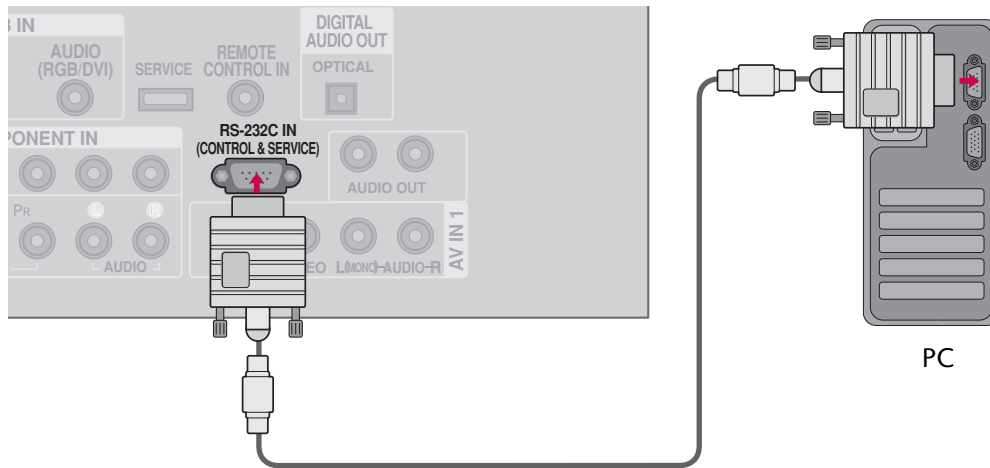


EXTERNAL CONTROL THROUGH RS-232C

The RS-232C port allows you connect the RS-232C input jack to an external control device (such as a computer or an A/V control system) to control the TV's functions externally.

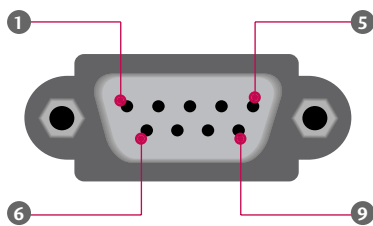
- Note: RS-232C on this unit is intended to be used with third party RS-232 control hardware and software. The instructions below are provided to help with programming software or to test functionality using telenet software.

RS-232C Setup



Type of Connector; D-Sub 9-Pin Male

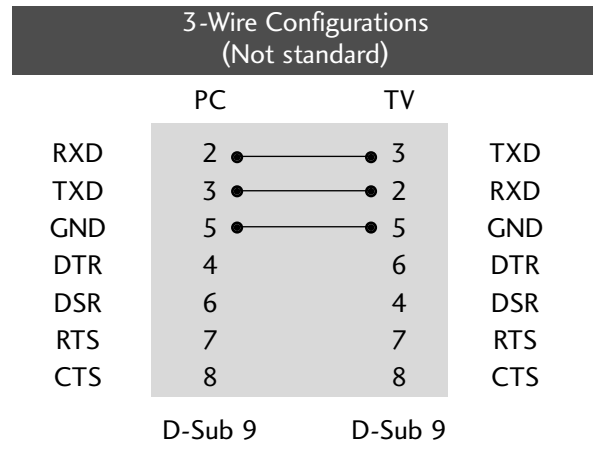
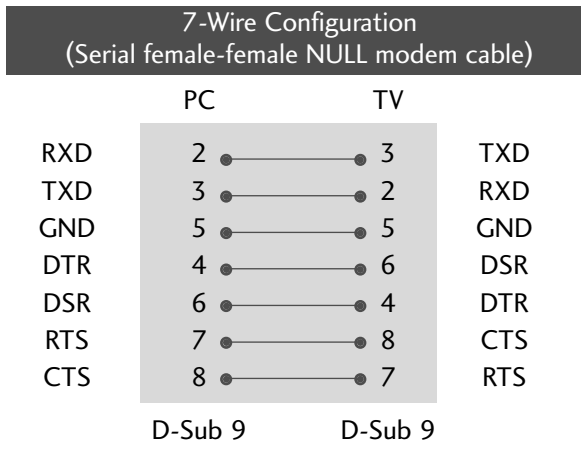
No.	Pin Name
1	No connection
2	RXD (Receive data)
3	TXD (Transmit data)
4	DTR (DTE side ready)
5	GND
6	DSR (DCE side ready)
7	RTS (Ready to send)
8	CTS (Clear to send)
9	No Connection



