Introduction

The 3-chip DLP projectors, PT-D7700 series and DW10000 series, and single-chip DLP projectors, PT-D5700 series, are equipped with a multi-screen support system for optimizing multiple screen images.

- **Edge Blending Function**
  Overlaps the edges of the images projected from multiple projectors, automatically controls the brightness and hue, and produces a multi-image display of a natural and unified image without showing the boundary of individual images.

- **Digital Image Expansion Function**
  Each projector is equipped with a built-in image expansion function for enlarging up to 10 times in the horizontal and vertical directions, enabling enlarged projection without using additional image enlargement equipment.
  Enlarged and adjusted image data can be registered for each input signal.
  (3-chip DLP: Max 96 memories, 1-chip DLP: Max 8 memories)

- **Color Matching Function**
  Compensates for individual differences in color reproduction characteristics derived from the optical components between multiple projectors. The independently developed support software and measuring instrument enable high-accuracy adjustment to create the best image in a short period of time and produce uniform color between images as well as high color reproduction.

This manual describes the edge-blending adjustment method, but it can also be used for adjusting brightness and hue of a normal multi-screen system without using the edge-blending function.
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* Reference: The adjustment sequence of edge blending and color matching is optional. However, distinguishing difference in color is difficult when color matching is performed after edge blending. In such a case, it is easier to detect the difference by using the lens shift function to make two images side by side.

* White balance adjustment and contrast adjustment should be performed, in principle, after completing color matching adjustment.
1. Edge-Blending System Design and Considerations

- In order to project a large image or high-definition image stably without showing the image boundary such as a joint line or difference in brightness or hue when using multiple projectors, the user needs to bear in mind the selection and installation method etc. of the projector, screen and image generation equipment.

**High-definition Image Projection Using the Multi-screen Support System**

![Diagram of projection methods](image)

**Projection by a single projector**

- Color matching function
- Multi-screen support system
- Horizontal direction of the image is enlarged 2 times by the digital image expansion function.

**Multi-screen support system**

- Color matching function
- Edge-blending function
- A clearer and brighter image can be obtained by fully utilizing the pixels of the DMD element per each projector

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1-1. Selection of a Screen and Lens by Front or Rear Projection

1-1-1. Front Projection Method

- Most suitable projection method for edge blending.

- Select a zoom lens other than the short-focus fixed lens (ET-D75LE5)
  - Considerations
  Because a short-focus fixed lens is not capable of zooming or lens shift, the projector needs to be placed on the center line of each screen. Even with a shift-capable lens (ET-D75LE6 etc), increased shift quantity generates distortion in the projected image by the lens perimeter and the images near the joint line often cannot be overlapped with each other.

- When selecting a screen, a wide-angle white mat (screen gain 1.0 or less) should be selected.
  - Considerations
  A beaded, pearlescent, or silver screen has high screen gain and a narrow viewing angle. When a projected screen is viewed from an angle, the brightness difference is visible at the joint line.
1-1-2. Rear Projection Method

- When performing edge blending with rear projection, due attention should be paid to selecting the screen and lens.
  
  Two types of screen, hard and soft screens, are available, but the one with a wide view angle (better with greater αH and αV values) with a low screen gain (GS= 1.0 or smaller) needs to be selected.
  
- When using a hard screen, a screen with its surface processed to provide a Fresnel or lenticular effect is not suitable and **cannot be used for edge blending**.
  
  As a non-directional screen such as white mat is not available for rear projection applications, a diffusion type screen should be selected.

Rear Screen Examples

- When sagging or warp exists in a screen, accurate overlapping cannot be achieved at the blending area. A hard screen is recommended provided one can be carried without problems into the set-up site.

- Photo 1 is the edge-blended image of two horizontally projected images viewed from the front. Hot spots are visible due to the high screen gain of 1.6, but look acceptable when viewed from the center front direction.

- Photo 2 is the image when viewed from an angle. The projected light from the near-side projector is stronger on the opposite side, and the brightness is not well blended.

- There are two ways to improve this phenomenon, but because of the directional characteristic of the rear screen, the problem cannot fully be solved.
  
  (1) Placing the projector at a greater distance from the screen.
  
