as “VOLUME -” button of the projector and remote control.	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.13. AUDIO MUTE ON Command

Command	“C0B” [CR]	
Details	Sound Mute ON This command works the same as “MUTE” button of the remote control for Mute ON, but does not work for Mute OFF.	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.14. AUDIO MUTE OFF Command

Command	“C0C” [CR]	
Details	Sound Mute OFF This command works the same as “MUTE” button of the remote control for Mute OFF, but does not work for Mute ON.	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.15. VIDEO MUTE ON Command

Command	“C0D” [CR]	
Details	Video Mute ON This command works the same as “NO SHOW” button of the remote control for No Show ON, but does not work for No Show OFF.	
Details	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.16. VIDEO MUTE OFF Command

Command	“C0E” [CR]	
Details	Video Mute OFF This command works the same as “NO SHOW” button of remote control for No Show OFF, but does not work for No Show ON.	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.17. Screen Normal size Command

Command	“C0F” [CR]	
Details	Set screen size to Normal (4:3)	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.18. Screen Wide size Command

Command	“C10” [CR]	
Details	Set screen size to Wide (16:9)	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.19. Image Standard Command

Command	“C11” [CR]	
Details	Set screen size to Standard	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.20. Image Real Command

Command	“C12” [CR]	
Details	Set screen size to Real	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.21. Image Cinema Command

Command	“C13” [CR]	
Details	Set screen size to Cinema	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.22. Image 1 Command

Command	“C14” [CR]	
Details	Set image to Image 1	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.23. Image 2 Command

Command	“C15” [CR]	
Details	Set image to Image 2	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.24. Image 3 Command

Command	“C16” [CR]	
Details	Set image to Image 3	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.25. Image 4 Command

Command	“C17” [CR]	
Details	Set image to Image 4	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.26. Image Blackboard (Green) Command

Command	“C18” [CR]	
Details	Set Image to Blackboard (Green)	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.27. MENU ON Command

Command	“C1C” [CR]	
Details	Display Menu of On Screen Display	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.28. MENU OFF Command

Command	“C1D” [CR]	
Details	Clear Menu of On Screen Display	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.29. DISPLAY CLEAR Command

Command	“C1E” [CR]	
Details	Clear On Screen Display Clear for On Screen Display unconditionally	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.30. BRIGHTNESS + Command

Command	“C20” [CR]	
Details	Brightness of User Control +1	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.31. BRIGHTNESS – Command

Command	“C21” [CR]	
Details	Brightness of User Control -1	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.32. Computer 2 RGB Command

Command	“C25” [CR]	
Details	Select RGB input of Computer 2	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.33. IMAGE (Toggle) Command

Command	“C27” [CR]	
Details	Switch Image Setting status This command works the same as “IMAGE” button on the projector or remote control as "IMAGE” function.	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.34. ON START Setting Command

Command	“C28” [CR]	
Details	Set Power ON Start setting status This status is stored on EEPROM and retained regardless of Power OFF/ON	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.35. ON START Cancel Command

Command	“C29” [CR]	
Details	Cancel Power ON Start This status is stored on EEPROM and retained regardless of Power OFF/ON	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.36. Power Management Ready Command

Command	“C2A” [CR]	
Details	Set Power Management to Ready mode This status is stored on EEPROM and retained regardless of Power OFF/ON	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.37. Power Management OFF Command

Command	“C2B” [CR]	
Details	Set Power Management OFF This status is stored on EEPROM and retained regardless of Power OFF/ON	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.38. Power Management Shut down Command

Command	“C2E” [CR]	
Details	Set Power Management to Shut down mode This status is stored on EEPROM and retained regardless of Power OFF/ON	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“？” [CR]

7.39. D.ZOOM + Command

Command	“C30” [CR]	
Details	Make screen image larger This command works the same as “ZOOM △” button of the remote control.	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.40. D.ZOOM – Command

Command	“C31” [CR]	
Details	Make screen image smaller This command works the same as “ZOOM ▽” button of the remote control.	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.41. Video Auto Command

Command	“C32” [CR]	
Details	Select Auto input of Video	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.42. Video Video Command

Command	“C33” [CR]	
Details	Select Video input of Video	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.43. Video S-Video Command

Command	“C34” [CR]	
Details	Select S-Video input of Video	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.44. POINTER RIGHT Command

Command	“C3A” [CR]	
Details	Move the Pointer of On Screen Display Menu to the right. This command works the same as Point button “>” on the projector.	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.45. POINTER LEFT Command

