

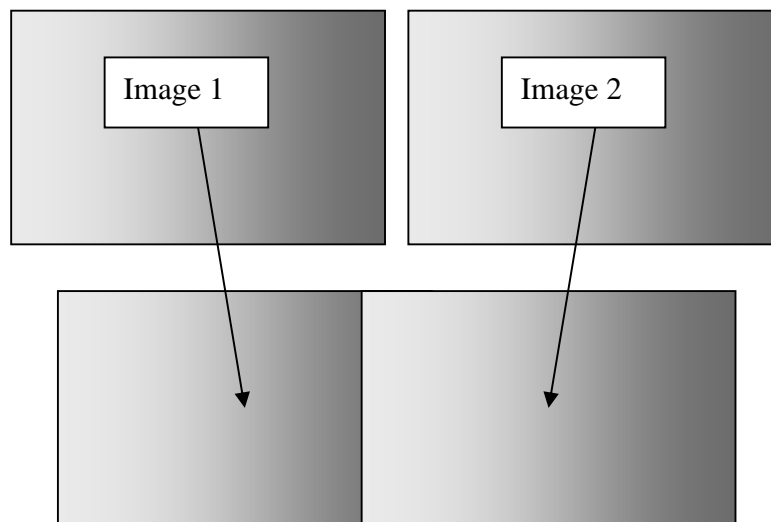
Quick setup guide for edge-blending with the C2-7000 series.

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Introduction

Edge-blending is a method whereby two or more video/data projectors are used together with part of their images overlapping, thereby creating a wider (or taller) display more suitable for showing wide-screen video images. The term edge-blending relates to the fact that the overlap needs to be carefully handled to prevent the overlap causing image brightness problems.

This guide is intended to summarise how to setup such projectors when used with TV One's C2-7000 series of Dual Channel Video Processors. These units are ideally suited to edge-blending tasks because of their twin CORIO2 scaling engines.

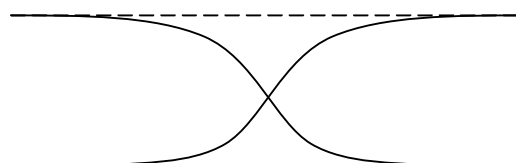


Basic method of overlapping two projection images to create a larger one.

Because the two overlapping areas will create a brighter than normal image, 'blending' is performed on the edges to allow seamless merging of the images together. The 'blend' is basically an S-shaped curve that is applied to gradually reduce the brightness of the image at the edge, so that they can overlap properly:



S-curves for left and right projectors, with edges blended.



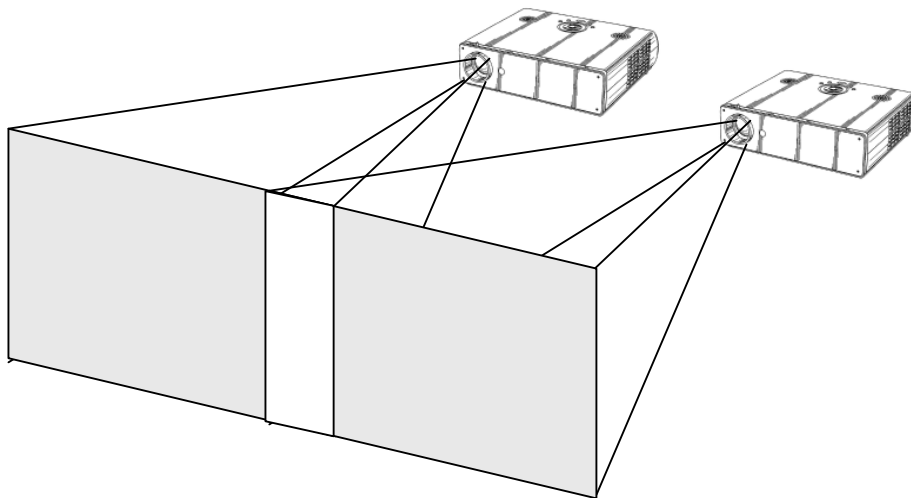
S-curves, when properly overlapping, will add together to result in full brightness.