  (2) Reselecting a more appropriate screen (low gain, wide view-angle type)
When selecting a soft screen, care must be taken when setting up. When sagging or a wrinkle exists on the screen surface where two images blend together, a double image appears.

* Considerations
When a soft screen is used and the projection room and audience room are separate areas, a change of air pressure by a door being opened or from air conditioning equipment causes the screen to deflect, thereby generating a double image at the edge of the blending area. Care must be taken over the air-conditioning setting (air direction, velocity, ventilation equipment etc) and the door characteristics (location, sliding door etc) to avoid sagging of the screen.

Selecting a Lens
In a rear projection environment, a short-focus fixed lens is used in most cases due to the space restriction. The wide angle of the incident light into the rear screen causes a large difference in brightness between the front view and the side view. A short-focus zoom lens (ET-D75LE6 3-chip type, ET-DLE100 1-chip type) is therefore recommended.

* Considerations
When a short-focus fixed lens, ET-D75LE5 or ET-DLE50, is used, direct rear projection generates a high degree of distortion caused by the lens and does not allow accurate adjustment at the overlapped image. (Photo 3 shows direct rear projection using a short-focus fixed lens)
When using a short-focus fixed lens, a custom-ordered rear projection mirror system should be employed.
The rear projection mirror system (Photo 4) not only reduces the projection distance, but also corrects lens distortion caused by the mirror. (Patented)
1-2. Considerations for Setting Up Projectors

1-2-1. Positional Relationship between Projectors and Screen

- As shown in the Fig. 2 Plan view, projectors must be placed in parallel with the screen.
- When the projectors are not set up in parallel with the screen, a trapezoidal distortion is generated in the horizontal or vertical direction of the projected image shape, and the blended image edges are not well overlapped, resulting in a visible bright band or a dark area. Overall image linearity is also degraded.
- The width of blending may be set freely but a wide area makes connection smoother. Approx 10% of the horizontal width or 128 to 140 dots can be used as a rule of thumb.
- Once a blending width is determined, each projector should be set up with its lens center aligned with the center of each projected image.
- Each lens has some inherent distortion. The amount of distortion is smaller near the lens center. Distortion of a zoom lens varies between the telescopic end and wide-angle end. Please check with the sales team for more details.

Fig. 2  (Plan view)

- Fig. 3 is a conceptual illustration viewed from the side.
- The projector should be set up with the lens center aligned with the screen center line, which is perpendicular to the screen.
- In the case of front projection, the projector is either placed on a platform or hung from the ceiling depending on the installation environment. Either method is possible within the adjustment range of lens shift.
- When the range of lens shift is exceeded during installation of projectors, which is termed a tilted installation, a trapezoidal correction is required. But because edge-blending does not follow a trapezoidal correction, a tilted installation is not possible.

* Lens shift quantity varies by model and the lens used. Check with the specification for more details. For example, when the entire range of vertical shift is used, a horizontal shift becomes impossible.
1-2-2. Considerations for Projector Installation Method

- When determining a projector installation (securing) method, the method associated with the least amount of mechanical positional displacement, wobbling from vibration, or image shift by time duration should be selected.

For securing a projector, the five screw holes for ceiling installation must be used regardless of whether the projector is placed on a platform or hung from a ceiling. The screw holes located under the projector, which are for the legs, should not be used because thermal expansion of the plastic cabinet affects image stability.

- Rear projection method
  - When achieving edge blending using a short-focus fixed lens, a mirror system should be used as mentioned before. In this case, accurate determination of the relative position and dimensions, so-called “scribing”, is very important.
  - When performing a three-dimensional image contour adjustment of the optical system using the projector’s adjustment stage, or distortion correction of a reflection mirror, selecting the correct adjustment method for eliminating chronic changes of bolts and screws is important. Refer to the installation manual of the rear projection mirror system for the actual adjustment method.
  - A sturdy platform or mirror stand is also necessary when using a short-focus zoom lens.
  - Fine projection adjustment is much easier with a projector platform equipped with an angle adjustment in the horizontal and vertical directions along with a left-right swing adjustment function.
  - When securing a projector on a platform, use of the projector legs (4 places) for securing or use of a strap is not recommended for a permanent setup, because this method, although easy, can cause image shifts. Always use the 5 securing holes furnished for connecting with a ceiling mounting bracket.

