MODEL:

**VP-790**
Warp Generator

P/N: 2900-300171 Rev 2
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Introduction

Welcome to Kramer Electronics! Since 1981, Kramer Electronics has been providing a world of unique, creative, and affordable solutions to the vast range of problems that confront video, audio, presentation, and broadcasting professionals on a daily basis. In recent years, we have redesigned and upgraded most of our line, making the best even better!

Our 1,000-plus different models now appear in 11 groups that are clearly defined by function: GROUP 1: Distribution Amplifiers; GROUP 2: Switchers and Routers; GROUP 3: Control Systems; GROUP 4: Format/Standards Converters; GROUP 5: Range Extenders and Repeaters; GROUP 6: Specialty AV Products; GROUP 7: Scan Converters and Scalers; GROUP 8: Cables and Connectors; GROUP 9: Room Connectivity; GROUP 10: Accessories and Rack Adapters and GROUP 11: Sierra Video Products.

This online guide accompanies the Warp Generator application software for the Kramer VP-790.
2 Installing the VP-790 Warp Generator


The Control Software requires the following:

- Windows™ XP, Vista or Windows™ 7

To install the VP-790 Warp Generator Software:

1. Double click the Setup.exe file.
   The Welcome window appears:

   ![Welcome Window](image)

   Figure 1: Welcome Window

2. Click Next.
   The Choose Destination Location window appears:
3. Click **Browse** to select the destination folder.

4. When finished, click **Next**.

   The **Confirm Installation** window appears:
5. Click Next. The **Installation Progress** window appears:

![Figure 4: Installation Progress Window](image)

6. Click **Close**.

   An icon appears on the desktop and a shortcut appears in the **Start Menu Programs** folder in the **Kramer** sub-folder.

2.1 **Connecting the PC to the VP-790**

See [Section 5.4.1](#) for instructions on how to connect the device to a PC via the Ethernet.
The **VP-790 Warp Generator** is an application that lets you manipulate video stream warps quickly with its simple-to-use editor. Image warping can be useful when projecting onto uneven surfaces and for correcting projector misalignment. It is also useful for the correcting of projected images on concave or convex surfaces or even for intentional image distortion.

The **VP-790 Warp Generator** uses two file types:

- Grid Files (.txt): files that contain information regarding output resolution, grid co-ordinates, number of points in a grid, and so on. Grid Files are displayed as an array of grid points and define how the image is to be warped. To create a warp, points can be dragged and dropped to compensate for the projected image and then converted into a warp file ready for upload to the **VP-790** machine.

- Warp Files (.twf): files generated from Grid files that can be uploaded to **VP-790** to be used as a warp map and applied to a given video stream.

Note that up to eight warp maps can be stored on the **VP-790**.

The **Warp Generator** uses the warp test pattern, generated by the **VP-790**, as a visual grid tool to tweak and see how accurate the created warp is. Simply edit the warp grid until the Warp Test Pattern looks uniform (unless the aim is to make it non-uniform).

Section 4 defines the Warp Generator software tools and Section 5 describes how to use those tools to prepare a warp map.
4  **Warp Generator**

Warp Generator consists of a main user interface which is used for handling the warp files and the grid screen which includes grid design tools.

This section defines the main user interface (see Section 4.1) and the grid tools (see Section 4.2).

4.1  **Main User Interface**

Double-click the **VP-790** Warp Generator icon. The main window opens. This section defines the **Warp Generator** main window:

![VP-790 Warp Generator Main Window](image)

<table>
<thead>
<tr>
<th>#</th>
<th>Feature</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Connect</td>
<td>Open the auto connect and connection dialog boxes</td>
</tr>
<tr>
<td>2</td>
<td>Disconnect</td>
<td>Close the current connection</td>
</tr>
<tr>
<td>3</td>
<td>Reload Files</td>
<td>Check the warp and grid file folders for any new additions</td>
</tr>
<tr>
<td>4</td>
<td>Help</td>
<td>Open the help file</td>
</tr>
<tr>
<td>5</td>
<td>What’s This?</td>
<td>Gives a brief description of a button’s function when the mouse cursor hovers over a given button</td>
</tr>
<tr>
<td>6</td>
<td>About</td>
<td>Contact and product details</td>
</tr>
</tbody>
</table>
### Grid Tools

The grid tool windows, Grid Designer and Evaluator Control appear when creating or editing a warp map and are used to adjust the warp map to fit the screen’s irregular surface.
## 4.2.1 The Grid Designer

This section defines the Grid Designer Window.

