

DLP™ Projector

MODEL

HC7800D/HC7800DW

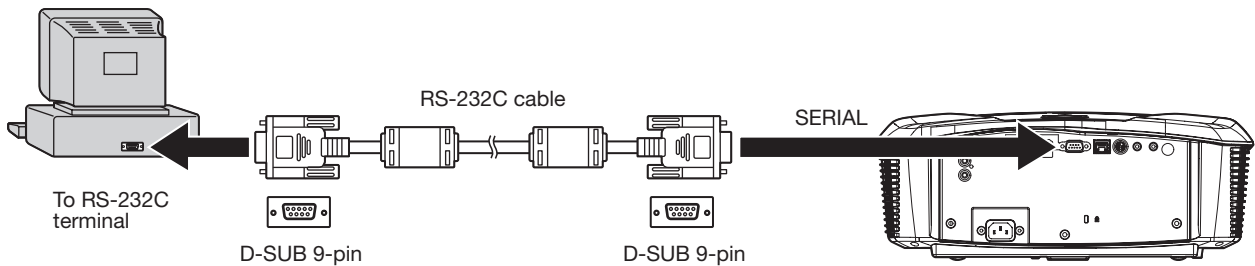
## Controlling the projector using a personal computer

This projector can be controlled by connecting a personal computer with RS-232C terminal.

### PC-controllable functions:

- Turning the power ON or OFF
- Changing input signals
- Inputting commands by pressing the buttons on the control panel and remote control
- Menu setting

### Connection



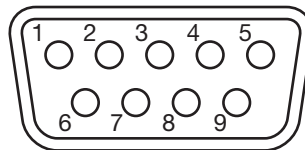
### Important:

- Connect the computer with the projector on a one-to-one basis.
- Make sure that your computer and projector are turned off before connection.
- Boot up the computer first, and then plug the power cord of the projector.  
(If you do not follow this instruction, the Com port may not function.)
- Adapters may be necessary depending on the PC connected to this projector. Contact your dealer for details.

## 1. Interface

### 1.1 Pin assignment of SERIAL terminal (D-SUB 9-pin)

Pin	Description
1	NC
2	RXD
3	TXD
4	NC
5	GND
6	NC
7	RTS
8	CTS
9	NC



### 1.2 Communications format

PROTOCOL	RS-232C
BAUD RATE	9600 [bps]
DATA LENGTH	8 [bits]
PARITY BIT	NONE
STOP BIT	1 [bit]
FLOW CONTROL	NONE

This projector uses RXD, TXD and GND lines for RS-232C control.

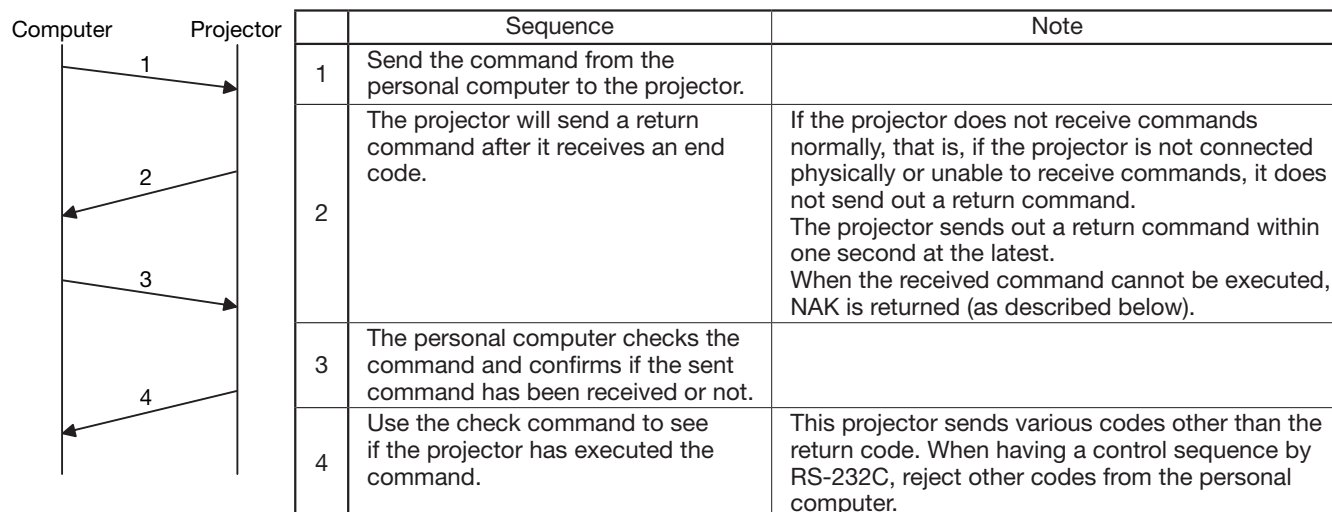
## 2. Control command configuration

The command consists of the address code, function code, data code, ACK/NAK, and end code. The length of the command varies among the functions.