Edge-blending requirements

To obtain the best edge-blending results, you will need:

1. A perfectly flat projection screen. This is vital, or it will not be possible to perfectly align your two projected images with each other.
2. Two matched projectors. Every projector on the market is different, with different lenses, projection methods, brightness, contrast, etc. Ideally you will need to identical projectors to obtain the best results.
3. A solid table or mounting bracket. Once you've set up your projectors and aligned them, you will not want them to move – so some method of holding them in place with brackets secured to walls or ceilings, or simply a sturdy table, will be vital.
4. Adjustable mountings (or more preferably projectors with built-in advanced adjustments). Proper alignment of two projectors can be very difficult, but will be aided by using some sort of mounting bracket that is easily adjustable. You may need to be able to move the projectors independently in all directions: left, right, up, down, forward, backward and also be able to tilt them to correct for any rotational errors.
5. Adjustable projectors. Most projectors will offer certain advanced features such as key-stone correction. This will be vital to ensure proper alignment, as it will partly compensate for mounting problems.
6. Of course, you'll need a C2-7000 series unit with the latest firmware that supports edge-blending (minimum version is 70). This unit's independent outputs will feed to the two projectors to be used.

Basic setup of the two projectors



Basic video projector setup showing overlap.

The above diagram shows how the two projects should be placed to create a wider than normal image. The amount by which they overlap is very important, as this will also relate to the zooming values to be used for each of the C2-7000's channels (output 1 being '1A' and output 2 being '2B').

Zooming is required because each projector is showing slightly more than half of the projected image, and thus each channel needs to be zoomed into a different area of the original source picture.

At this point, it is only necessary to place the projector roughly where you would like them to be, with around 15% overlap horizontally. If your projectors are already fixed into position, check that there is around 10% to 20% overlap, or edge-blending will not be possible.

You must also ensure that both projects are in focus with the same zoom settings (if your projector has this).

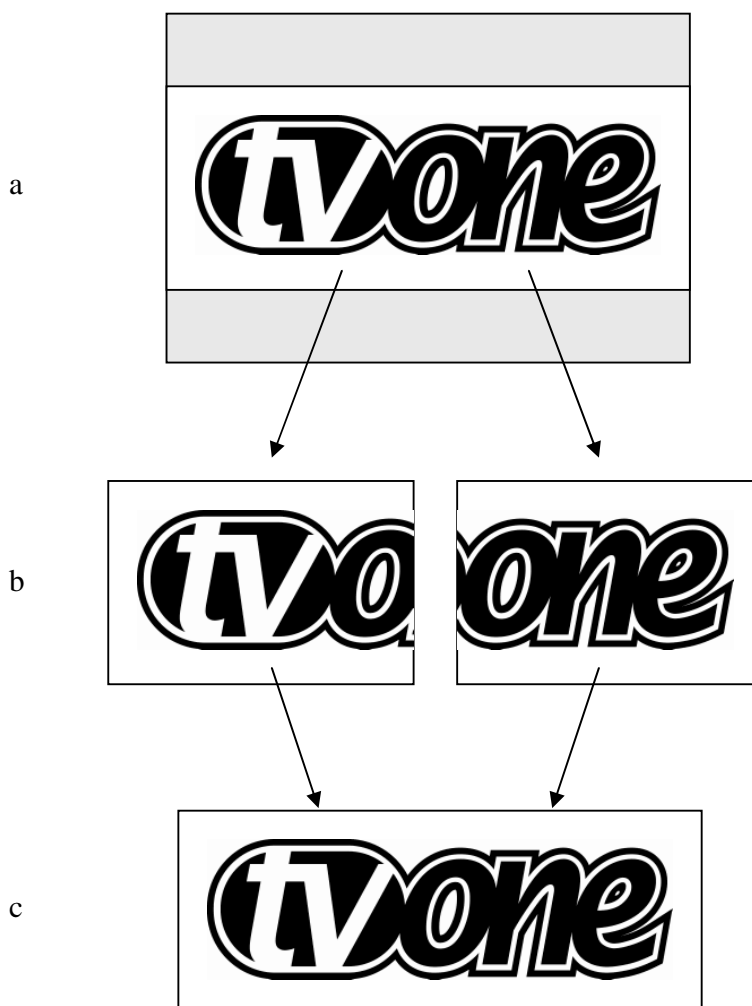
Connections to the C2-7000 scaler and projectors

Since a single C2-7000 unit can operate in 'Independent' mode, whereby it has two separate processing channels, it is merely necessary to connect Output 1 to your left-most projector, and Output 2 to your right-most projector.