![Grid Designer Window](image)

**Figure 7: The Grid Designer window**

<table>
<thead>
<tr>
<th>#</th>
<th>Feature</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Reset the whole grid</td>
<td>Reset all the points back to their original New Grid positions</td>
</tr>
<tr>
<td>2</td>
<td>Reset the selected point</td>
<td>Reset the currently selected point back to its original New Grid position</td>
</tr>
<tr>
<td>3</td>
<td>Save changes and exit</td>
<td>Save the current grid and exit to the main user interface</td>
</tr>
<tr>
<td>4</td>
<td>Discard Changes and exit</td>
<td>Ignores any changes made since the last save and exits to the main user interface</td>
</tr>
<tr>
<td>5</td>
<td>Undo the last action</td>
<td>Revert the last change made through the editor or grid designer during the current grid editing session</td>
</tr>
<tr>
<td>6</td>
<td>Redo the previously undone action</td>
<td>Reapply the last Undone change</td>
</tr>
<tr>
<td>7</td>
<td>Resample the grid</td>
<td>Increase the number of grid lines in both H and V directions</td>
</tr>
<tr>
<td></td>
<td>Down-sample the grid</td>
<td>Decrease the number of grid lines in both H and V directions</td>
</tr>
<tr>
<td>8</td>
<td>Fine positioning</td>
<td>Move the selected point to the left, right, up and down directions in small increments that are set via the drop down box. Fine positioning gives finer control over individual grid point positioning. This is useful for fine tuning a warp especially when manipulating a grid where the output resolution of the target to be warped is higher than that of the display the Warp Generator tool is running on</td>
</tr>
<tr>
<td>9</td>
<td>Open Presets</td>
<td>Show/hide presets (See Section 4.2.1.1)</td>
</tr>
<tr>
<td>10</td>
<td>3x3 Curvature Y</td>
<td>Set the vertical cue line positions in a 3x3 grid (see Section 4.2.1.2)</td>
</tr>
<tr>
<td>11</td>
<td>3x3 Curvature X</td>
<td>Set the horizontal cue line positions in a 3x3 grid (see Section 4.2.1.2)</td>
</tr>
<tr>
<td>12</td>
<td>Toggle Warp Alignment Test Grid</td>
<td>Toggle the embedded test pattern On and Off. This test pattern is built into the VP-790 and is also selectable through the VP-790 controls</td>
</tr>
<tr>
<td>13</td>
<td>Toggle Warp</td>
<td>Toggle the warp engine of the VP-790 On and Off. Useful when wishing to compare an edited warp grid to the un-warped image</td>
</tr>
</tbody>
</table>
4.2.1.1 Warp Map Presets

The presets area is used to create the general appearance of the warp map.

Figure 8: Setting Presets

The presets area lets you set an initial warp grid, which is based on the position of the projector relative to the screen (to the left or right, above, below, or centered), and the general shape of the screen (flat, concave or convex both ways, and pin, barrel or cylindrical). Click the CREATE! button to apply it to the grid.

Note that by clicking the CREATE! button, any previous changes you have made to the warp grid are reset.

Once the presets are defined, you can hide the presets part and continue designing the warp grid, using the Grid designer window and the Evaluator Controls window alternately.

4.2.1.2 The Cue Lines

The cue lines appear as fine red lines that initially divide the grid evenly. The cue lines are provided to help the user get a better ‘feel’ for how their grid point position choices will affect the final warped result on the output of the VP-790.