Command	“C3B” [CR]	
Details	Move the Pointer of On Screen Display Menu to the left. This command works the same as Point button “<” on the projector.	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.46. POINTER UP Command

Command	“C3C” [CR]	
Details	Move up the Pointer of On Screen Display Menu This command works the same as “△” button of the projector.	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.47. POINTER DOWN Command

Command	“C3D” [CR]	
Details	Move down the Pointer of On Screen Display Menu This command works the same as “▽” button of the projector.	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.48. Mouse Right Click Command

Command	“C3E” [CR]	
Details	This command works the same as “Mouse Right Click” button of a Remote control.	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.49. ENTER Command

Command	“C3F” [CR]	
Details	This command works the same as “SELECT” button of the projector and remote control.	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.50. FREEZE ON Command

Command	“C43” [CR]	
Details	Freeze picture on-screen This command works the same as “FREEZE” button of the remote control for Freeze ON, but does not work for Freeze OFF.	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.51. FREEZE OFF Command

Command	“C44” [CR]	
Details	Cancel Freeze function This command works the same as “FREEZE” button of the remote control for Freeze Off, but does not work for Freeze ON.	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.52. Computer 1 Analog RGB Command

Command	“C50” [CR]	
Details	Select Analog RGB input	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.53. Computer 1 Scart Command

Command	“C51” [CR]	
Details	Select Analog Scart input	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

7.54. Computer 1 Component Command

Command	“C54” [CR]	
Details	Select Component input	
Response	Acceptable	[ACK] [CR]
	Unacceptable	“?” [CR]

8. Status Read Commands

8.1. Format

8.1.1. PC issues commands in format as below

"CR" **Command** **[CR]**

Command：1 character（See Basic Status Read Command Table）

8.1.2. When a projector receives the appropriate command, it returns a character line as the required data.

Required data **[CR]**

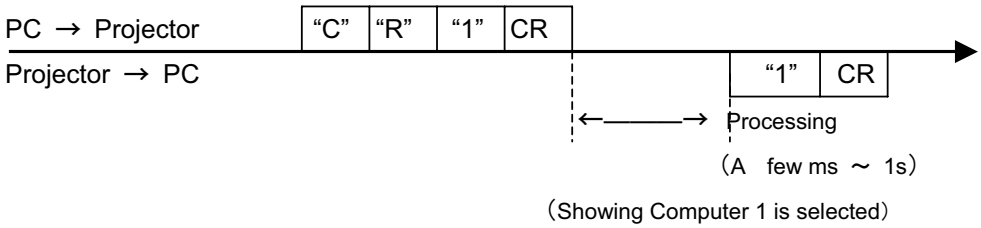
Required data：A character line （See Basic Status Read Command Table）

8.1.3. When the received data cannot be decoded, the projector returns "**?"[CR]**.

8.2. Transfer Example

Get input mode for projector by basic commands.

Command (issue current input mode command)



（Showing Computer 1 is selected）

8.3.Status Read Command

Command	"CR0" [CR]	
Details	Get the projector status	
Response	Acceptable	"%1" [CR]
	%1	"00" = Power ON "80" = Standby "40" = Processing Countdown "20" = Processing Cooling Down "10" = Power Failure "28" = Processing Cooling Down due to High Temperature "08" = Temperature Failure "88" = Coming back after Temperature Failure "02" = RS232C Command cannot be received "24" = Processing Power-save Cooling Down "04" = Power save
	Unacceptable	"?" [CR]

[Details of Response]

8.3.1. "00" [CR]

Status : Power ON

Normal image is on-screen.

8.3.2. "80" [CR]

Status : Standby

When the status is Standby, Status Read Commands are always acceptable, but Functional Execution Commands are not acceptable except POWER ON Command.

8.3.3. "40" [CR]

Status : Countdown

When "Display" in Setting Menu is ON and POWER ON is executed, it starts processing Countdown.

When "Display" in Setting Menu is OFF, processing Countdown is canceled and the status moves to Power ON.

8.3.4. “20” [CR]

Status : Processing Cooling Down

When the status is Power ON, and POWER OFF Command (“C01”[CR]) is executed, it moves to Cooling Down status.

This status automatically moves to Standby when lamp turns off and the fan spin finishes after about 90 seconds. (The fan spin time depends on models.)

This function is used to cool down lamps and other optical parts, and is quite important for projector’s liability.

During this time, Functional Execution Commands are invalid.

8.3.5. “10” [CR]

Status : Power Failure

When the power supply voltage inside the projector reaches abnormal status, the projector is automatically turned off. The projector returns “10”[CR], which shows it moves to Power OFF status due to power failure. Fan also stops unlike Cooling Down status.