APPENDIX

RS-232C Configurations

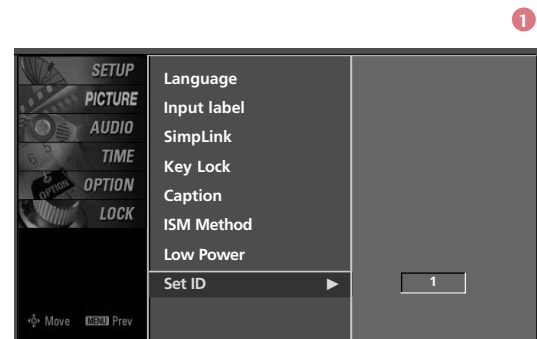
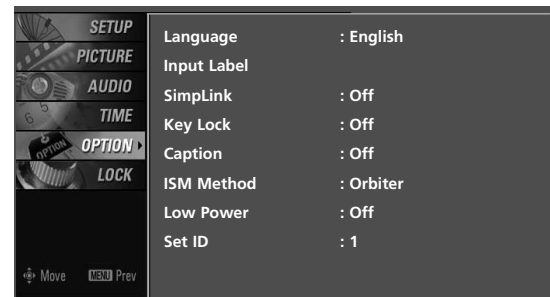
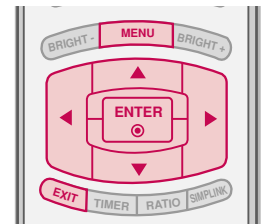
Either cable below can be used.



Set ID

Use this function to specify a TV ID number.
Refer to 'Real Data Mapping'. ▶ p.93.

- 1 Press the **MENU** button and then use ▲ or ▼ button to select the **OPTION** menu.
- 2 Press the ► button and then use ▲ or ▼ button to select **Set ID**.
- 3 Press the ► button and then use ▲ or ▼ button to adjust **Set ID** to choose the desired TV ID number. The adjustment range of Set ID is 1~99.
- 4 Press **EXIT** button to return to TV viewing or press **MENU** button to return to the previous menu.



Communication Parameters

- Baud rate: 9600 bps (UART)
- Data length: 8 bits
- Parity: None
- Stop bit: 1 bit
- Communication code: ASCII code
- Use a crossed (reverse) cable.

NOTE ▶ This product has command echo back in the RS-232C Command.

Command Reference List

	COMMAND1	COMMAND2	DATA (Hexadecimal)		COMMAND1	COMMAND2	DATA (Hexadecimal)
01. Power	k	a	0 ~ 1	15. Treble	k	r	0 ~ 64
02. Input Select	k	b	(▶ p.92)	16. Bass	k	s	0 ~ 64
03. Input Select	x	b	(▶ p.92)	17. Balance	k	t	0 ~ 64
04. Aspect Ratio	k	c	(▶ p.92)	18. Color Temperature	k	u	0 ~ 3
05. Screen Mute	k	d	0 ~ 1	19. Red Adjustment	k	v	0 ~ C8
06. Volume Mute	k	e	0 ~ 1	20. Green Adjustment	k	w	0 ~ C8
07. Volume Control	k	f	0 ~ 64	21. Blue Adjustment	k	\$	0 ~ C8
08. Contrast	k	g	0 ~ 64	22. ISM Method	j	p	(▶ p.94)
09. Brightness	k	h	0 ~ 64	23. Low Power	j	q	0 ~ 1
10. Color	k	i	0 ~ 64	25. Channel Add/Del	m	b	0 ~ 1
11. Tint	k	j	0 ~ 64	26. Key	m	c	(▶ p.95)
12. Sharpness	k	k	0 ~ 64	27. Back Light	m	g	0 ~ 64
13. OSD Select	k	l	0 ~ 1	LCD TV Model Only			
14. Remote Control Lock Mode	k	m	0 ~ 1	Plasma TV Model Only			