	Address code	Function code	Data code	ACK/NAK	End code
ASCII	'30h' '30h'	Function	Data	'3Ah' '4Eh'	'0Dh'
Character	00	Function	Data	:N	↵

- [Address code] Fixed to 00. ('30h' '30h' in the ASCII code)  
 [Function code] Code unique to each control operation.  
 [Data code] Data (value) unique to each control operation (Not always indicated.)  
 [ACK/NAK] Code indicating the NAK return as described below  
 Fixed to :N ('3Ah' '4Eh' in the ASCII code. Not added to ACK.)  
 [End code] Fixed to ↵. ('0Dh' in the ASCII code)

## 3. Control sequence



- NAK return  
 In the following cases, the projector returns the command with “:N” added.
  - (1) Though the command sent from the computer is received by the projector successfully, it cannot be executed because the projector is in the operation prohibition state.
  - (2) The data length of the sent command is incorrect or the command is invalid.
- When a command is sent out during the following operations, it may not be executed.
  - (1) During signal switching
  - (2) In the process of the auto position
  - (3) After the power is turned on.

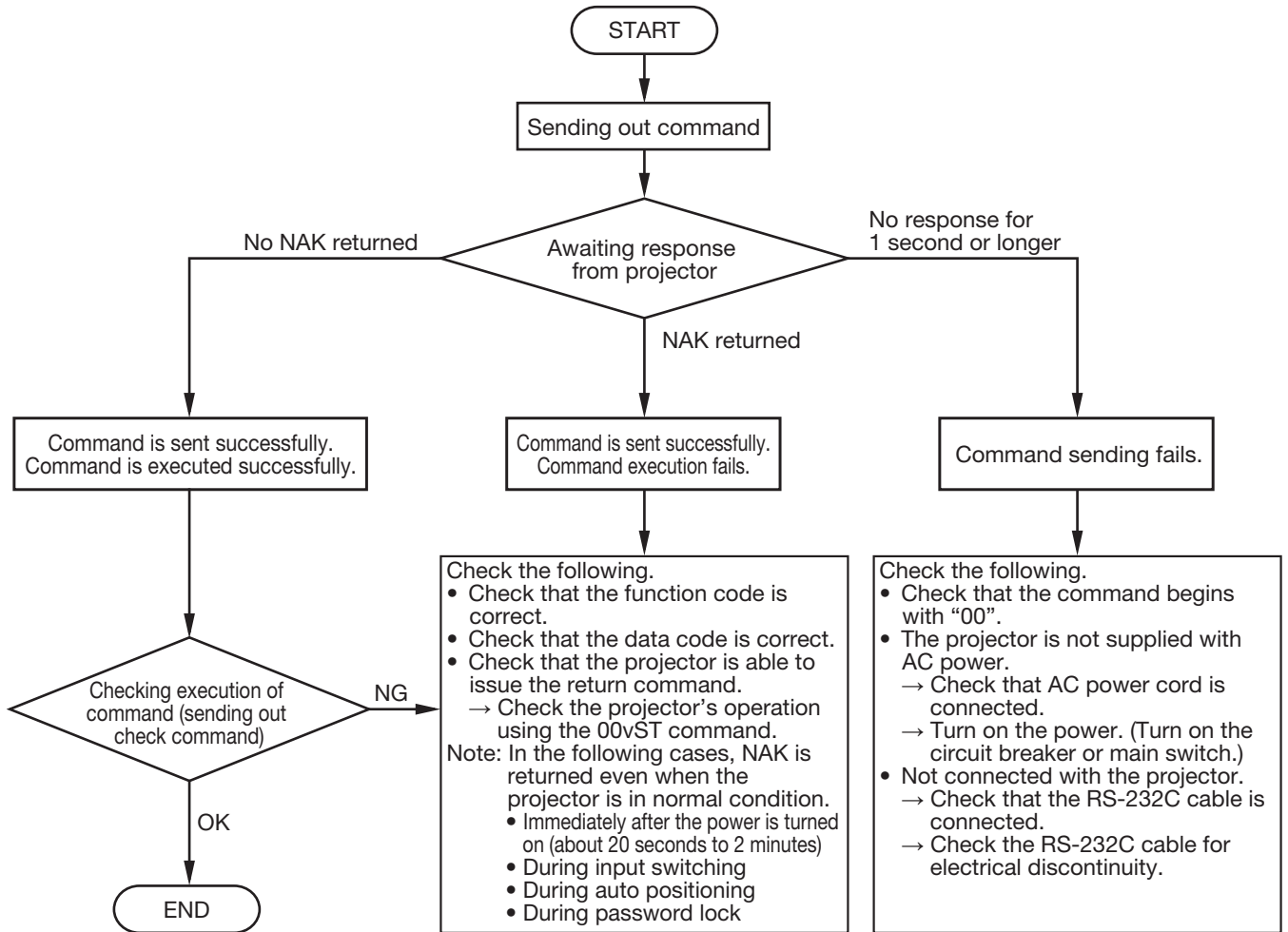
The projector receives no commands for about 20 seconds (or for 2 minutes at the longest if the lamp does not light up promptly as the life is expiring). In this case, the projector returns the received command with NAK added.
- The return command is sent out within 1 second at the latest.
- When sending commands successively, wait to receive the return command of the current command before sending a next command.
- The projector may not receive a command when the splash screen is being displayed immediately after turning on the power. Use command “00r10” to cancel the splash screen.
- While using the LAN terminals, the LAN functions take precedence.
- For the LAN terminals, the same commands as those for connecting with the TCP/IP (port number 63007) are available. Note, however, that the response becomes slightly slower than when using the RS-232C terminals. For the use of LAN terminals, see page 9.

