Controlling the Multiple Product

Use this method to connect several products to a single PC. You can control several products at a time by connecting them to a single PC.

Connecting the cable
Connect the RS-232C cable as shown in the picture.
* The RS-232C protocol is used for communication between the PC and product. You can turn the product on/off, select an input source or adjust the OSD menu from your PC.

Communication Parameter
- Baud Rate: 9600bps (UART)
- Data Length: 8bits
- Parity Bit: None
- Stop Bit: 1bit
- Flow Control: None
- Communication Code: ASCII code
## Command Reference List

<table>
<thead>
<tr>
<th>No.</th>
<th>Command</th>
<th>COMMAND1</th>
<th>COMMAND2</th>
<th>DATA(Hexa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.</td>
<td>Power</td>
<td>k</td>
<td>a</td>
<td>00H - 01H</td>
</tr>
<tr>
<td>02.</td>
<td>Input Select</td>
<td>k</td>
<td>b</td>
<td>02H - 09H</td>
</tr>
<tr>
<td>03.</td>
<td>Aspect Ratio</td>
<td>k</td>
<td>c</td>
<td>01H - 09H</td>
</tr>
<tr>
<td>04.</td>
<td>Screen Mute</td>
<td>k</td>
<td>d</td>
<td>00H - 01H</td>
</tr>
<tr>
<td>05.</td>
<td>Volume Mute</td>
<td>k</td>
<td>e</td>
<td>00H - 01H</td>
</tr>
<tr>
<td>06.</td>
<td>Volume Control</td>
<td>k</td>
<td>f</td>
<td>00H - 64H</td>
</tr>
<tr>
<td>07.</td>
<td>Contrast</td>
<td>k</td>
<td>g</td>
<td>00H - 64H</td>
</tr>
<tr>
<td>08.</td>
<td>Brightness</td>
<td>k</td>
<td>h</td>
<td>00H - 64H</td>
</tr>
<tr>
<td>09.</td>
<td>Color</td>
<td>k</td>
<td>i</td>
<td>00H - 64H</td>
</tr>
<tr>
<td>10.</td>
<td>Tint</td>
<td>k</td>
<td>j</td>
<td>00H - 64H</td>
</tr>
<tr>
<td>11.</td>
<td>Sharpness</td>
<td>k</td>
<td>k</td>
<td>00H - 64H</td>
</tr>
<tr>
<td>12.</td>
<td>OSD Select</td>
<td>k</td>
<td>l</td>
<td>00H - 01H</td>
</tr>
<tr>
<td>13.</td>
<td>Remote Lock/ key Lock</td>
<td>k</td>
<td>m</td>
<td>00H - 01H</td>
</tr>
<tr>
<td>14.</td>
<td>Balance</td>
<td>k</td>
<td>t</td>
<td>00H - 64H</td>
</tr>
<tr>
<td>15.</td>
<td>Color Temperature</td>
<td>k</td>
<td>u</td>
<td>00H - 03H</td>
</tr>
<tr>
<td>16.</td>
<td>Abnormal state</td>
<td>k</td>
<td>z</td>
<td>FFH</td>
</tr>
<tr>
<td>17.</td>
<td>ISM mode</td>
<td>j</td>
<td>p</td>
<td>00H - 08H</td>
</tr>
<tr>
<td>18.</td>
<td>Auto configuration</td>
<td>j</td>
<td>u</td>
<td>01H</td>
</tr>
<tr>
<td>19.</td>
<td>Key</td>
<td>m</td>
<td>c</td>
<td>Key Code</td>
</tr>
<tr>
<td>20.</td>
<td>Tile Mode</td>
<td>d</td>
<td>d</td>
<td>00H - 44H</td>
</tr>
<tr>
<td>21.</td>
<td>Tile H Size</td>
<td>d</td>
<td>g</td>
<td>00H - 64H</td>
</tr>
<tr>
<td>22.</td>
<td>Tile V Size</td>
<td>d</td>
<td>h</td>
<td>00H - 64H</td>
</tr>
<tr>
<td>23.</td>
<td>Tile ID Set</td>
<td>d</td>
<td>i</td>
<td>00H - 10H</td>
</tr>
<tr>
<td>24.</td>
<td>Elapsed time return</td>
<td>d</td>
<td>l</td>
<td>FFH</td>
</tr>
<tr>
<td>25.</td>
<td>Temperature value</td>
<td>d</td>
<td>n</td>
<td>FFH</td>
</tr>
<tr>
<td>26.</td>
<td>Lamp fault check</td>
<td>d</td>
<td>p</td>
<td>FFH</td>
</tr>
</tbody>
</table>
Transmission / Receiving Protocol