- Front Projection Method
  - In principle, the same considerations and cautions for rear projection apply.
  - When using a short-focus zoom lens (ET-D75LE6) or super long-focus zoom lens (ET-D75LE8), use of a bracket for supporting/securing the lens tip is recommended because the lens is heavy.
  - When using a ceiling hanging bracket, use a low-ceiling hanging bracket as a rule. If a high-ceiling hanging bracket needs to be used due to the building structure, always use additional hardware to prevent image wobbling. Also attach a drop prevention wire, normally included in the ceiling hanging bracket.

* Considerations
  When a projector is mounted at a position at a considerable distance from the building structure by means of a high-ceiling hanging bracket, independently fabricated pole or hanging bolts, image wobbling could occur as a result of the vibration moment originating from the building, or a shift of image contour could occur from thermal contraction of metal parts due to temperature changes brought about by air-conditioning.
1-2-3. Considerations When Mounting and Adjusting with a Ceiling Hanging Bracket

- Problems are sometimes reported such as poor edge-blending immediately following or less than a week after installation and adjustment. One of the causes of these problems is adjustment of the hanging bracket and temperature drift of the projector.
Considerations during adjustment are as follows.
- Procedure to adjust the installed angle of a ceiling bracket is shown on the next page using ET-PKD75S as an example.
When fastening bolts for adjusting an image contour, the following cautions should be heeded to avoid metal distortion caused by non-uniform bolt-fastening.
- When the projected image is shifted to the left or right of the screen, fasten the hexagonal nuts (4 places) for securing the top hanging bolt with uniform torque after the left-right adjustment.
- When the projected image is shifted upward or downward of the screen, loosely fasten the hexagonal bolts (2 each on the left and right sides) for up-down angle adjustment, and tilt the projector by moving its back end in the vertical direction to the desired angle. After adjustment, fasten the hexagonal bolt on the left and right alternately little by little to apply uniform torque.
- When the projected image is tilted to the left or right, loosely fasten the left-right angle adjustment bolts (3 each in the front and rear), adjust the left-right tilt of the projector, and then fasten the bolt in the front and rear alternately in the diagonal position little by little to apply uniform torque.
- After turning on the lamp, the projector generates some temperature drift in the lens shift or focus. Adjustments should be made after ageing of at least 30 minutes in the power-on condition.
After a lens shift, press the remote control button in the opposite direction momentarily to relax the drive power applied to bring about the lens shift. In addition, lightly rock the projector after adjustment to confirm that the adjusted position does not move.
ADJUSTING THE OVERALL PROJECTOR ANGLE

• The ceiling base allows the installer to correct vertical or horizontal skew or rotation of pictures. It should be adjusted so that the lens axis is perpendicular to the screen surface.
• Before making the following adjustments, first temporarily adjust the picture size with the zoom lens, then the focus with the focus ring, and then proceed with the projector angle adjustment. (For more details of picture size and focus adjustment, read the user’s manual supplied with the projector.)

Correcting Horizontal Picture Skew

1. Loosen the 4 hex nuts retaining the ceiling base to the top ceiling-mount bolts, then swivel the projector head horizontally until the picture is centered on the screen.
2. Retighten the 4 hex nuts.

Correcting Vertical Picture Skew

Note:
• Do not loosen the hex nuts that retain the adjustable base to the pole base as the projector may fall off the pole base.
1. Loosen the two hex-head bolts (one on each side) that attach the adjustable base to the pole base, then tilt the projector until the picture is centered on the screen.
2. Retighten the hex-head bolts.

Correcting Rotation

Note:
• Do not loosen the hex nuts that attach the adjustable base to the projector mounting bracket as the projector may fall off the adjustable base.
1. Loosen the 3 hex-head bolts each at the front and rear that attach the adjustable base to the projector mounting bracket, and then rotate the projector around its optical axis until the picture edges are aligned with the screen frame.
2. Retighten the 3 hex-head bolts each at the front and rear.