[Example] Selecting COMPONENT as the input signal during auto positioning (Values enclosed in quotation marks are ASCII codes.):

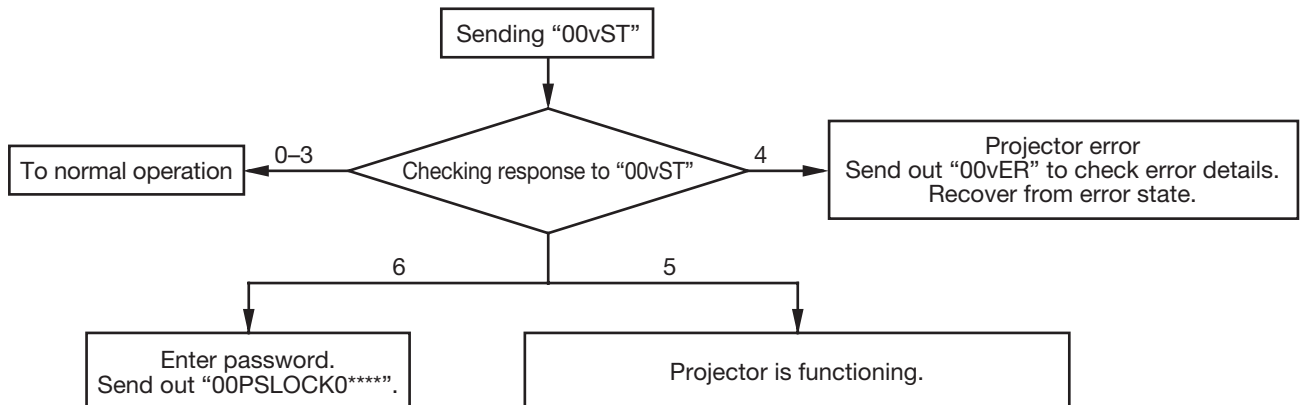
Command sent from the PC	Status code returned from the projector	Description
'30' '30' '5F' '63' '31' '0D' 00_c1 ↵		(During auto positioning) Command for selecting COMPONENT as the input signal is sent out.
	'30' '30' '5F' '63' '31' '3A' '4E' '0D' 00_c1:N ↵	The command is received by the projector but cannot be executed. (NAK return)

- The flowchart on the next page shows the recommended operating sequence for your reference to create a program.

**[RS-232C control flowchart]**



**[Method of checking state of projector]**



**[Compatibility with the former models]**

To use the RS-232C commands designed for the former models of Mitsubishi projector, by inputting "00COMMAND0", the projector responds in the same way as the former models. (No NAK is returned.)

(For the recommended procedure to use the former command systems, see "Controlling the projector using a personal computer" for FL7000U.)