Transmission

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

* [Command 1]: First command. (j, k, m, d)
* [Command 2]: Second command.
* [Set ID]: Set up the Set ID number of product.
  * range: 1~99. by setting '0', server can control all products.
* In case of operating with more than 2 sets using set ID as '0' at the same time, it should not be checked the ack message.
  * Because all sets will send the ack message, so it's impossible the check the whole ack messages.
* [DATA]: To transmit command data.
  * Transmit 'FF' data to read status of command.
  * [Cr]: Carriage Return
    * ASCII code '0x0D'
* [ ]: ASCII code Space (0x20)

OK Acknowledgement

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

* The Product 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.

Error Acknowledgement

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

* If there is error, it returns NG
Transmission / Receiving Protocol

01. Power(Command : a)
  ▶ To control Power On/Off of the Set.
  
  **Transmission**
  
  \[\text{[k][a][ ][Set ID][ ][Data][Cr]}\]
  
  Data 0 : Power Off  1 : Power On
  
  **Acknowledgement**
  
  \[\text{[a][ ][Set ID][ ][OK][Data][x]}\]
  
  ▶ To show the status of Power On/Off.
  
  **Transmission**
  
  \[\text{[k][a][ ][Set ID][ ][FF][Cr]}\]
  
  **Acknowledgement**
  
  \[\text{[a][ ][Set ID][ ][OK][Data][x]}\]
  
  Data 0 : Power Off  1 : Power On

02. Input Select (Command : b) (Main Picture Input)
  ▶ To select input source for the Set.
  
  You can also select an input source using the INPUT button on the remote control.
  
  **Transmission**
  
  \[\text{[k][b][ ][Set ID][ ][Data][Cr]}\]
  
  Data  2 : AV  6 : RGB (DTV)
  4 : Component 1  7 : RGB (PC)
  5 : Component 2  8 : HDMI (DTV)
  9 : HDMI (PC)
  
  **Acknowledgement**
  
  \[\text{[b][ ][Set ID][ ][OK][Data][x]}\]
  
  Data  2 : AV  6 : RGB (DTV)
  4 : Component 1  7 : RGB (PC)
  5 : Component 2  8 : HDMI (DTV)
  9 : HDMI (PC)
### 3. Aspect Ratio (Command: c) (Main picture format)

- To adjust the screen format.
- You can also adjust the screen format using the ARC (Aspect Ratio Control) button on remote control or in the Screen menu.

**Transmission**

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

<table>
<thead>
<tr>
<th>Data</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Normal Screen (4:3)</td>
</tr>
<tr>
<td>2</td>
<td>Wide Screen (16:9)</td>
</tr>
<tr>
<td>3</td>
<td>Horizon (Spectacle)</td>
</tr>
<tr>
<td>4</td>
<td>Zoom1</td>
</tr>
<tr>
<td>5</td>
<td>Zoom2</td>
</tr>
<tr>
<td>6</td>
<td>Original</td>
</tr>
<tr>
<td>7</td>
<td>14:9</td>
</tr>
<tr>
<td>8</td>
<td>Full (Europe version only)</td>
</tr>
<tr>
<td>9</td>
<td>1:1 (PC)</td>
</tr>
</tbody>
</table>

**Acknowledgement**

```
[c][ ][Set ID][ ][OK][Data][x]
```

### 4. Screen Mute (Command: d)

- To select screen mute on/off.

**Transmission**

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

<table>
<thead>
<tr>
<th>Data</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Screen mute off (Picture on)</td>
</tr>
<tr>
<td>1</td>
<td>Screen mute on (Picture off)</td>
</tr>
</tbody>
</table>

**Acknowledgement**

```
[d][ ][Set ID][ ][OK][Data][x]
```
05. Volume Mute (Command: e)

To control On/Off of the Volume Mute.

Transmission

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

Data 0 : Volume Mute On (Volume Off)
1 : Volume Mute Off (Volume On)

Acknowledgement

[e] [Set ID] [OK] [Data] [x]

Data 0 : Volume Mute On (Volume Off)
1 : Volume Mute Off (Volume On)

06. Volume Control (Command: f)

To adjust Volume.

Transmission

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

Data Min : 00H ~ Max : 64H
(Hexadecimal code)

Acknowledgement

[f] [Set ID] [OK] [Data] [x]

Data Min : 00H ~ Max : 64H

• Refer to ‘Real data mapping’ page A7.
Transmitting / Receiving Protocol

07. Contrast (Command : g)
To adjust screen contrast.
You can also adjust the contrast in the Picture menu.

Transmission

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

Data Min : 00H ~ Max : 64H
• Refer to 'Real data mapping' as shown below.