* If the picture still suffers from trapezoidal distortion after all of the above adjustment steps, the projector requires elevation angle adjustment. See “PROJECTION DISTANCE” on page 4.
1-3. Considerations for System Design of a Signal Transmission System

1-3-1. Enter the same input signal to each projector
- The projector input signal for edge blending should be as stipulated by the distributor.
- Adjustment data for each input signal needs to be registered in the memory of each projector.

1-3-2. When individual images other than the edge-blending image need to be displayed
- When registering individual image data in the memory, the image size is made smaller to avoid image overlapping and saved in the sub-memory. In addition, the image is shifted to a non-overlapping position using the raster position function.

1-3-3. Considerations When Multiple Input Signals are Switched for Display
- When a projector is used with multiple PCs, the signal level, phase and displayed area are slightly different depending on the PC used even though the signal type is the same such as XGA, thus requiring edge-blending adjustment when a different PC is used. In this case, unifying the output signal to a single signal type using a scan converter reduces the number of memory registrations in the projector.

* Considerations for setting a multi-scan converter
- Set up the output resolution of the multi-scan converter to match the DMD resolution of the projector
  Ex. D7700 (1400 dots x 1050 dots)
- Unify the output signal level, image expansion rate, image shift etc of multiple units of multi-scan converters. A default output setting is desirable.
- Variation exists in the dot clock and phase between multi-scan converters.
  The dot clock of each projector needs to be adjusted for each pair of projector and multi-scan converter. In this case, the dot clock adjustment should be made by displaying the internal test pattern of the multi-scan converter. DVI connection is recommended.

* Photo 6 shows a dot clock shift in the projector of the left side image.
* Dot clock shift in a multi-scan converter affects the hue and brightness.
A system using a multi-window processor is capable of freely making a synthesized pattern on the screen.
2. Edge Blending Adjustment Method
2-1. Cross-hatch Adjustment

- Project a cross-hatch from the test patterns of each projector and match the size of the two patterns using zoom and shift.
- Confirm that no trapezoidal distortion exists in the vertical or horizontal direction deriving from projector tilt in the up/down and left/right directions as well as vertical linearity, and carry out corrections where necessary.
- Overlapping two cross-hatches and shifting by 1 dot in the horizontal and vertical directions as shown makes parallelism checking easier. Turn on the edge blending and marker, and then set a blending width. The set value of the blending width of the two projectors should be the same (for example 128 dots). The blending start point is indicated in green, and the width is shown in red. The objective is to overlap the patterns using the lens shift of the two projectors and form a complete single yellow (green + red) line.
- The basics of creating a blended width are to use the same value on the two projectors and this is the range where two images overlap. When the blending width is made smaller than the overlapped range, the blended area becomes lighter, while if it is made larger, the blended area becomes darker.

![Adjust installed angle to fully eliminate distortion in the cross-hatch.](image)

![Adjust the two cross-hatches in the blending area to be completely in parallel.](image)

![Overlap the cross-hatches and turn on the blending and then turn off the marker.](image)
2-1-1. Adjustment Example of Cross-hatch Patterns

If the horizontal lines of the two patterns do not align with each other even if the pattern size has been matched by zooming, the projection angle of the two projectors will not be the same. Angle adjustment is necessary in this case.

In the case of the following pattern A, the bottom part of the pattern by the left projector is more expanded than the top part. Or the top part of the pattern by the right projector is more expanded than the bottom part.

**In the case of pattern B**, the top part of the pattern by the left projector is more expanded than the bottom part, or the bottom part of the pattern by the right projector is more expanded than the top part.

The image size of the two patterns matches but the hatch lines do not match. This problem is caused by the projector angle of the two projectors not being matched. The projection angle of one side or both sides is incorrect. A trapezoidal distortion is also generated at the same time. Correct the mounting angle by comparing with a right-angled object such as a screen frame.
2-2. Brightness Level Adjustment