ITEM	Function		Data
	Character	ASCII	
Changing the RS-232C command system	COMMAND	43h 4Fh 4Dh 4Dh 41h 4Eh 44h	0 (Former command system), 1 (New command system)

## 4. Command list

### 4.1 Operation commands

The operation commands are used for the basic operation setting of this projector. They may not be executed while the signals are changed. The operation commands have no data codes. (When the commands for input select are sent while the splash screen is being displayed, the splash screen is only canceled.)

ITEM	Function		Note
	Character	ASCII	
POWER ON	!	21h	This command is invalid for 1 minute after the power is turned off.
POWER OFF	"	22h	This command is invalid for 1 minute after the power is turned on.
INPUT COMPUTER	_r1	5Fh 72h 31h	This command will not be executed in Stand-by mode.
INPUT HDMI1	_d1	5Fh 64h 31h	This command will not be executed in Stand-by mode.
INPUT HDMI2	_d2	5Fh 64h 32h	This command will not be executed in Stand-by mode.
INPUT COMPONENT	_c1	5Fh 63h 31h	This command will not be executed in Stand-by mode.

[Example] When setting the input signal to COMPUTER. (Values enclosed in quotation marks are ASCII codes.):

Command sent from the PC, etc.	Status code returned from the projector	Description
'30' '30' '5F' '72' '31' '0D' 00_r1		Command for setting the input signal to COMPUTER
	'30' '30' '5F' '72' '31' '0D' 00_r1	Command receipt confirmation (Command echo back)

### 4.2 Reading command diagram

The projectors operating status, such as POWER-ON/OFF and the currently selected input terminal, etc. can be monitored.

ITEM	Character		ASCII	
	Function	Data (Receive)	Function	Data (Receive)
POWER ON	vP	1	76h 50h	31h
POWER OFF	vP	0	76h 50h	30h
INPUT COMPUTER	vl	r1	76h 49h	72h 31h
INPUT HDMI1	vl	d1	76h 49h	64h 31h
INPUT HDMI2	vl	d2	76h 49h	64h 32h
INPUT COMPONENT	vl	c1	76h 49h	63h 31h
POWER ON/OFF IMPOSSIBLE	vPK	0	76h 50h 4Bh	30h
POWER ON/OFF POSSIBLE	vPK	1	76h 50h 4Bh	31h
NO SIGNAL SUPPLIED	vSM	0	76h 53h 4Dh	30h
SIGNAL SUPPLIED	vSM	1	76h 53h 4Dh	31h

Use the following commands to obtain the values of the items in the INFORMATION menu.

ITEM	Function		Data (Receive)
	Character	ASCII	
LAMP TIME (LOW)	vLE	76h 4Ch 45h	hhhhmm
RESOLUTION	vRESO	76h 52h 45h 53h 4Fh	HHHHxVVV
VERTICAL FREQUENCY	vVFREQ	76h 56h 46h 52h 45h 51h	***.**
HORIZONTAL FREQUENCY	vHFREQ	76h 48h 46h 52h 45h 51h	***.**
SYNC. TYPE	vSYNCT	76h 53h 59h 4Eh 43h 54h	0 (NO SIGNAL), 3 (3wire), 4 (4wire), 5 (5wire)

“hhhh” and “mm” represent hours and minutes respectively.

“HHHH” and “VVV” represent the horizontal and vertical resolutions respectively.

“\*\*\*.\*\*” represents the vertical frequency (in Hz) or the horizontal frequency (in kHz).

Use the following commands to obtain other information.

ITEM	Function		Data (Receive)
	Character	ASCII	
Model name	vMDL	76h 4Dh 44h 4Ch	***** (within 16 characters)
Input source	vSOURCE	76h 53h 4Fh 55h 43h 45h	r1 c1 d1 d2
Projector status	vST	76h 53h 54h	0 (Stand-by mode), 1 (Within 1 minute after POWER-ON (warm-up mode)), 2 (POWER-ON mode (including state of warning)), 3 (Cooling mode), 4 (Abnormal state (including shutdown due to an error)), 5 (State of functioning (menu display, dialog display, etc.)), 6 (Awaiting password entry)
Error status	vER	76h 45h 52h	Reading out error data (3 digits, hexadecimal numbers, total 9 bits) (MSB) xb1, xb2... xb8, xb9, 0, 0, 0 (LSB) xb1: Fan error xb2: Lamp error (The lamp goes out or does not light.) xb3: Lamp warning 1 (The lamp life has expired.) xb4: Lamp warning 2 (The lamp life is expiring.) xb5: Temperature error xb6: The temperature warning is being indicated. xb7: Lamp cover open error xb8: Fixed to 0. xb9: States of other component abnormality

The PC sends the command without attaching the data code to it. On the other hand, the projector attaches to the received command its current operating status as the data code and send it back to the PC.

