

**HITACHI RS232C COMMUNICATION SPECIFICATION**

v.01

Model: P42H401, P42T501,P50H401, P50T501, ,P50S601, P50V701, P50X901,P55H401, P55T501, P60X901  
L42S601,L42V651, L47S601,L47V651

The Specification detail the external RS-232C control communication with HITACHI Plasma TV .

1. Interface

1. 1 Hardware

- (1) DSUB 9P
- (2) Pin Assignment

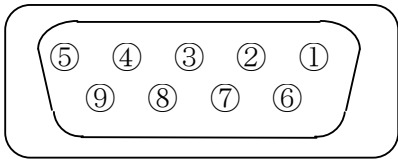


Fig.1 FeMale DSUB 9pin  
(Outside view)

Pin #	Signal	Remark
1	NC	
2	RXDO	FPD← Control PC
3	TXDO	FPD → Control PC
4	DTR	FPD → Control PC
5	GND	FPD GND ↔ PC GND
6	NC	
7	RTS	FPD → Control PC
8	CTS	FPD ← Control PC
9	NC	
Frame	GND	

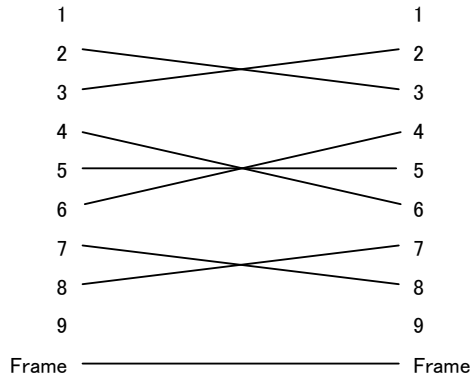
FPD: PDP/LCD

1. 2 Electric: To be upon the RS232C standard

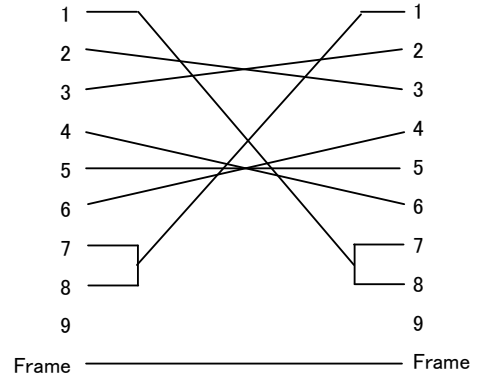
### 1.3 RS-232C Cable

Connect it with PC by using RS-232C Cable connected as follows.

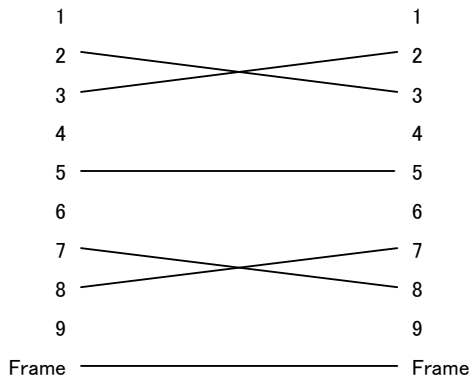
**Cable1**



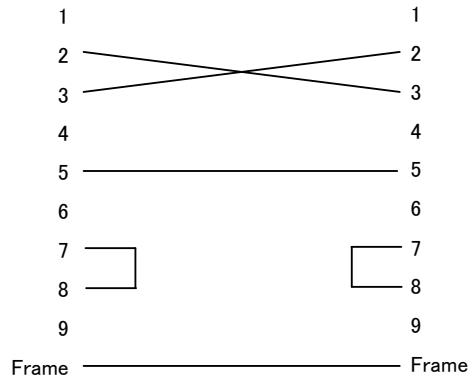
**Cable2**



**Cable3**



**Cable4**

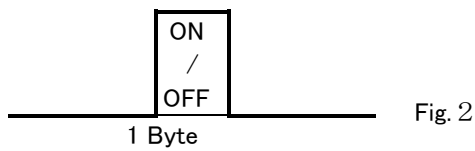


## 2. Communication Format

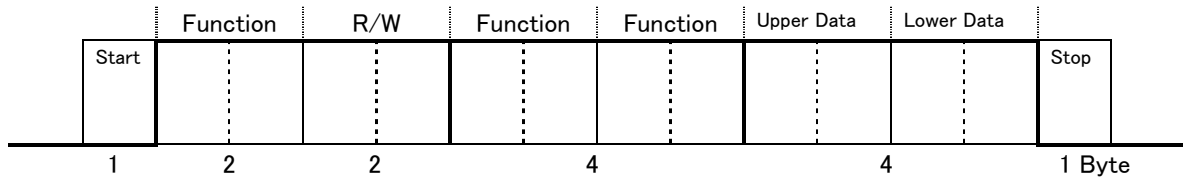
- (1) Communication System :Asynchronous
- (2) Bit Rate :9600bps
- (3) Data Length :7bit
- (4) Parity :No
- (5) Stop Bit :1bit
- (6) Flow Control :No (Xon/Xoff, Hardware)