Acknowledgement

[g] [Set ID] [OK] [Data] [x]

* Real data mapping
0 : Step 0
A : Step 10
F : Step 15
10 : Step 16
64 : Step 100

08. Brightness (Command : h)
To adjust screen brightness.
You can also adjust the brightness in the Picture menu.

Transmission

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

Data Min : 00H ~ Max : 64H
• Refer to 'Real data mapping' as shown below.

Acknowledgement

[h] [Set ID] [OK] [Data] [x]

* Real data mapping
0 : Step
A : Step 10
F : Step 15
10 : Step 16
64 : Step 100
Controlling the Multiple Product

Transmission / Receiving Protocol

09. Color(Command : i) (Video only)

► To adjust the screen color.
► You can also adjust the color in the Picture menu.

Transmission

\[ \text{[k][i][Set ID][Data][Cr]} \]

Data Min : 00H ~ Max : 64H

(Hexadecimal code)

• Refer to ‘Real data mapping’ page A7.

Acknowledgement

\[ \text{[i][Set ID][OK][Data][x]} \]

Data Min : 00H ~ Max : 64H

10. Tint(Command : j) (Video only)

► To adjust the screen tint.
► You can also adjust the tint in the Picture menu.

Transmission

\[ \text{[k][j][Set ID][Data][Cr]} \]

Data Red: 00H ~ Green: 64H

(Hexadecimal code)

• Refer to ‘Real data mapping’ page A7.

Acknowledgement

\[ \text{[j][Set ID][OK][Data][x]} \]

Data Red: 00H ~ Green: 64H

* Tint Real data mapping

0 : Step -50

: 64 : Step 50
11. Sharpness(Command : k) (Video only)
   ▶ To adjust the screen Sharpness.
   You can also adjust the sharpness in the Picture menu.

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

   Data Min : 00H ~ Max : 64H
   (Hexadecimal code)

   • Refer to ‘Real data mapping’ page A7.

   **Acknowledgement**
   
   
   [k] [Set ID] [OK] [Data] [x]

   Data Min : 00H ~ Max : 64H

12. OSD Select(Command : l)
   ▶ To control OSD on/off to the set.

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

   Data 0 : OSD Off 1 : OSD On

   **Acknowledgement**
   
   [l] [Set ID] [OK] [Data] [x]

   Data 0 : OSD Off 1 : OSD On

13. Remote Lock /Key Lock (Command : m)
   ▶ To control Remote Lock on/off to the set.
   This function, when controlling RS-232C, locks the remote control and the local keys.

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

   Data 0 : Off 1 : On

   **Acknowledgement**
   
   [m] [Set ID] [OK] [Data] [x]

   Data 0 : Off 1 : On
Controlling the Multiple Product

Transmission / Receiving Protocol

14 Balance (Command : t)
► To adjust the sound balance.

Transmission

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

Data Min : 00H ~ Max : 64H
(Hexadecimal code)

* Refer to ‘Real data mapping’ page A7.

Acknowledgement

```
[t][ ][Set ID][ ][OK][Data][x]
```

Data Min : 00H ~ Max : 64H
* Balance : L50 ~ R50

15. Color Temperature (Command : u)
► To adjust the screen color temperature.

Transmission

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

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

Acknowledgement

```
[u][ ][Set ID][ ][OK][Data][x]
```

Data 0 : Normal
1 : Cool
2 : Warm
3 : User
Controlling the Multiple Product

Transmission / Receiving Protocol

16. Abnormal state (Command : z)
   - Abnormal State: Used to Read the power off status when Stand-by mode.
   
   **Transmission**
   
   \[
   [\text{k}][\text{z}][\text{Set ID}][\text{Data}][\text{Cr}]
   \]
   
   Data FF: Read
   - 0: Normal (Power on and signal exist)
   - 1: No signal (Power on)
   - 2: Turn the monitor off by remote control
   - 3: Turn the monitor off by sleep time function
   - 4: Turn the monitor off by RS-232C function
   - 6: AC down
   - 8: Turn the monitor off by off time function
   - 9: Turn the monitor off by auto off function

   **Acknowledgement**
   
   \[
   [\text{z}][\text{Set ID}][\text{OK}][\text{Data}][\text{x}]
   \]

17. ISM mode (Command: j p)
   - Used to select the afterimage preventing function.
   
   **Transmission**
   
   \[
   [\text{j}][\text{p}][\text{Set ID}][\text{Data}][\text{Cr}]
   \]
   
   Data
   - 1: Inversion
   - 2: Orbiter
   - 4: White Wash
   - 8: Normal

   **Acknowledgement**
   
   \[
   [\text{p}][\text{Set ID}][\text{OK}][\text{Data}][\text{x}]
   \]
Controlling the Multiple Product

Transmission / Receiving Protocol

18. Auto Configure(Command: j u)
   ▶ To adjust picture position and minimize image shaking automatically. It works only in RGB(PC) mode.