[Example] When checking the currently selected input terminal (when the input HDMI1 is being selected). (Values enclosed in quotation marks are ASCII codes.):

Command sent from the PC, etc.	Status code returned from the projector	Description
'30' '30' '76' '49' '64' '31' '0D' 00vld1		Command for checking the input terminal
	'30' '30' '76' '49' '64' '31' '0D' 00vld1	Check result (HDMI1)

### 4.3 Remote commands (Not executable in stand-by mode. When the remote commands are sent while the splash screen is being displayed, the splash screen is only canceled.)

The remote commands allow the computer to control the projector in the same way as by the remote control. (Some operations cannot be controlled.) The remote commands have no data codes.

Button's name on remote	Function	
	Character	ASCII
PICTURE MODE	00r86	72h 38h 36h
F.R.C.	00r56	72h 35h 36h
AV MEMORY1	00re4	72h 65h 34h
AV MEMORY2	00re5	72h 65h 35h
AV MEMORY3	00re6	72h 65h 36h
▲	00r53	72h 35h 33h
▼	00r2b	72h 32h 62h
◀	00r4f	72h 34h 66h
▶	00r59	72h 35h 39h
MENU	00r54	72h 35h 34h
CONTRAST	00rd0	72h 64h 30h
BRIGHTNESS	00rd1	72h 64h 31h

Button's name on remote	Function	
	Character	ASCII
GAMMA	00rd5	72h 64h 35h
BRILLIANT COLOR™	00rc7	72h 63h 37h
3D MODE	00r57	72h 35h 37h
COLOR MANAGEMENT	00rb4	72h 62h 34h
ENTER	00r10	72h 31h 30h
IRIS	00r55	72h 35h 35h
ASPECT	00re2	72h 65h 32h
COLOR TEMP.	00rd4	72h 64h 34h
SHARPNESS	00rd6	72h 64h 36h
COLOR	00rd2	72h 64h 32h
AUTO POSITION	00r09	72h 30h 39h
ANAMO	00r97	72h 39h 37h

[Example] When displaying the MENU selection bar. (Values enclosed in quotation marks are ASCII codes.):

Command sent from the PC, etc.	Status code returned from the projector	Description
'30' '30' '72' '35' '34' '0D' 00r54		Command operating the same as the MENU button
	'30' '30' '72' '35' '34' '0D' 00r54	Command receipt confirmation (Command echo back)

#### 4.4 Menu setting commands (Not executable in stand-by mode. Possible only to read during muting.)

The menu setting commands are used for the menu setting of this projector. If the personal computer sends the command without attaching the data code, the projector attaches to the received command its current setting value as the data code and send it back to the PC.