### (7) Format

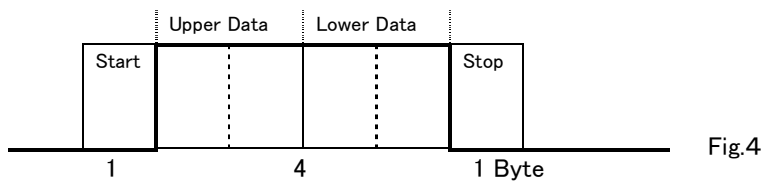
#### (7. 1) Terminal Mode control format received



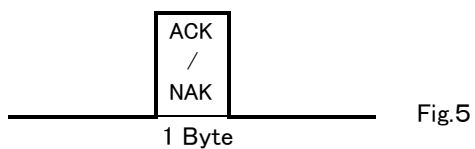
#### (7. 2)Communication format received:12Byte + 2Byte



#### (7. 3)Answer format:4Byte + 2Byte



#### (7. 4)Answer (ACK/NAK) format:1 Byte



### 3. Communication Protocol

#### 3. 1 Terminal Mode (Communication Mode between FPD—External)

Table 3.1.2 Terminal mode control

Terminal Mode Switching		FPD	
		Receive	Return
ON	Action	Request ON	Accept/Reject
	Character	ENQ	ACK/NAK
	Code(HEX)	05	06/15
OFF	Action	Request OFF	Accept/Reject
	Character	EOT	ACK/NAK
	Code(HEX)	04	06/15

- (1) External PC can control TV to make Terminal Mode ON and OFF.
- (2) Terminal Mode: ON = Communication is possible, OFF = Communication is prohibited.
- (3) When Terminal Mode is ON, the front key and Remote control unit can't be accepted.  
Only Power SW on the front can be operational.
- (4) When TV set turn OFF and ON, Terminal Mode maintains.
- (5) Factory setting: Terminal Mode is OFF and AV Control Mode is OFF with Not checking box of Menu .
- (6) When TV received a request of either Communication ON or OFF, the TV will return an answer to PC.
- (7) In the following case, even if the check box of Menu is checked, Terminal Mode cannot be turn on.
  - Adjust Mode
  - Under Event Timer and Timer Recording
- (8) When the Function with "WRITE"(Table 5) is used, write in E2PROM same as the Normal Mode.
- (9) The Function with OSD is refer to Table 5

### 3.2 Command summary (receiving and returning)

#### 3.2.1 Format of command received

- TV accept the communication format as Table 3.2.1.1, only when the Terminal Mode is ON.
- The length of all command is fixed as 12 bytes, Start and Stop Code should be added in front and behind of the 12 bytes. One normal communication unit consists of Total 14 bytes.
- The command consist of 6 HEX codes, from 1st to 6th as below. (Total 12 bytes)
- All commands should be described by Character Code converted from HEX code.
- The format of command is shown in the table 3.2.1.2 There are 3 types of format.
- All commands are classified into the 3 types by 1st command and 2nd command.

Table 3.2.1.1 Communication format received

Receive Byte No.	Start	Command(12byte)												Stop
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Contents of Commands	Start	1st (Function)		2nd (R/W)		3th upper byte (Function)		4th lower byte (Function)		5th upper byte (Data)		6th lower byte (Data)		Stop
Character(HEX)	STX	0~F	0~F	0~F	0~F	0~F	0~F	0~F	0~F	0~F	0~F	0~F	0~F	ETX
Code(HEX)	02	*1	*1	*1	*1	*1	*1	*1	*1	*1	*1	*1	*1	03

\*1 Character Code: Example "0"-"9" → 30-39, "A"-"F" → 41-46

Notes: All command and data should be converted to HEX code first. Then upper 4 bit should be converted Character Code (HEX) as above, and lower 4 bit should be done as well.