8.3.6. “28” [CR]

Status : Processing Cooling Down due to High Temperature

When the inside temperature is out of the operating temperature, it automatically starts Cooling Down. Response for this status is “28”[CR].

Even if the temperature decreases during this process, Cooling Down is executed.

8.3.7. “08” [CR]

Status: Temperature Failure

When the inside temperature does not go down even after Cooling Down, response for this status is “08”[CR].

Projector maintains the Standby mode.

8.3.8. “88” [CR]

Status : Coming back after Temperature Failure

When Temperature Failure occurs, it starts Cooling Down and moves to Standby status、response for this status is “88”[CR] which shows it moves to Standby status due to Temperature Failure.

This status will be kept till the next operation takes place. When Power On is executed, it cancels the Temperature Failure information and operates normal operation.

8.3.9. “02” [CR]

Status : RS232C Command cannot be received

When received this command, try to execute Status Read Command again.

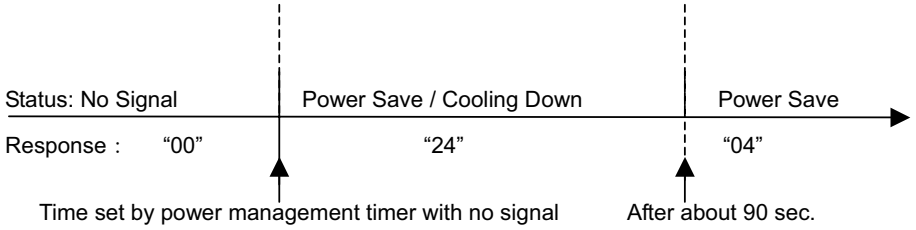
8.3.10 “24” [CR]

Status: Processing Power Save/Cooling Down

When Power Management function in the Setting Menu is set ON, the status goes to Power Save/Cooling Down if no signal state status last for 5 minutes. (During this time, green LED of a projector is turned off.)

During this time, any Functional Execution Commands are invalid.

The status moves to Power Save status after 90 seconds of Power Save/Cooling Down. (Green LED of a projector becomes flashing)



8. 3.11 "04" [CR]

Status: Power Save

When Power Management function in the Setting Menu is set ON, the status goes to Power Save status via Cooling Down if no signal state status last for 5 minutes. During this time, Control Commands stated below become valid;

Power ON Command : "C00" [CR]・・・・Moves to Power ON status

Power OFF Command : "C01" [CR]・・・Moves to Standby status

Transition to Power ON status is the same as transition from normal Standby to Power ON status.

8.4.Input Mode Read Command

Command	“CR1” [CR]	
Details	Get selected Input.	
Response	Acceptable	“%1” [CR]
	%1	”１” = Computer is selected “３” = Video is selected
	Unacceptable	“?” [CR]

8.5.Lamp Time Read Command

Command	“CR3” [CR]	
Details	Get total lamp running hours.	
Response	Acceptable	“%1” [CR]
	%1	Displays Lamp running hour with 4 digit numbers. Example) “0410” [CR] ‥‥410 hours
	Unacceptable	“?” [CR]

8.6.Setting Read Command

Command	“CR4” [CR]	
Details	Get screen setting status such as Ceiling/Rear.	
Response	Acceptable	“%1” [CR]
	%1	“11” [CR] = Normal Screen Setting “10” [CR] = Image is top/bottom reversed. (Status: Rear＆Ceiling ON) “01” [CR] = Image is left/right reversed. (Status: Rear ON) “00” [CR]=Image is top/bottom and left/right reversed. (Status: Ceiling ON)
	Unacceptable	“?” [CR]

8.7.Temp Read Command

Command	“CR6” [CR]	
Details	Get the temperature inside a projector. With some built-in temperature sensors, it is possible to know all temperatures at once.	
Response	Acceptable	“%1_%2_%3” [CR]
	%1, %2	%1 ＝Temp. of sensor 1 %2 ＝Temp. of sensor 2 %3 ＝Temp. of sensor 3 Temp. data form shows as 00.0. When the temp. sinks to -, the first character is “-” like “-05.5”[CR]. When no temp. data returns due to hardware problems, the first character is “E” like ”E00.0”[CR]. With some built-in temp. sensors, the projector sends commands continuously. “_31.5_ _35.2”[CR] There is the first sensor’s data, one space, and the second sensor’s data.
	Unacceptable	“?” [CR]