ITEM	Function		Data
	Character	ASCII	
PICTURE MODE	PM	50h 4Dh	0 (CINEMA), 1 (VIDEO), 2 (3D), 3 (ISF(DAY)), 4 (ISF(NIGHT)), 5 (AV MEMORY1), 6 (AV MEMORY2), 7 (AV MEMORY3)
GAMMA MODE	GS	47h 53h	0 (CINEMA), 1 (2.0), 2 (2.1(VIDEO)), 3 (2.2), 4 (3D), 5 (2.4), 6 (USER1), 7 (USER2), 8 (ISF(DAY)), 9 (ISF(NIGHT))
GAMMA MODE - USER1 (REFERENCE)	GSU1REF	47h 53h 55h 31h 52h 45h 46h	0 (2.0), 1 (2.1), 2 (2.2), 3 (3D), 4 (2.4)
GAMMA MODE - USER2 (REFERENCE)	GSU2REF	47h 53h 55h 32h 52h 45h 46h	0 (2.0), 1 (2.1), 2 (2.2), 3(3D), 4 (2.4)
GAMMA MODE - USER1 (ADJUST MODE)	GSU1L	47h 53h 55h 31h 4Ch	±99 ±99 ±99 (R, G, B) Signal level (02%, 04%, 06%, 10%, 15%, 20%, 25%, 30%, 40%, 50%, 70%, 90%)
GAMMA MODE - USER2 (ADJUST MODE)	GSU2L	47h 53h 55h 32h 4Ch	±99 ±99 ±99 (R, G, B) Signal level (02%, 04%, 06%, 10%, 15%, 20%, 25%, 30%, 40%, 50%, 70%, 90%)
CONTRAST	PP	50h 50h	±30
BRIGHTNESS	QQ	51h 51h	±30
COLOR TEMP.	A	41h	0 (HighBrightness), 1 (COOL), 2 (MEDIUM), 3 (WARM), 4 (3D), 5 (USER), 6 (ISF(DAY)), 7 (ISF(NIGHT))
COLOR TEMP. - USER (REFERENCE)	CTREF	43h 54h 52h 45h 46h	0 (COOL), 1 (MEDIUM), 2 (WARM)
COLOR TEMP.-USER (CONTRAST)	P	50h	±60 ±60 ±60 (R, G, B)
COLOR TEMP.-USER (BRIGHTNESS)	Q	51h	±60 ±60 ±60 (R, G, B)
COLOR	T	54h	±10
TINT	S	53h	±10
SHARPNESS	R	52h	±5
BrilliantColor™	WEH	57h 45h 48h	0 (OFF), 1 (ON)
3D	TDE	54h 44h 45h	0 (OFF), 1 (ON)
3D MODE	TDM	54h 44h 4Dh	0 (AUTO), 1 (FRAME PACKING), 2 (SIDE BY SIDE), 3 (TOP AND BOTTOM)
3D SYNC.	TDS	54h 44h 53h	0 (NORMAL), 1 (REVERSE)
2D-3D CONVERSION	TDC	54h 44h 43h	0 (OFF), 1 (ON)
3D DEPTH	TDD	54h 44h 44h	01 - 10
SCREEN SIZE	SCR	53h 43h 52h	16:9, CINEMA SCOPE (2.35:1)
VERTICAL LOCATION	IMP	49h 4Dh 50h	±26
FRAME RATE CONVERSION	FRC	46h 52h 43h	0 (OFF), 1 (TRUE FILM), 2 (TRUE VIDEO)
F.R.C. LEVEL	FRCL	46h 52h 43h 4Ch	1 - 5
AUTO IRIS	IRIS	49h 52h 49h 53h	0 (OFF), 1 (AUTO1), 2 (AUTO2), 3 (AUTO3)
NOISE REDUCTION	NR	4Eh 52h	0 (OFF), 1 (ON)
CTI	CTI	43h 54h 49h	00 - 05
INPUT LEVEL	IPL	49h 50h 4Ch	0 (AUTO), 1 (ENHANCED), 2 (NORMAL), 3 (SUPERWHITE)
SET UP	STU	53h 54h 55h	0 (AUTO), 1 (OFF), 2 (3.75%), 3 (7.5%)
COLOR MANAGEMENT	CMG	43h 4Dh 47h	0 (OFF), 1 (ON)
COLOR MANAGEMENT (GAIN)	CMGG	43h 4Dh 47h 47h	-49 - 50 (R, Y, G, C, B, M)
COLOR MANAGEMENT (SATURATION)	CMGS	43h 4Dh 47h 53h	±50 (R, Y, G, C, B, M)
COLOR MANAGEMENT (HUE)	CMGH	43h 4Dh 47h 48h	±50 (R, Y, G, C, B, M)
COLOR SPACE	CSP	43h 53h 50h	0 (WIDE), 1 (NORMAL)
LAMP MODE	LM	4Ch 4Dh	0 (STANDARD), 1 (LOW)
STANDBY MODE	STBY	53h 54h 42h 59h	0 (STANDARD), 1 (LOW)
AUTO POWER ON	APON	41h 50h 4Fh 4Eh	0 (OFF), 1 (ON)
AUTO POWER OFF	APOF	41h 50h 4Fh 46h	00 (OFF), 05, 10, 15, 30, 60
SPLASH SCREEN	SS	53h 53h	0 (OFF), 1 (ON)