Connect your video source (e.g. a DVD player or computer) to an input on the C2-7000 unit. It is not necessary to feed two signals – the C2-7000 unit can use the same signal for both outputs.

Initial setup of C2-7000 unit

This section describes how to start setting your scaler up. It is vital that your scaler is 'clean' of any user settings, so it is advisable to perform a full factory reset by either re-updating the firmware, or holding down buttons 1, 2 and 10 together until at least 2 'beeps' are heard.



Showing setup of zoom for each channel.

Figures 'a', 'b' and 'c' show how an original wide-screen image is 'split' into two using the C2-7000's independent scalers with identical zoom values. Zoom values for around 10% to 20% overlap are usually around 180%. In other words, not quite 2x zooming (since that would give no overlap at all).

Figure 'a' shows the original image and 'b' shows the two zoomed images. Note that the two images are at different 'Pan' positions – i.e. they are zoomed into different areas of the image – the left and right-hand sides. Figure 'c' then shows the images re-combined as they should eventually appear on your projection screen.

To produce the above effect, you'll now need to change some settings on the C2-7000 unit:

1. Set the unit into 'Independent' mode – this runs both scaling engines independently as 1A and 2B.
2. Go into the 'Adjust outputs' menu and ensure that both scaling engines are outputting the same resolutions. Use Toggle 1 / 2 (Shift-1) to switch between 1A and 2B.
3. Go into the 'Adjust windows' menu and ensure that both windows 1A and 2B are set to the same 'Source', which needs to be your original video signal (e.g. from a DVD player).
4. For window 1A, change the 'Zoom' value to 190%, with H pan% of 0% (fully left).
5. For window 2B, change the 'Zoom' value to 190%, with H pan% of 100% (fully right).

If your projectors are properly setup and connected, with the scaler active the above settings, you should now have a very rough overlap of the two images on a single projection screen. Where they do overlap you will see an over-bright part of the image, and most probably some overlapping errors.

Edge-blending activation

Edge blending is activated in the 'Adjust keyers' part of the menu, as follows:

1. Go into the 'Adjust keyers' menu, ensuring that 1A is active. Press Toggle 1 / 2 (Shift-1) if 2B is still shown.
2. For keyer 1A, change 'Edge blend' from 'None' to 'R' – so that it's right-hand edge is blended.
3. For keyer 2B, change 'Edge blend' from 'None' to 'L' – so that it's left-hand edge is blended.

You will also notice that some red and green lines have appeared. The red lines indicate the edge of the screen, and the green lines indicate the start or end of the blend. If these lines are not present, change 'E.blend guides' to 'Auto' or 'On'. 'Auto' makes them appear only whilst you are in the 'Adjust keyers' menu. 'On' forces them to be on all the time.

Edge-blending overlap / size

The blend size needs to be the same on both keyers, and is related to both the output resolution ('Output res' in 'Adjust outputs') and the zoom value ('Zoom' in 'Adjust windows').

There is a formula for calculating the edge blend size (E) from the zoom value (Z) and horizontal pixel width of the output (H):

$$E = 2 * H * (1 - Z/200) \text{ [pixels]}$$

For example, with zoom (Z) at 190%, output resolution of 1024x768 (H=1024), we can calculate E as:

$$E = 2 * 1024 * (1 - 190/200) = 102.4 \text{ [pixels]}$$

There is also a formula for calculating the zoom value (Z) from the edge blend size (E) and horizontal pixel width of the output (H):

$$Z = (1 - E / (2 * H)) * 200$$

For example, with E at 150 pixels, an output resolution of 1920 x 1080i (H=1920), we can calculate Z as:

$$Z = (1 - 150 / (2 * 1920)) * 200 = 192 \text{ [\%]}$$

For the recommended zoom value of 190%, the following edge blend horizontal sizes should be used for various output resolutions:

Zoom %	Output resolution	Edge blend H size
190	640 x 480	64
190	800 x 600	80
190	1024 x 768	102
190	1280 x 720	128
190	1280 x 1024	128
190	1600 x 1200	160
190	1920 x 1080i	192