Table 3.2.1.2 Form of Commands (12 bytes) received

Form No.	Action	Command(12byte)					
		1st	2nd	3rd	4th	5th	6th
(a)	Reset Write/Read etc	Command (**)	Dummy (00)	Dummy (00)	Dummy (00)	Dummy (00)	Dummy (00)
(b)	Read Data	Command (**)	Operation (**)	Command (**)	Command (**)	Dummy (00)	Dummy (00)
(c)	Write Data	Command (**)	Operation (**)	Command (**)	Command (**)	Data (**)	Data (**)

#### 3.2.2 Format of commands returned

- After the operation instructed by command followed the table 3.2.1.2 is finished, TV will return an answer formatted as in the table 3.2.2 to PC.

Table 3.2.2 Form of Answer

Send byte No.	Communication Normal/Error	When requested of reading Data only (TV→External PC)					
		1	2	3	4	5	6
Contents of Commands	Accepted/Rejected	Start	Data upper byte		Data lower byte		Stop
Character(HEX)	ACK/NAK	STX	0~F	0~F	0~F	0~F	EXT
Code(HEX)	06/15	02	*1		*1		03

\*1 Character Code: Example "0"-"9" → 30-39, "A"-"F" → 41-46

### 3. 3 Command Table

#### 3. 3. 1 1st sub command (for Function) table

The command formats for adjustment items are shown in table 3.3.1

Table 3.3.1 Command table for 1st sub command and adjusted items

No.	Setting Item	Command*			OSD	E2PROM	Command Format (*1)
	Function	1 <sup>st</sup> (HEX)	R/W Cont.	3 <sup>rd</sup> 4 <sup>th</sup> (HEX)			
1	POWER	6E	R/W	0000	Info	Write	(c)
2	INPUT	6F	R/W	0000	Info	Write	(c)
3	VOLUME	27	R/W	0000	Volume Bar		(c)
4	BALANCE	28	R/W	0000	Audio Menu		(c)
5	TREBLE	2B	R/W	0000	Audio Menu		(c)
6	BASS	2A	R/W	0000	Audio Menu		(c)
7	AUDIO MUTE	29	R/W	0000	Audio Menu		(c)
	(TV MODE)						(c)
8	PICTURE MODE	A4	R/W	0003	Day/Night		(c)
9	CONTRAST	59	R/W	0000	Video Menu		(c)
10	BRIGHTNESS	1F	R/W	0000	Video Menu		(c)
11	COLOR	10	R/W	0000	Video Menu		(c)
12	TINT	13	R/W	0000	Video Menu		(c)
13	SHARPNESS	14	R/W	0000	Video Menu		(c)
14	COLOR TEMPARATURE	60	R/W	0000	Video Menu		(c)
15	ASPECT	40	R/W	0000	Aspect (Info OSD)		(c)
16	INFO	B2	W	0000	Info		(c)
17	DIRECT 0~9 KEY	D0	W	0000	CH No. or Picture No.	Write	(c) (Note1)
18	DIRECT CH -	D0	W	0001	CH No.	Write	(c) (Note2)
19	DIRECT Select KEY	D0	W	0002	.Select CH No. or Select Picture No.	Write	(c)
20	AUTO MOVIE MODE	D4	R/W	0000	Video Menu		(c)
21	EXIT	D9	W	0000	To erase OSD/TV Guide		(c) (Note3)

(Note1)

When INPUT is "Cable or AIR", 0-9 KEY is used to input CH Number.

When INPUT is Photo Input, 0-9KEY is used to input Picture number.

(Note2)

When INPUT is "Cable or AIR", Select KEY selects CH.

When INPUT is Photo Input, Select KEY selects Picture number or displays THUMBNAIL

(Note3)

EXIT Command is similar to EXIT button for remote control.

Normally it's used to erase OSD/TV Guide temporarily.

In TV Guide model, TV Guide screen might disturb the correct RS232C communication.

Therefore, it is preferable to disable "Auto Guide" function so that TV Guide screen will not show up after initial power on.

3. 3. 2 2nd sub command (Read/Write) table

Refer to table 3.3.1

R : Read only. 01(HEX) can be accepted. Data (absolute value) will be read out from TV.

W : Write only. 00(HEX) can be accepted. Data (absolute value) will be written to TV.

R/W : Read & Write. Both of 00 and 01(HEX) can be accepted.

When 01(HEX) is transferred to TV, the DATA (absolute value) will be read out from TV.

When 00(HEX) is transferred to TV, the DATA (absolute value) will be written to TV.

3. 3. 3 5<sup>th</sup> and 6<sup>th</sup> data command table

The table 3.3.3 below shows the spec of 5th and 6th data on Normal 1st command.