ITEM	Function		Data
	Character	ASCII	
BACK COLOR	BB	42h 42h	0 (BLACK), 1 (BLUE)
IMAGE REVERSE	IR	49h 52h	0 (OFF), 1 (MIRROR), 2 (INVERT), 3 (MIRROR INVERT)
TRIGGER1(POWER)	SCT	53h 43h 54h	0 (OFF), 1 (ON)
TRIGGER2(ANAMO)	SCTA	53h 43h 54h 41h	0 (OFF), 1 (ON)
TEST PATTERN	TP	54h 50h	0 (OFF), 1 (CROSS HATCH), 2 (WHITE), 3 (BLACK)
ASPECT	SC	53h 43h	0 (AUTO), 1 (4:3), 2 (16:9), 3 (ZOOM1), 4 (ZOOM2), 5 (STRETCH), 6 (ANAMORPHIC1), 7 (ANAMORPHIC2)
PASSWORD FUNCTION	PSLOCK****	50h 53h 4Ch 4Fh 43h 4Bh	0**** (UNLOCK), 1**** (DISPLAY INPUT), 2**** (MENU ACCESS), **** is a 4 to 8-digit password comprised of any figures 1 to 4.
MENU POSITION	MP	4Dh 50h	0 (Upper left), 1 (Lower right)
MENU DIMMER	MDIM	4Dh 44h 49h 4Dh	0 (OFF), 1 (ON)
CINEMA MODE	CINE	43h 49h 4Eh 45h	0 (VIDEO), 1 (AUTO), 2 (FILM)
REMOTE POSITION	RP	52h 50h	0 (AUTO), 1 (FRONT), 2 (REAR)
LANGUAGE	LG	4Ch 47h	0 (Japanese), 1 (English), 2 (Spanish), 3 (German), 4 (French), 5 (Italiano), 6 (Chinese), 7 (Korean), 8 (Russian), 9 (Portuguese)
RESET ALL	RSTALL	52h 53h 54h 41h 4Ch 4Ch	
HORIZ.POSITION	HP	48h 50h	+: increment, -: decrement *1
VERT.POSITION	VP	56h 50h	+: increment, -: decrement *1
FINE SYNC.	FN	46h 4Eh	0 - 31
TRACKING	TRK	54h 52h 4Bh	+: increment, -: decrement *1
COMPUTER INPUT	CIN	43h 49h 4Eh	0 (RGB), 1 (Y <sub>C</sub> C <sub>R</sub> /Y <sub>P</sub> P <sub>R</sub> ), 2 (AUTO)
OVER SCAN	VOS	56h 4Fh 53h	00 (90%) - 10 (100%)
HOLD	HLD	48h 4Ch 44h	0 (OFF), 1 (ON)
HOLD BEGIN	HLB	48h 4Ch 42h	0 - 99
HOLD END	HLE	48h 4Ch 45h	0 - 99
CLAMP POSITION	CLP	43h 4Ch 50h	1 - 255
CLAMP WIDTH	CLW	43h 4Ch 57h	1 - 63
VERT.SYNC.	VSC	56h 53h 43h	0 (AUTO), 1 (OFF)
LPF	LPF	4Ch 50h 46h	0 (OFF), 1 (ON)
SHUTTER(U)	SHU	53h 48h 55h	0 - 32
SHUTTER(L)	SHL	53h 48h 4Ch	0 - 32
SHUTTER(LS)	SHLS	53h 48h 4Ch 53h	0 - 95
SHUTTER(RS)	SHRS	53h 48h 52h 53h	0 - 95

\*1) Setting range differs depending on the input signals.

- Some commands are not executed depending on the input signal. The operational restrictions same as those on the menu setting are applied. Refer to "Menu operation" in the User Manual for more details.

## How to set the value

Use the character or ASCII code as shown below to set the value.

Character	+	-	0	1	2	3	4	5	6	7	8	9
ASCII	'2Bh'	'2Dh'	'30h'	'31h'	'32h'	'33h'	'34h'	'35h'	'36h'	'37h'	'38h'	'39h'

[Example 1] When setting the 3D to ON. (Values enclosed in quotation marks are ASCII codes.):

Command sent from the PC, etc.	Status code returned from the projector	Description
'30' '30' '54' '44' '45' '31' '0D' 00TDE1 [↵]		Command for setting the 3D to ON
	'30' '30' '54' '44' '45' '31' '0D' 00TDE1 [↵]	Command receipt confirmation (Command echo back)

[Example 2] When setting the signal level 2% RED of the GAMMA MODE-USER1 to +5. (Values enclosed in quotation marks are ASCII codes.):

Command sent from the PC, etc.	Status code returned from the projector	Description
'30' '30' '47' '53' '55' '31' '4C' '30' '30' '32' '2B' '30' '35' '0D' 00GSU1L002+05 [↵]		Command for setting the picture control
	'30' '30' '47' '53' '55' '31' '4C' '30' '30' '32' '2B' '30' '35' '0D' 00GSU1L002+05 [↵]	Command receipt confirmation (Command echo back)

[Example 3] When setting the CONTRAST R of the COLOR TEMP.-USER to +10, the CONTRAST G to 0, and the CONTRAST B to -5. (Values enclosed in quotation marks are ASCII codes.):