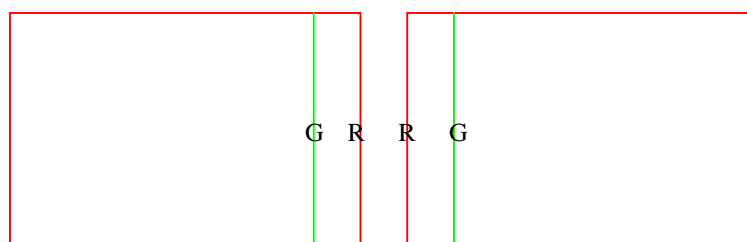
To set these edge-blend widths, perform the following:

1. Go into the 'Adjust keyers' menu, ensuring that 1A is active in the top-left corner. Press Toggle 1 / 2 (Shift-1) if 2B is still shown.
2. For keyer 1A, change 'E.blnd size' (the first number) to the H size recommended above.
3. For keyer 2B, change 'E.blnd size' (the first number) to the H size recommended above.

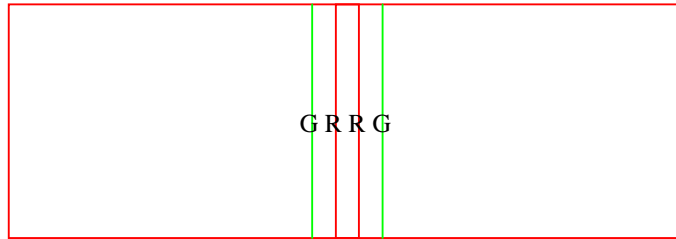
It is very important for 1A and 2B to use the same blend width, or you will not be able to accurately blend your images. However, should your projectors be mismatched, changing the blend width on one or both of them can sometimes help – but this should be done as a last resort.

Edge-blending guide lines

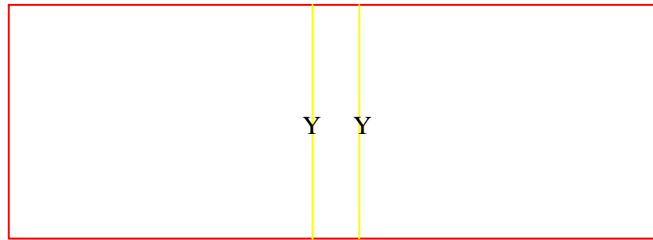
These lines, as mentioned earlier, are used to aid the alignment of your projectors. They show the area to overlap – the red lines indicate the inside edge of the output resolution, whilst the green lines indicate the edge of blending. (G marks the green lines, R marks the red, Y marks the yellow, for those reading in black and white.)



Outputs 1A and 2B with guide lines shown.



Outputs 1A and 2B partly overlapping.

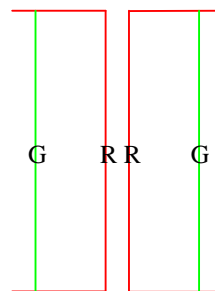
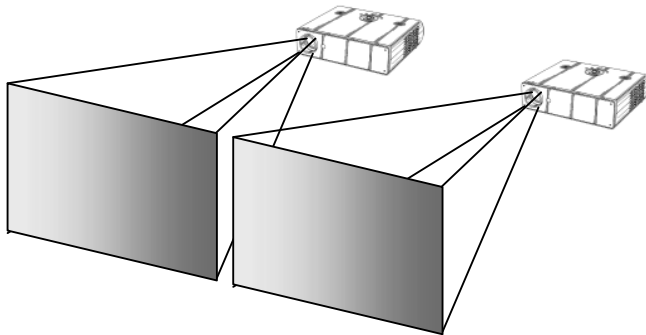


Outputs 1A and 2B perfectly overlapping – the red and green lines turn to yellow when aligned together.