	COMMAND1	COMMAND2	DATA0 (Hexadecimal)	DATA1 (Hexadecimal)	DATA2 (Hexadecimal)	DATA3 (Hexadecimal)	DATA4 (Hexadecimal)	DATA5 (Hexadecimal)
24. Channel Tuning	m	a	physical program high	major program low	major low	minor high	minor low	attribute

Transmission / Receiving Protocol

Transmission

[Command1][Command2][][Set ID][][Data][Cr]

[Command 1]: First command to control the set.(j, k, m or x)

[Command 2]: Second command to control the set.

[Set ID] : You can adjust the set ID to choose desired TV ID number in Setup menu. Adjustment range is 1 ~ 99. When selecting Set ID '0', every connected the TV is controlled. Set ID is indicated as decimal (1 ~ 99) on menu and as Hexa decimal (0x0 ~ 0x63) on transmission /receiving protocol.

[DATA]: To transmit the command data.

Transmit the 'FF' data to read status of command.

[Cr]: Carriage Return

ASCII code '0x0D'

[]: ASCII code 'space (0x20)'

* In this model, TV will not send the status during the standby mode.

OK Acknowledgement

[Command2][][Set ID][][OK][Data][x]

The TV transmits ACK (acknowledgement) based on this format when receiving normal data. At this time, if the data is data read mode, it indicates present status data. If the data is data write mode, it returns the data of the PC computer.

* In this model, TV will not send the status during the standby mode.

* Data Format

[Command 2]: Use as command.

[Set ID]: Use the small character, if set ID is 10, it will send the '0', 'a'.

[DATA]: Use the small character, if data is 0 x ab, it will send the 'a', 'b'.

[OK]: Use the large character.

Error Acknowledgement

[Command2][][Set ID][][NG][Data][x]

The TV transmits ACK (acknowledgement) based on this format when receiving abnormal data from non-viable functions or communication errors.

Data1: Illegal Code

Data2: Not supported function

Data3: Wait more time

* In this model, TV will not send the status during the standby mode.

* Data Format

[Command 2]: Use as command.

[Set ID]: Use the small character, if set ID is 10, it will send the '0', 'a'.

[DATA]: Use the small character, if data is 0 x ab, it will send the 'a', 'b'.

[NG]: Use the large character

01. Power (Command: k a)

To control Power On/Off of the TV.

Transmission [k][a][][Set ID][][Data][Cr]

Data 0: Power Off Data 1: Power On

Acknowledgement [a][][Set ID][][OK/NG][Data][x]

* In a like manner, if other functions transmit 'FF' data based on this format, Acknowledgement data feedback presents status about each function.

* Note: In this model, TV will send the Acknowledge after power on processing completion.

There might be a time delay between command and acknowledge.

02. Input Select (Command: k b) (Main Picture Input)

To select input source for the TV.

Transmission [k][b][][Set ID][][Data][Cr]

Data 0: DTV Data 1: Analog
 Data 2: AV1 Data 3: AV2
 Data 4: Component 1 Data 5: Component 2
 Data 7: RGB-PC Data 8: HDMI1
 Data 9: HDMI2

Acknowledgement [b][][Set ID][][OK/NG][Data][x]

* If you select input source, we recommend "command x b".

03. Input Select (Command: x b)

To select input source for TV.