The data length should be referred to the table 3.2.1.2, table 3.3.1

Table 3.3.3 Spec for 3rd – 6th data on Normal command

No.	Transfer data(HEX)		Note
	5th	6th	
1	Dummy Data	Dummy Data	
2	Dummy Data	Transferred Data(1byte)	
3	Transferred Data (upper1byte)	Transferred Data (lower1byte)	

Notes: Any data transferred as Dummy data will be ignore by TV and PC.

### 3. 3. 5 Setting item list

#### 3. 3. 5. 1 Adjusting item list

Table 3.3.5.1 Setting item list

	Setting Item		5 <sup>th</sup> /6 <sup>th</sup> Range of Data	Initial Data	Comments
1	POWER		0:Off 1:On	0	
2	INPUT		0:Input1 1:Input2 2:Input3 3:Input Front <del>4</del> 5:Cable or Air <del>6</del> <del>7</del> 8: 9: Photo Input A: B:HDMI1 C:HDMI2 D:HDMI Front	-	
3	VOLUME		0~60	20	
4	BALANCE		0~60	30	
5	TREBLE		0~30	15	
6	BASS		0~30	15	
7	AUDIO MUTE		0:Off 1:On 2.Soft Mute	0	
	(TV)				
8	PICTURE MODE		0:Day(Dynamic) 1:Day(Normal) 2:Night	0	
9	CONTRAST		0~62(STEP)	62	
10	BRIGHTNESS		0~62(STEP)	31	
11	COLOR		0~62(STEP)	31	
12	TINT		0~62(STEP)	31	
13	SHARPNESS		0~62(STEP)	31	
14	COLOR TEMPERATURE		0:High 1:Medium 2:Standard 3:Black&White	-	

(Note) COLOR TEMPARATURE command

NACK responds when Black&Whitew is specified for model T and model H.

NACK responds when Photo Input is specified for model H and model S.

15	ASPECT		0: 16:9 Standard1 1: 16:9 Zoom 2: 4:3 Standard 3: 4:3 Expanded 4: 4:3 Zoom1 5: 4:3 Zoom2 6: 16:9Standard2 7: FULL 8: NORMAL 9: REAL	-	
16	INFO		0:Off 1:On	0	
17	DIRECT 0~9		KEY CODE 0~9	-	
18	DIRECT CH -		0	-	
19	DIRECT Select		0	-	
20	AUTO MOVIE MODE		T,H,Smodel andVmodel(LCDonly) 0:Off 1:On(AUTO) X model andVmodel(PDPonly) 0:Off 1:Original 2:Smooth	0	(NOTE2)

(NOTE)

if the READ command is executed at once after the WRITE command is executed, a correct value cannot be read because data has not been updated.

Execute the READ command after the OSD display disappears and data is updated.

(NOTE2) AUTO MOVIE MODE Command

NACK responds when Smooth is specified for model T , model H , model S and model V (LCD).

NACK responds when Game Mode is ON.

## Command String Development Information

4.1- To assist with developing command strings, the table below shows a Hex character conversion chart

Table 4.1.1 Hex Character Conversion Chart

Hex Character	Hex Code	Hex Character	Hex Code
0	30	A	41
1	31	B	42
2	32	C	43
3	33	D	44
4	34	E	45
5	35	F	46
6	36		
7	37		
8	38		
9	39		

4.2 - An example of the proper coding technique is demonstrated below for the "Power On" Command.

Hex Character Set: 6E: Power Function

00: Write Function (Note- A "01" would indicate a read function)

00: 3<sup>rd</sup> (Upper byte-Function)

00: 4<sup>th</sup> (Lower byte-Function)

00: 5<sup>th</sup> (Upper byte-Data)

01: 6<sup>th</sup> (Lower byte- Data)

Hex Coded Data: 3645303030303030303031

Note- an STX (02-Hex) would be added at the start of the string and ETX (03-Hex) would be added at the end of the string to create a complete command.

4.3- Figure 6 shows the 14 byte string formatted in Hex Characters for the "Power On Function".