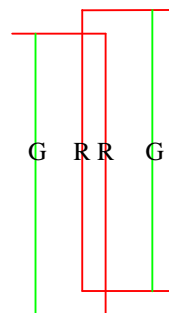
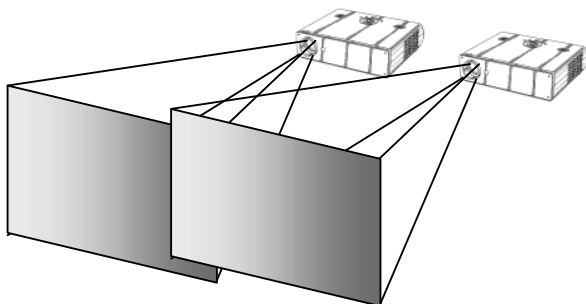
Alignment of projectors

This is possibly the most difficult part of properly setting up edge blending. Using the guide lines, you need to fine-tune your projector positions and tilts so that the above-mentioned red and green vertical lines perfectly overlap to produce yellow ones.

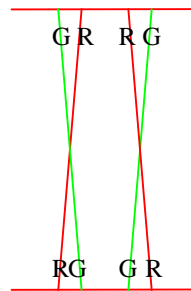
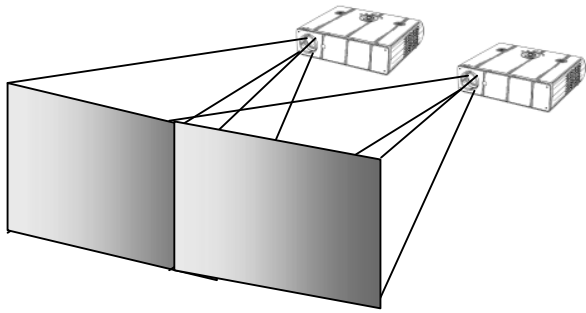
Depending on how your projectors are aligned, you'll get different results, each with different solutions as detailed below:



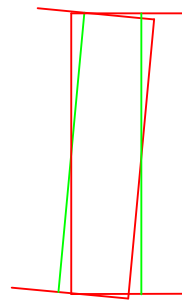
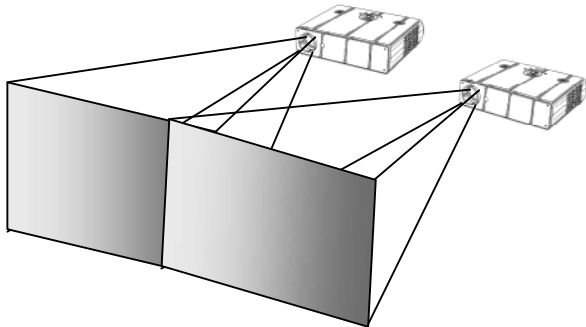
Too far apart – you need around 15% overlap, such that the red and green lines overlap.



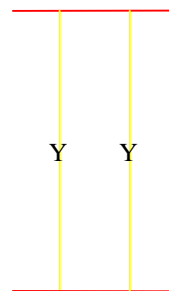
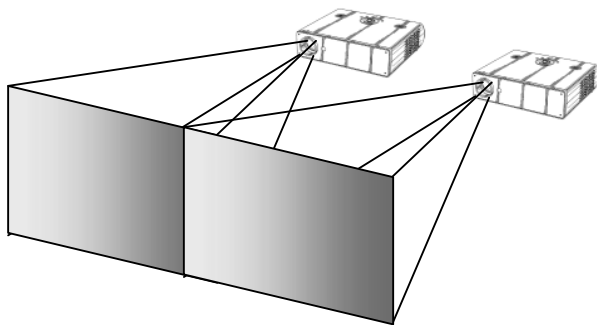
Offset – make sure your projectors are perfectly aligned both horizontally and vertically.



Key-stoning – ensure your projectors have the same keystone values, to produce perfectly aligned vertical lines.



Rotation – one or both of the projectors has a slight tilt. Once corrected, you may then need to re-align them.



Perfect alignment – your red and green vertical lines should overlap to produce yellow ones.

Gamma correction

By now you should have two perfectly aligned projectors, but possibly with a brighter than normal overlap. This is most probably because a projector's luminance is not perfectly linear and therefore will need to have what's called 'gamma correction' applied.

Gamma correction is available on the C2-7000 series within the same 'Adjust keyers' menu as the other adjustments. You will need to adjust both output channels gamma correction to be the same, unless you have non-matching projectors.

To change gamma correction:

1. Go into the 'Adjust keyers' menu, ensuring that 1A is active. Press Toggle 1 / 2 (Shift-1) if 2B is still shown.
2. For keyer 1A, change 'E.blnd gamma' (the first number) until the brighter area starts to dim – note the number required for this.
3. For keyer 2B, change 'E.blnd gamma' (the first number) to the same gamma value as per above.