Transmission [x][b][][Set ID][][Data][Cr]

Data 00: DTV (Antenna) Data 01: DTV (Cable)
 Data 10: Analog (Antenna) Data 11: Analog (Cable)
 Data 20: AV1 Data 21: AV2
 Data 40: Component 1 Data 41: Component 2
 Data 60: RGB-PC Data 90: HDMI1
 Data 91: HDMI2

Acknowledgement [b][][Set ID][][OK/NG][Data][x]

04. Aspect Ratio (Command: k c)

To adjust the screen format.

You can also adjust the screen format using the RATIO button on remote control or in the Picture menu.

Transmission [k][c][][Set ID][][Data][Cr]

Data 1: 4:3 5: Zoom 2
 2: 16:9 6: Set by program
 4: Zoom 1 9: Just scan
 ⋮
 Reserved

Acknowledgement [c][][Set ID][][OK/NG][Data][x]

05. Screen Mute (Command: k d)

To select screen mute on/off.

Transmission [k][d][][Set ID][][Data][Cr]

Data 0: Screen mute off (Picture on)

Data 1: Screen mute on (Picture off)

Acknowledgement [d][][Set ID][][OK/NG][Data][x]

06. Volume Mute (Command: k e)

To control volume mute on/off.

You can also adjust mute using the MUTE button on remote control.

Transmission [k][e][][Set ID][][Data][Cr]

Data 0: Volume mute on (Volume off)

Data 1: Volume mute off (Volume on)

Acknowledgement [e][][Set ID][][OK/NG][Data][x]

07. Volume Control (Command: k f)

To adjust volume.

You can also adjust volume with the volume buttons on remote control.

Transmission [k][f][][Set ID][][Data][Cr]

Data Min: 0 ~ Max: 64 (*transmit by Hexadecimal code)

*Refer to 'Real data mapping 1'. See page 93.

Acknowledgement [f][][Set ID][][OK/NG][Data][x]

08. Contrast (Command: k g)

To adjust screen contrast.

You can also adjust contrast in the Picture menu.

Transmission [k][g][][Set ID][][Data][Cr]

Data Min: 0 ~ Max: 64 (*transmit by Hexadecimal code)

*Refer to 'Real data mapping 1'. See page 93.

Acknowledgement [g][][Set ID][][OK/NG][Data][x]

09. Brightness (Command: k h)

To adjust screen brightness.

You can also adjust brightness in the Picture menu.

Transmission [k][h][][Set ID][][Data][Cr]

Data Min: 0 ~ Max: 64 (*transmit by Hexadecimal code)

*Refer to 'Real data mapping 1'. See page 93.

Acknowledgement [h][][Set ID][][OK/NG][Data][x]

10. Color (Command: k i)

To adjust screen color.

You can also adjust color in the Picture menu.

Transmission [k][i][][Set ID][][Data][Cr]

Data Min: 0 ~ Max: 64 (*transmit by Hexadecimal code)

*Refer to 'Real data mapping 1' as shown below.

Acknowledgement [i][][Set ID][][OK/NG][Data][x]

11. Tint (Command: k j)

To adjust screen tint.

You can also adjust tint in the Picture menu.

Transmission [k][j][][Set ID][][Data][Cr]

Data Red: 0 ~ Green: 64 (*transmit by Hexadecimal code)

*Refer to 'Real data mapping 1' as shown below.

Acknowledgement [j][][Set ID][][OK/NG][Data][x]

12. Sharpness (Command: k k)

To adjust screen sharpness.

You can also adjust sharpness in the Picture menu.

Transmission [k][k][][Set ID][][Data][Cr]

Data Min: 0 ~ Max: 64 (*transmit by Hexadecimal code)

*Refer to 'Real data mapping 1' as shown below.

Acknowledgement [k][][Set ID][][OK/NG][Data][x]

13. OSD Select (Command: k l)

To select OSD (On Screen Display) on/off.