Command sent from the PC, etc.	Status code returned from the projector	Description
'30' '30' '50' '2B' '31' '30' '2B' '30' '30' '2D' '30' '35' '0D' 00P+10+00-05 [↵]		Command for setting the picture control
	'30' '30' '50' '2B' '31' '30' '2B' '30' '30' '2D' '30' '35' '0D' 00P+10+00-05 [↵]	Command receipt confirmation (Command echo back)

[Example 4] When setting the RED COLOR GAIN of the COLOR MANAGEMENT to -10. (Values enclosed in quotation marks are ASCII codes.):

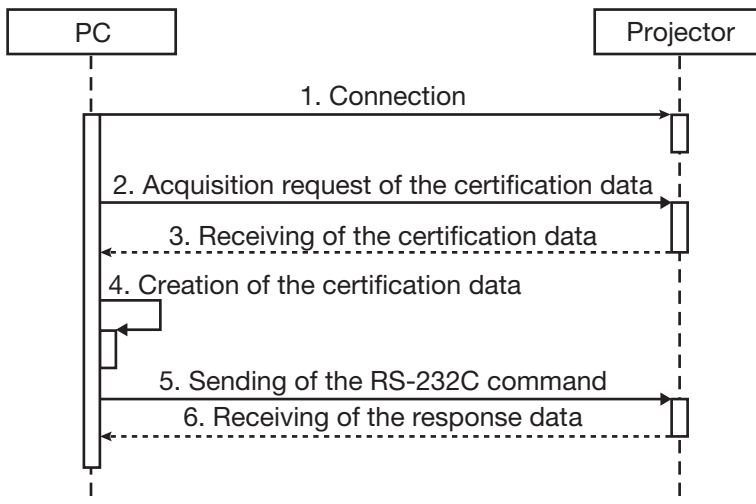
Command sent from the PC, etc.	Status code returned from the projector	Description
'30' '30' '43' '4D' '47' '47' '52' '2D' '31' '30' '0D' 00CMGGR-10 [↵]		Command for setting the picture control
	'30' '30' '43' '4D' '47' '47' '52' '2D' '31' '30' '0D' 00CMGGR-10 [↵]	Command receipt confirmation (Command echo back)

## 5. Execution procedure of RS-232C commands via LAN

When the RS-232C command is executed via LAN, a 32-byte connection certification data must be added before the RS-232C command.

To create a 32-byte certification data, following information and procedure are required.

- Random character string for creating the certification data that is acquired from the projector (8 characters)
  - Network password of the projector (1 to 32 characters)
  - MD5 hash calculation
- Based on the above, the execution procedures to connect to the projector and send the RS-232C commands are described below.
1. Connect to Port 63007 of the projector from the PC as a TCP/IP client.
  2. After completing the connection, send the acquisition request for the certification data (“\$AK [↵]”) from the PC to the projector.
  3. Acquire “\$AK\*\*\*\*\* [↵]” on the PC as the response of the request sent in Step 2. (\*\*\*\*\*: Random character string for creating the certification data)
  4. Create the data for the certification on the PC.
    - Create the key of the certification data by linking the data acquired in Step 3 with the network character string.  
For example, when the random character string is 12345678 and the password is ABCD, the key of the certification data is 12345678ABCD (character string in ASCII code).
    - Run MD5 hash on the key of the certification data.
    - Create the certification data by converting the hash-calculated 16-byte data into the ASCII code character string.  
Example:  
Calculation result: [4f][3c][5d][a1][7b][4f][b5][ed][2c][99][4e][bb][f6][57][67][54] (hexadecimal numeral)  
Certification data: 4f 3c 5d a1 7b 4f b5 ed 2c 99 4e bb f6 57 67 54 (character string in ASCII code)
  5. Send the RS-232C command with the certification data from the PC to the projector.  
Example:  
To send the PON command (00! [↵]) using the certification data created in Step 4:  
4f3c5da17b4fb5ed2c994ebbf657675400! [↵]
  6. Receive the response from the projector on the PC.  
Response data has the following patterns.  
Normal: 00! [↵] (Parameter is added depending on the command.)  
Error in the certification data: PRV=ERRA [↵]  
Command error: 00! [↵]:N



You can change the password using the NETWORK PASSWORD in the NETWORK menu.

The default password is “admin.”

When you use a LAN function, set the STANDBY MODE to “LAN” or “Speaker Out” “Monitor Out”.

Refer to the operation manual of the projector for setting the STANDBY MODE.