Aspect ratio adjustment

Since your original video source is probably 16:9 (or a similar aspect ratio), it will also be necessary to change your vertical zoom value differently to the horizontal one. This is best done after projector alignment by performing the following:

1. Go to the 'Adjust windows' menu and change 'Aspect adjust' to 'Advanced'. This enables separate H & V zoom adjustments.
2. Go to 'Adjust windows' for 1A and you will now be able to adjust the vertical zoom independently of the horizontal zoom. H zoom should be left as it is, so adjust the V zoom until the correct aspect ratio of your output is achieved.
3. Go to 'Adjust windows' for 2B and adjust the V zoom to the same value as 1A.

Locking both outputs together

If your video source contains live (moving) video then it is worthwhile locking one channels' output to the others' – this will eliminate any line or frame drift, which may cause frame-rate conversion problems. This is best done by locking 2B to OUT1 (which is 1A's channel).

To do this, perform the following:

1. Go to 'Adjust outputs'
2. Ensure that '2B' is selected – press Toggle 1 / 2 (Shift-1) if not.
3. Where 'Lock [Off] RGB1' is seen (where RGB1 is the default Lock source), change the Lock source to 'OUT1'.
4. Then change the Lock method from 'Off' to 'Genlock'.

Other setup approaches

The previous setup method relies on your projectors being moved and aligned to the C2-7000's 190% zoom factor. Other setup approaches are also used where the zoom factor is adjusted to the projectors' current position – for instance if they are already fixed into their final positions.

Assuming your projectors are in fixed positions, you will need to adjust the 'E.blnd' H-size for both 1A and 2B (to be the same values) such that they overlap, creating the yellow lines mentioned earlier. You will then need to adjust the zoom values for 1A and 2B according to the formula given earlier. For various zoom and output resolutions, the following values for the edge blending H-size can be used:

Table showing Zoom% values for various Horizontal resolutions and edge blend H size overlaps.

E.blnd H	640x480	800x600	1024x768	1280x720	1280x1024	1600x1200	1920x1080i
50	192	194	195	196	196	197	197
55	191	193	195	196	196	197	197
60	191	193	194	195	195	196	197
65	190	192	194	195	195	196	197
70	189	191	193	195	195	196	196
75	188	191	193	194	194	195	196
80	188	190	192	194	194	195	196
85	187	189	192	193	193	195	196
90	186	189	191	193	193	194	195
95	185	188	191	193	193	194	195
100	184	188	190	192	192	194	195
105	184	187	190	192	192	193	195
110	183	186	189	191	191	193	194
115	182	186	189	191	191	193	194
120	181	185	188	191	191	193	194
125	180	184	188	190	190	192	193
130	180	184	187	190	190	192	193
135	179	183	187	189	189	192	193
140	178	183	186	189	189	191	193
145	177	182	186	189	189	191	192
150	177	181	185	188	188	191	192
155	176	181	185	188	188	190	192
160	175	180	184	188	188	190	192
165	174	179	184	187	187	190	191
170	173	179	183	187	187	189	191
175	173	178	183	186	186	189	191
180	172	178	182	186	186	189	191
185	171	177	182	186	186	188	190
190	170	176	181	185	185	188	190
195	170	176	181	185	185	188	190
200	169	175	180	184	184	188	190
205	168	174	180	184	184	187	189
210	167	174	179	184	184	187	189
215	166	173	179	183	183	187	189
220	166	173	179	183	183	186	189
225	165	172	178	182	182	186	188
230	164	171	178	182	182	186	188
235	163	171	177	182	182	185	188
240	163	170	177	181	181	185	188
245	162	169	176	181	181	185	187
250	161	169	176	180	180	184	187
255	160	168	175	180	180	184	187
260	159	168	175	180	180	184	186
265	159	167	174	179	179	183	186
270	158	166	174	179	179	183	186
275	157	166	173	179	179	183	186
280	156	165	173	178	178	183	185
285	155	164	172	178	178	182	185
290	155	164	172	177	177	182	185
295	154	163	171	177	177	182	185
300	153	163	171	177	177	181	184
305	152	162	170	176	176	181	184