Transmission [k][l][][Set ID][][Data][Cr]

Data 0: OSD off Data 1: OSD on

Acknowledgement [l][][Set ID][][OK/NG][Data][x]

14. Remote Control Lock Mode (Command: k m)

To lock the remote control and the front panel controls on the set.

Transmission [k][m][][Set ID][][Data][Cr]

Data 0: Lock off Data 1: Lock on

Acknowledgement [m][][Set ID][][OK/NG][Data][x]

If you're not using the remote control and front panel controls on the TV, use this mode. When main power is on/off, remote control lock is released.

15. Treble (Command: k r)

To adjust treble.

You can also adjust treble in the Audio menu.

Transmission [k][r][][Set ID][][Data][Cr]

Data Min: 0 ~ Max: 64 (*transmit by Hexadecimal code)

*Refer to 'Real data mapping 1' as shown.

Acknowledgement [r][][Set ID][][OK/NG][Data][x]

16. Bass (Command: k s)

To adjust bass.

You can also adjust bass in the Audio menu.

Transmission [k][s][][Set ID][][Data][Cr]

Data Min: 0 ~ Max: 64 (*transmit by Hexadecimal code)

*Refer to 'Real data mapping 1' as shown below.

Acknowledgement [s][][Set ID][][OK/NG][Data][x]

17. Balance (Command: k t)

To adjust balance.

You can also adjust balance in the Audio menu.

Transmission [k][t][][Set ID][][Data][Cr]

Data Min: 0 ~ Max: 64 (*transmit by Hexadecimal code)

*Refer to 'Real data mapping 1' as shown below.

Acknowledgement [t][][Set ID][][OK/NG][Data][x]

18. Color Temperature (Command: k u)

To adjust color temperature.

You can also adjust color temperature in the Picture menu.

Transmission [k][u][][Set ID][][Data][Cr]

Data 0: Medium 1: Cool 2: Warm 3: User

Acknowledgement [u][][Set ID][][OK/NG][Data][x]

19. Red Adjustment (Command: k v)

To adjust red in color temperature

Transmission [k][v][][Set ID][][Data][Cr]

Data Min: 0 ~ Max: C8

*Refer to 'Real data mapping 2' as shown below.

Acknowledgement [v][][Set ID][][OK/NG][Data][x]

20. Green Adjustment (Command: k w)

To adjust green in color temperature.

Transmission [k][w][][Set ID][][Data][Cr]

Data Min: 0 ~ Max: C8

*Refer to 'Real data mapping 2' as shown below.

Acknowledgement [w][][Set ID][][OK/NG][Data][x]

*Real data mapping 1	*Real data mapping 2
0: Step 0	0: -20
⋮	:-19
A: Step 10 (SET ID 10)	A: -18
⋮	⋮
F: Step 15 (SET ID 15)	5F: -1
10: Step 16 (SET ID 16)	64: 0
⋮	69: +1
63: Step 99 (SET ID 99)	⋮
64: Step 100	C3: +19
	C8: +20

21. Blue Adjustment (Command: k \$)

To adjust blue in color temperature.

Transmission [k][\$][][Set ID][][Data][Cr]

Data Min: 0 ~ Max: C8

*Refer to 'Real data mapping 2'. See page 93.

Acknowledgement [\$][][Set ID][][OK/NG][Data][x]

22. ISM Method (Command: j p)

(Only Plasma TV model)

To avoid having a fixed image remain on screen.

Transmission [j][p][][Set ID][][Data][Cr]

Data 1: Inversion 2: Orbiter

4: White Wash 8: Normal

Acknowledgement [p][][Set ID][][OK/NG][Data][x]

23. Low Power (Command: j q)

(Only Plasma TV model)

To control the low power function on/off.

Transmission [j][q][][Set ID][][Data][Cr]

Data 0: Low Power off

1: Low Power on

Acknowledgement [q][][Set ID][][OK/NG][Data][x]

24. Channel Tuning (Command: m a)

To tune channel to following physical/major/minor number.