- The next task is brightness adjustment.
  The adjustment is performed using the full black internal test pattern. Room lighting should be as dark as possible. Increase the “Black Level Inside” (BRIGHT INSIDE) of the black level adjustment item to make the Image connection area clearly visible.
- Next, find a vertical band of intermediate darkness on both sides of the overlapped area produced by unnecessary light from the opposite-side projector, and try to reduce the area by adjusting the values of the top, bottom, left and right (UPPER, LOWER, LEFT, RIGHT).
- Then, adjust the darkness of the main image area to that of the overlapped area by reducing the black level that was increased with “black level inside”. By using the “black level outside” (BRIGHT OUTSIDE), adjust the darkness of the area produced by shifting the value of top/bottom/left/right from the effective image area.
* Try to make the brightness caused by unnecessary light as invisible as possible and match the black level of both projectors. The unnecessary light outside the image area is roughly the same level as the black level inside but the edge gradually fades out.

Determine the most appropriate width by considering the incoming light cast onto the screen in each location.

- Black level of the left-side projector (Black level inside adjustment)
- Darkness produced by two projectors
- Unnecessary light of the right-side projector (Black level outside adjustment)
- Unnecessary light of the left-side projector (Black level outside adjustment)
3. Color Matching Adjustment Method

3-1. Projector Setting before Color Matching

- One of the three modes, “3 colors”, “7 colors” or “measurement”, can be selected for color matching adjustment. When adjusting color balance visually, select either “3 colors” or “7 colors”.
- In order to avoid adjustment errors, apply the video signal actually used for unifying the basic image-related settings of the projectors.
- Before performing a color matching adjustment, match the modes and values of the items shown below.

Set the initial values by using the default key on the remote control unit.
- For the purpose of checking the menu items shown below, press the MENU key on the projector or remote control. Using the “Main Menu” displayed, unify the mode and values in the [Image] menu or [Option 1] menu.

**Setting Requirement before Starting Color Matching Adjustment: [Main Menu] - [Image]**

<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Image mode]</td>
<td>Graphic in the case of a PC</td>
</tr>
<tr>
<td></td>
<td>Standard in the case of a video</td>
</tr>
<tr>
<td></td>
<td>Because memory is set up by signal type, confirm that each projector is not set up with a different image mode.</td>
</tr>
<tr>
<td>[Picture]:</td>
<td>Match the value across the projectors (Return to the default values)</td>
</tr>
<tr>
<td>[Black level]:</td>
<td>Match the value across the projectors (Return to the default values)</td>
</tr>
<tr>
<td>[Color Depth]¹²:</td>
<td>Match the value across the projectors (Return to the default values)</td>
</tr>
<tr>
<td>[Hue]¹²:</td>
<td>Match the value across the projectors (Return to the default values)</td>
</tr>
<tr>
<td>[Color temperature setting]:</td>
<td>Use “User 1”¹² or “User” ¹¹, and set the value of white balance (High) to 255 (default), (Low) to 128(default). (Adjust white balance later)</td>
</tr>
<tr>
<td>[White gain]¹¹:</td>
<td>Match the value of all projectors (Single-chip type projectors only)</td>
</tr>
<tr>
<td>[System daylight view]¹¹:</td>
<td>Off</td>
</tr>
<tr>
<td>[Gamma selection]:</td>
<td>Standard, 2.2 (recommended)</td>
</tr>
<tr>
<td>[Dynamic iris]²:</td>
<td>Off</td>
</tr>
<tr>
<td>[AI]¹¹:</td>
<td>Off</td>
</tr>
</tbody>
</table>

*¹ indicates the item applicable to a single DLP projector
*² indicates the item applicable to a 3-chip DLP projector

**Setting Requirement Before Starting Color Matching Adjustment: [Main Menu] - [Option 1]**

<table>
<thead>
<tr>
<th>Setting</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automatic signal setup:</td>
<td>Off</td>
</tr>
<tr>
<td>[Color collection]:</td>
<td>Off (Not applicable to D7000 series)</td>
</tr>
<tr>
<td>[Contrast made]¹¹:</td>
<td>Match the value on all projectors</td>
</tr>
</tbody>
</table>

In the case of DVI-D, match the values of EDID setting and AUX EDID SET.
3-2. Color Matching Principle

Color expression spectrum (color gamut) can be indicated as shown below. Projector color matching adjustment aims to match the color gamut of multiple projectors in order to match the color expression spectrum of the projectors through the process of either three primary color adjustment of red (R), green (G) and blue (B) (3-color matching adjustment) or seven-point adjustment of RGB + cyan (Cy), magenta (Mg), yellow (Ye) and white (Wh).