   Transmission
   
   ![Transmission Format]

   Acknowledgement
   
   ![Acknowledgement Format]

19. Key(Command: m c)
   ▶ To send IR remote key code.

   Transmission
   
   ![Transmission Format]

   Data : Key code : Refer to page A18.

   Acknowledgement
   
   ![Acknowledgement Format]
Controlling the Multiple Product

Transmission / Receiving Protocol

20. Tile Mode(Command : d d)
▶ Change a Tile Mode.

Transmission

[d][d][Set ID][Data][x]

<table>
<thead>
<tr>
<th>Data</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>Tile mode is off.</td>
</tr>
<tr>
<td>12</td>
<td>1 x 2 mode(column x row)</td>
</tr>
<tr>
<td>13</td>
<td>1 x 3 mode</td>
</tr>
<tr>
<td>14</td>
<td>1 x 4 mode</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>44</td>
<td>4 x 4 mode</td>
</tr>
</tbody>
</table>

* The data can not be set to 0X or X0 except 00.

Acknowledgement

[d][00][OK/NG][Data][x]
21. Tile H Size(Command : d g)
   ►To set the Horizontal size.

Transmission
[d][g][ ][Set ID][ ][Data][x]

Data Min : 00H ~ Max : 64H

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

22. Tile V Size(Command : d h)
   ►To set the Vertical size.

Transmission
[d][h][ ][Set ID][ ][Data][x]

Data Min : 00H ~ Max : 64H

Acknowledgement
[h][ ][Set ID][ ][OK/NG][Data][x]
23. Tile ID Set(Command : d i)
   To assign the Tile ID for Tiling function.

   **Transmission**
   
   \[
   [\text{d}][\text{i}][\text{Set ID}][\text{Data}][\text{x}]
   \]

   Data Min : 00H ~ Max : 10H
   (Hexadecimal code)

   **Acknowledgement**
   
   \[
   [\text{i}][\text{Set ID}][\text{OK/NG}][\text{Data}][\text{x}]
   \]

24. Elapsed time return(Command : d l)
   To read the elapsed time.

   **Transmission**
   
   \[
   [\text{d}][\text{l}][\text{Set ID}][\text{Data}][\text{x}]
   \]

   * The data is always FF (in Hex).

   **Acknowledgement**
   
   \[
   [\text{l}][\text{Set ID}][\text{OK/NG}][\text{Data}][\text{x}]
   \]

   * The data means used hours.
   (Hexadecimal code)
Transmission / Receiving Protocol

25. Temperature value (Command : d n)
   ▶ To read the inside temperature value.

   **Transmission**
   
   ![Transmission Format]

   * The data is always FF (in Hex).

   **Acknowledgement**
   
   ![Acknowledgement Format]

   * The data is 1 byte long in Hexadecimal.

26. Lamp fault Check (Command : d p)
   ▶ To check lamp fault.

   **Transmission**
   
   ![Transmission Format]

   * The data is always FF (in Hex).

   **Acknowledgement**
   
   ![Acknowledgement Format]

   Data 0 : Lamp Fault
   1: Lamp OK
**IR Codes**

### How to connect

- Connect your wired remote control to Remote Control port on the Product.

### Remote Control IR Code

- **Output waveform**
  single pulse, modulated with 37.917KHz signal at 455KHz

- **Carrier frequency**
  \[ \text{FCAR} = \frac{1}{T_c} = \frac{f_{osc}}{12} \]
  Duty ratio = \( T_1/T_c = 1/3 \)

- **Configuration of frame**
  - **1st frame**
    - Lead code
    - Low custom code
    - High custom code
    - Data code
    - Data code

  - **Repeat frame**
    - Repeat code
    - Lead code

- **Lead code**
  9ms 4.5ms

- **Repeat code**
  9ms 2.25ms 0.55ms

- **Bit description**
  - Bit "0" 0.56ms 1.12ms 0.56ms 2.24ms
  - Bit "1" 0.56ms

- **Frame interval : Tf**
  - The waveform is transmitted as long as a key is depressed.