Transmission [m][a][][Set ID][][Data0][][Data1][][Data2][][Data3][][Data4][][Data5][Cr]

Digital channels have a Physical, Major, and Minor channel number. The Physical number is the actual digital channel number, the Major is the number that the channel should be mapped to, and the Minor is the sub-channel. Since the ATSC tuner automatically maps the channel to the Major number, the Physical number is not required when sending a command.

Data 0: Physical Channel Number

NTSC air: 02~45, NTSC cable: 01, 0E~7D

ATSC air: 01~45, ATSC cable: 01~87

Data1 & 2: Major Channel Number

Data1: High byte Data2: Low byte

Two bytes are available for the Major and Minor, normally only the second byte is used.

Data3 & 4: Minor Channel Number

Not needed for NTSC.

Data5:

7	Main/Sub Picture	6	Two/One Part Channel	5	Using Physical Channel	4	Reserved	3	2	1	0	Step
0	Main	0	Two	0	Use	x		0	0	0	0	NTSC Air
1	Sub	1	One	1	No Use	x		0	0	0	1	NTSC Cable
						x		0	0	1	0	ATSC Air
						x		0	0	1	1	ATSC Cable_std
						x		0	1	0	0	ATSC Cable_hrc
						x		0	1	0	1	ATSC Cable_irc
						x		0	1	1	0	ATSC cable_auto
						x		0	1	1	1	Reserved
						x		x	x	x	x	...
						x		1	1	1	1	Reserved

The table above lists the binary code which must be converted to Hexadecimal before sending. For example: The binary code to tune the sub source to an NTSC cable channel is "1000 0001", which translates to "81" in Hex.

- * 7th bit: For which source do you want to change the channel.
- * 6th bit: Use a two part or one part channel. Most cases just use 0 since it's ignored when using NTSC.
- * 5th bit: Use 0 with NTSC since it can only use the physical channel number. Normally use 1 for ATSC since most times it doesn't matter what the physical number is.
- * 4th bit: Set to 0.
- * 3-0 bits: Choose signal type.

* Tune Command Examples:

1. Tune to the analog (NTSC) cable channel 35.

Data 0 = Physical of 35 = 23
 Data 1 & 2 = No Major = 00 00
 Data 3 & 4 = No Minor = 00 00
 Data 5 = 0000 0001 in binary = 01
 Total = ma 00 23 00 00 00 00 01

2. Tune to the digital (ATSC) local channel 30-3.

Data 0 = Don't know Physical = 00
 Data 1 & 2 = Major is 30 = 00 1E
 Data 3 & 4 = Minor is 3 = 00 03
 Data 5 = 0010 0010 in binary = 22
 Total = ma 00 00 00 1E 00 03 22

```
Acknowledgement[a][ ][Set ID][ ][OK][Data0][Data1]
[Data2][Data3][Data4][x][a][ ][Set ID]
[ ][NG][Data0][x]
```

25. Channel Add/Del (Command: m b)

To add and delete the channels

```
Transmission [m][b][ ][Set ID][ ][Data][Cr]
```

Data 0: Channel Delete Data 1: Channel Add

```
Acknowledgement [b][ ][Set ID][ ][OK/NG][Data][x]
```

26. Key (Command: m c)

To send IR remote key code.

```
Transmission [m][c][ ][Set ID][ ][Data][Cr]
```

Data Key code: Refer to page 88.

```
Acknowledgement [c][ ][Set ID][ ][OK/NG][Data][x]
```

27. Back Light (Command: m g)

(Only LCD TV model)

To adjust screen back light.

```
Transmission [m][g][ ][Set ID][ ][Data][Cr]
```

Data Min: 0 ~ Max: 64 (*transmit by Hexadecimal code)

*Refer to 'Real data mapping 1'. See page 93.

```
Acknowledgement [g][ ][Set ID][ ][OK/NG][Data][x]
```