![Color expression spectrum of a projector](image)

Fig. 3.1 Color expression spectrum (color gamut) and projector's expression area

Because color adjustment beyond the color triangle of a projector is impossible, adjustment of color gamut of multiple projectors is performed within the color triangle inside the color spectrum.
3-3. Visual Color Matching Adjustment (3-color Matching Adjustment)

3-3-1. Identifying Color Difference (Color Purity)

The following description is given for red color adjustment.
Pressing the Menu button on a projector remote control displays the Main Menu. Selecting [Option 1] – [Color Matching] and then [3-color Matching] enables selection of RGB. Select R and press ENTER. Red color is displayed for comparison of the color (color purity) from the two projectors. (Fig. 3.2)

Turning the color matching Off from the [Main Menu] - [Advanced Menu] - [Color Matching], and applying a lens shift to show the two images side by side for eliminating the blending area makes a comparison of the left and right easier. (Fig. 3.3)

3-3-2. Applying an Adjustment

The principle of adjustment is to match the color of the two projectors by mixing other colors to achieve a better purity of color.
In the case shown on the left, the left-hand side is higher in red purity, so that other colors (green and blue) are added to the left side and red color is reduced from the right-hand side.
RGB content adjustment is applied to R color. When setting RGB content, a simple calculation is necessary as shown in Fig. 3.5.

Adjustment Example)

Three-color matching adjustment requires each value of R, G and B to be calculated by subtracting the content contained in other RGB elements.
Fig. 3.5  Color matching value calculation of R, G and B

After completing the adjustment of red color, perform a similar adjustment for green and blue color to obtain a balance of the 3 primary colors of multiple projectors.

The key point of adjustment is not to exceed the adjustment by performing excessive correction. When many projectors need to be adjusted, color correction by paying particular attention to adjacent projectors results in balanced color matching without sacrificing too much of the overall color gamut or brightness.
3-4. Visual Color Matching Adjustment (7-color Matching Adjustment)

3-color matching requires subtractions of RGB components contained in other colors from each primary color.

7-color matching, however, permits independent setting of adjustment values because the subtraction of the RGB component of other colors is not necessary when adjusting each component of RGB, Cy, Mg, Ye and Wh.

The adjustment method for each color is the same as for the 3 colors except that adjustment of the 7 colors of RGB, Cy, Mg, Ye and Wh is required. The adjustment is simpler because calculation of each RGB value is not necessary. Perform the adjustment in the order of R → G → B → Cy → Mg → Ye → Wh.
4. White Balance Adjustment, Picture Adjustment
(Finishing Adjustment, Maintenance Adjustment)

The final finishing adjustment after a color matching, or projection adjustment after a lamp replacement or after a periodic maintenance operation consists of a white balance adjustment and picture (contrast) adjustment.

Color matching adjustment does not require readjustment in principle, but picture adjustment and white balance adjustment is required periodically.

White balance and picture adjustment is performed by applying a 100% white signal of the actually used video signal.

When a 100% white signal cannot be displayed as the actually used video signal, picture adjustment can be performed with a normal uniform image of a brighter side. The white balance can be adjusted using a simplified method by displaying a 100% white test pattern generated by the projector. When a test pattern is displayed, picture adjustment cannot be performed. (When a projector is adjusted using only a built-in test pattern, the white balance is adjusted with the 100% white signal generated internally in the projector. When the actual video signal is displayed, the white balance between projectors may be slightly different.)

In order to avoid adjustment errors, as in the case of the color matching procedure, apply the actually used video signal to unify the basic video-related settings of the projectors. (Refer to P 16)

Signals from a PC have different input signal frequencies, thereby requiring an adjustment for each signal.

4-1. Picture Adjustment (Brightness Adjustment)

Picture adjustment is used for adjusting brightness only without changing color elements.

* Picture adjustment cannot be performed when the actually used video signal is applied. (While displaying a 100% white signal from the projector test pattern, the displayed brightness does not change if picture adjustment is performed) In such a case, just skip this item and go to 4-2. White Balance.