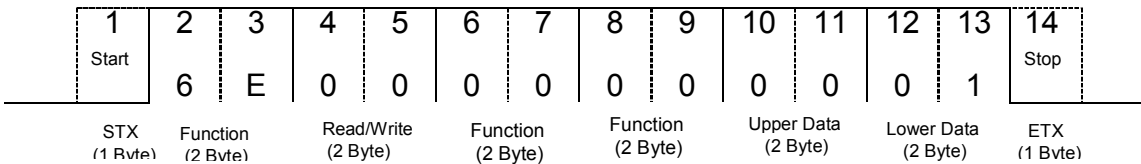


Figure 6

4.4- Figure 7 shows the "Power On" function converted to Hex Code set

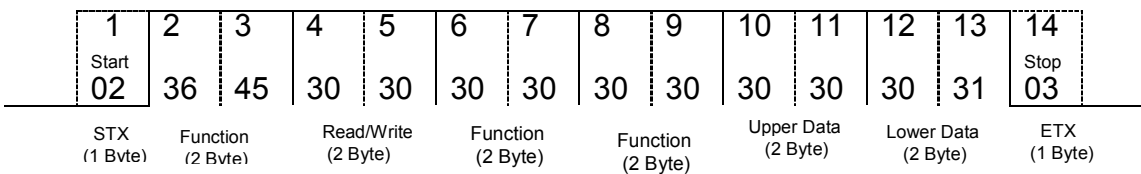


Figure 7

4.5- The following table provides the conversion strings for the "Write" commands

Table 4.5.1 Write Data Command Summary

No.	Item	Command	Initial Condition	Hex Character	Hex Code Set	Result
1	Power	On	0	6E0000000001	36453030303030303030303030303031	Turns Power On
2	Power	Off	0	6E0000000000	36453030303030303030303030303030	Turns Power Off
3	Input	Input 1	-	6F0000000000	36463030303030303030303030303030	Input 1
4	Input	Input 2	-	6F0000000001	36463030303030303030303030303031	Input 2
5	Input	Input 3	-	6F0000000002	36463030303030303030303030303032	Input 3
6	Input	Input front	-	6F0000000003	36463030303030303030303030303033	Input front
7						
8	Input	Cable or Air		6F0000000005	36463030303030303030303030303035	Cable or Air
9	Volume	Set to 0	20	270000000000	32373030303030303030303030303030	Set to 0
10	Balance	Set to 31	30	28000000001F	32383030303030303030303030303146	Set to 31
11	Treble	Set to 16	15	2B0000000010	32423030303030303030303030303130	Set to 16
12	Bass	Set to 16	15	2A0000000010	32413030303030303030303030303130	Set to 16
13	Audio Mute	Set to off	0	290000000000	32393030303030303030303030303030	Set to Off
14	Audio Mute	Set to On	0	290000000001	32393030303030303030303030303031	Set to On
15	Picture Mode	Set to Day(Dynamic)	0	A40000030000	41343030303030303030303030303030	Set to Day(Dynamic)
16	Picture Mode	Set to Day(Normal)	0	A40000030001	41343030303030303030303030303031	Set to Day(Normal)
17	Picture Mode	Set to Night	0	A40000030002	41343030303030303030303030303031	Set to Night
18	Contrast	Set to 59	60	59000000003B	35393030303030303030303030303342	Set to 59
19	Brightness	Set to 29	30	1F000000001D	31463030303030303030303030303144	Set to 29
20	Color	Set to 29	30	10000000001D	31303030303030303030303030303144	Set to 29
21	Tint	Set to 29	30	13000000001D	31333030303030303030303030303144	Set to 29
22	Sharpness	Set to 29	30	14000000001D	31343030303030303030303030303144	Set to 29
23	Color Temperature	Set to High	-	600000000000	36303030303030303030303030303030	Set to High
24	Color Temperature	Set to Medium	-	600000000001	36303030303030303030303030303031	Set to Medium
25	Color Temperature	Set to Standard	-	600000000002	36303030303030303030303030303032	Set to Standard
26	Color Temperature	Set to B&W	-	600000000003	36303030303030303030303030303033	Set to B&W
27	Aspect Ratio	Set to 16:9 Standard1	-	400000000000	34303030303030303030303030303030	Set to 16:9 Standard1
28	Aspect Ratio	Set 16:9 Zoom	-	400000000001	34303030303030303030303030303031	Set 16:9 Zoom
29	Aspect Ratio	Set to 4:3 Standard	-	400000000002	34303030303030303030303030303032	Set to 4:3 Standard
30	Aspect Ratio	Set to 4:3 Expanded	-	400000000003	34303030303030303030303030303033	Set to 4:3 Expanded
31	Aspect Ratio	Set to 4:3 Zoom1	-	400000000004	34303030303030303030303030303034	Set to 4:3 Zoom
32	Aspect Ratio	Set to 4:3 Zoom 2	-	400000000005	34303030303030303030303030303035	Set to 4:3 Zoom 2