\[ \text{TF} = 108\text{ms} @ 455\text{KHz} \]
<table>
<thead>
<tr>
<th>Code (Hexa)</th>
<th>Function</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>▲</td>
<td>R/C Button</td>
</tr>
<tr>
<td>01</td>
<td>▼</td>
<td>R/C Button</td>
</tr>
<tr>
<td>02</td>
<td>VOL(▲)</td>
<td>R/C Button</td>
</tr>
<tr>
<td>03</td>
<td>VOL(▼)</td>
<td>R/C Button</td>
</tr>
<tr>
<td>08</td>
<td>POWER ON/OFF</td>
<td>R/C Button (Power On/Off)</td>
</tr>
<tr>
<td>C4</td>
<td>POWER ON</td>
<td>Discrete IR Code (Only Power On)</td>
</tr>
<tr>
<td>C5</td>
<td>POWER OFF</td>
<td>Discrete IR Code (Only Power On)</td>
</tr>
<tr>
<td>09</td>
<td>MUTE</td>
<td>R/C Button</td>
</tr>
<tr>
<td>98</td>
<td>AV</td>
<td>R/C Button</td>
</tr>
<tr>
<td>0B</td>
<td>INPUT</td>
<td>R/C Button</td>
</tr>
<tr>
<td>0E</td>
<td>SLEEP</td>
<td>R/C Button</td>
</tr>
<tr>
<td>43</td>
<td>MENU</td>
<td>R/C Button</td>
</tr>
<tr>
<td>5B</td>
<td>EXIT</td>
<td>R/C Button</td>
</tr>
<tr>
<td>6E</td>
<td>PSM</td>
<td>R/C Button</td>
</tr>
<tr>
<td>44</td>
<td>SET</td>
<td>R/C Button</td>
</tr>
<tr>
<td>10</td>
<td>Number Key 0</td>
<td>R/C Button</td>
</tr>
<tr>
<td>11</td>
<td>Number Key 1</td>
<td>R/C Button</td>
</tr>
<tr>
<td>12</td>
<td>Number Key 2</td>
<td>R/C Button</td>
</tr>
<tr>
<td>13</td>
<td>Number Key 3</td>
<td>R/C Button</td>
</tr>
<tr>
<td>14</td>
<td>Number Key 4</td>
<td>R/C Button</td>
</tr>
<tr>
<td>15</td>
<td>Number Key 5</td>
<td>R/C Button</td>
</tr>
<tr>
<td>16</td>
<td>Number Key 6</td>
<td>R/C Button</td>
</tr>
<tr>
<td>17</td>
<td>Number Key 7</td>
<td>R/C Button</td>
</tr>
<tr>
<td>18</td>
<td>Number Key 8</td>
<td>R/C Button</td>
</tr>
<tr>
<td>19</td>
<td>Number Key 9</td>
<td>R/C Button</td>
</tr>
<tr>
<td>5A</td>
<td>AV</td>
<td>Discrete IR Code (Input AV Selection)</td>
</tr>
<tr>
<td>BF</td>
<td>COMPONENT1</td>
<td>Discrete IR Code (Input COMPONENT1 Selection)</td>
</tr>
<tr>
<td>D4</td>
<td>COMPONENT2</td>
<td>Discrete IR Code (Input COMPONENT2 Selection)</td>
</tr>
<tr>
<td>D5</td>
<td>RGB PC</td>
<td>Discrete IR Code (Input RGB PC Selection)</td>
</tr>
<tr>
<td>D7</td>
<td>RGB DTV</td>
<td>Discrete IR Code (Input RGB DTV Selection)</td>
</tr>
<tr>
<td>C6</td>
<td>HDMI/DVI</td>
<td>Discrete IR Code (Input HDMI/DVI Selection)</td>
</tr>
<tr>
<td>79</td>
<td>ARC</td>
<td>R/C Button</td>
</tr>
<tr>
<td>76</td>
<td>ARC (4:3)</td>
<td>Discrete IR Code (Only 4:3 mode)</td>
</tr>
<tr>
<td>77</td>
<td>ARC (16:9)</td>
<td>Discrete IR Code (Only 16:9 mode)</td>
</tr>
<tr>
<td>AF</td>
<td>ARC (ZOOM)</td>
<td>Discrete IR Code (Only ZOOM1, ZOOM2 mode)</td>
</tr>
<tr>
<td>99</td>
<td>AUTO CONFIC</td>
<td>Discrete IR Code</td>
</tr>
</tbody>
</table>