4-1-1. Brightness Adjustment Guidelines

When constructing an edge blending system or multi-screen system, because the brightness deterioration pattern of each lamp is different, brightness should be reduced to 70 - 80% while the lamp is new by using the contrast adjustment. This allows for the possibility of increasing brightness later during scheduled maintenance to compensate for the brightness deterioration of individual lamps.

Table 4 Guidelines for brightness reduction (with a new lamp)

<table>
<thead>
<tr>
<th>Relative brightness</th>
<th>Picture value</th>
<th>Adjustment possibility</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>100%</td>
<td>32 to 40(^1)</td>
<td>×</td>
<td>Projected brightness is kept at 100% without adjustment. No margin is left for future increase. (White-out is probable with a picture value of 40 or greater.)</td>
</tr>
<tr>
<td></td>
<td>0 to 10(^2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80%</td>
<td>24 to 25(^1)</td>
<td>○</td>
<td>Projected brightness is adjusted to approx 80%, leaving a 20% margin for future increase.</td>
</tr>
<tr>
<td></td>
<td>-8 to -7(^2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70%</td>
<td>21 to 23(^1)</td>
<td>◎</td>
<td>Projected brightness is adjusted to approx 70%, leaving a 30% margin for future increase.</td>
</tr>
<tr>
<td></td>
<td>-11 to -9(^2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50%</td>
<td>15 to 17(^1)</td>
<td>◎</td>
<td>Projected brightness is adjusted to approx 50%, leaving a 50% margin for future increase.</td>
</tr>
<tr>
<td></td>
<td>-17 to -15(^2)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^1\): Setting for D7700 series. \(^2\): Setting for D10000/D5700.

× = Not Recommend  ○ = Recommend  ◎ = Commended
Setting with a margin as shown above will allow adjustments upward in order to maintain uniform brightness between screens of multiple projectors by compensating for the brightness deterioration of each lamp.

4-1-2. Brightness Adjustment

- Apply an adjustment signal to multiple projectors (If possible, display a 100% white signal. Otherwise, display a uniform image of a brighter side.)
- Press Menu button on the projector remote control to display the Main Menu. Set a value by [Image] - [Picture] to adjust brightness.

**When the lamp is new**
- Compare the brightness (not color) of each projector. While referring to the table on P21 “Guidelines for brightness reduction”, determine the degree to which the brightness of the darkest projector is reduced and set up a picture value.
- By using the reference brightness of this projector, reduce the brightness of the other projectors.

**During periodic maintenance**
- Compare brightness (not color) of each projector and adjust the brightness of the other projectors based on the brightness of the darkest projector.

**Adjustment example: In the case of 3 screens**
The brightness is emphasized below for illustration purposes.

- In this example, the center projector is darker. Reduce the brightness of this projector by referring to the “Guidelines for brightness reduction” on P21.
  Using the menu [Image] - [Picture], adjust the brightness (Fig. 4.1, Fig. 4.2)

- Next, Reduce brightness of the left and right projectors to match that of the center projector.
  Using the menu [Image] - [Picture], adjust the brightness (Fig. 4.1, Fig. 4.2)
4-2. White Balance Adjustment

The white balance is used for adjusting 100% white quality. After a color matching adjustment while meeting the condition set on P16, color adjustment is completed by performing white balance with 100% white displayed.

If the contrast (brightness) adjustment on P21 4-1 is skipped, some degree of brightness adjustment can be performed by adjusting the RGB value of white balance using a common rate (For example, 30% reduction of RGB values). (Brightness adjustment only by white balance may cause deterioration of color reproduction).

4-2-1. White Balance Adjustment

(Adjustment example): In the case of 3 screens

In the example to the left, the center projector is greenish, while the right projector is reddish.

In the menu: [Image] - [Color temperature setting] - [User 1], Enter, [White balance High], Enter
This operation reduces the G component from the center projector and the R component from the right projector. (Fig. 4.3, 4.4)
Adjustment of [White balance Low] is not required.

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**Fig. 4.3** White balance menu

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**Fig. 4.4** Screen adjustment of RGB components with a white balance High