Cue lines appear only in 2x2 and 3x3 grids, as higher detailed grids already have enough information to represent the final warp result. The cue lines can be manipulated either via the PRESETS setup (see Section 4.2.1.1) or adjusted using the Curvature X and Y sliders (see Section 4.2.1).
4.3 The Evaluator Controls Window

The Evaluator Controls window displays detailed feedback regarding the warp grid and its viability for use on the VP-790 in addition to providing whole grid/multiple points editing functionality, such as:

- Sending the warp map to the VP-790
- Grid editing functions
- Grid evaluation and validation

Figure 9 illustrates the Evaluator Controls window:

![Evaluator Controls Window](image1)

Figure 9: Evaluator Controls Window

4.3.1 The Send Warp Area

Once the warp grid is prepared, the Send Warp control box converts the viewed warp grid to a warp file and sends it to a selected warp slot on the VP-790. The Send Warp area shows the warp status and displays the generation and transmission times, as illustrated in the example in Figure 10.

![Sending Warp](image2)

Figure 10: Saving a Warp to a Slot
4.3.2 The Grid Editing Area

The Grid Editing control box includes editing tools for the entire grid:

**Rotation (clockwise)**

In the Rotate box, type in the number of degrees you require the grid to rotate, then click the Rotate button.

Note that the rotation degree that is set is always relative to the original setting of the grid (a new or a downloaded file). The rotation occurs around the center of the editable area.
For example, applying a 45 degree rotation twice will not result in a 90 degree rotation but a 45 degree one.

Note that when rotating, the Scale Grid function (described below) can be used to prevent any cropping of the live video stream if so desired.

**Scale Grid**

Use the “Scale Grid” to shrink or expand the size of the grid relative to its original size (a new or a downloaded file) by 50 to 1000%.

For example, applying a 60% scale will shrink the grid by 60%; applying 60% again will not make any difference to the grid as it is already at 60% of its original size. All scales are performed as a function of grid point distance from the center of the editable area.

**Selected Point Position**

The Selected Point Position displays the horizontal and vertical position of a selected point.
Point Edit Control

Point Edit Control allows you to manipulate the grid by:

- Moving the entire row, column or grid
- Snapping a point to the edge of the grid, to a row or a column
- Locking the horizontal or vertical positions
- Mirroring selected points horizontally or vertically

Note that the Point Edit Control functions are automatically checked by the preset creation function, based on what will be most efficient to use in the current preset options.

Note that these can be unchecked if found to be undesirable for the modifications required for a specific setup after the initial preset has been generated.

4.3.3 Grid Evaluation Area

The grid evaluation area checks the viability of the grid by evaluating the angles, checking the folds and the size. It will also indicate grid generation failure and offer suggestions for correcting a grid file that has failed to be converted into a Warp file, as illustrated in Figure 11:

Figure 11: Grid Evaluation Examples

If a problem with the angles occurs, it will also show up on the grid, in red, around the points in question:
You can fix the conflicting angles and folds by moving the points until the red color around the point turns back to green.

The grid points cannot move beyond the boundaries created by adjoining grid points; any conflicting fold points will turn black. Folds are fixed when the black point turns back to blue.
5 Preparing a Grid

To prepare a grid do the following:

- Edit an existing grid file or start a new grid
- Use the Grid Designer PRESETS for initial settings
- Use Grid Designer and Grid Editor to finalize the warp map
- Upload it to the VP-790 (see Section 5.4)

The following example shows a projector positioned above a convex shaped screen and directed at the screen center, as illustrated in Figure 13:

![Figure 13: Projector Setup for Convex Screen](image)

The blue projection image field is naturally keystoned when such a projector alignment is used within an installation, so Warp Generator must compensate for both the keystone effect and also the curvature of the screen. To do this, the **Preset Menu**, the **3x3 Curvature** controls and the **Point Edit Control** functions will be used.
5.1 Creating the Grid

You can either open a previously prepared grid (by clicking the Edit Grid button) or open a new grid. To create a new grid, click the New Grid button. The New Grid window appears:

Figure 14: The New Grid Window

Type the grid file name and click OK.

The new grid appears in the main window. All New Grids start with a 2x2 grid. Editing the grid can be as simple as dragging and dropping the desired points with the selected point being highlighted with a large, black crosshair.

The white area represents the active video area of the VP-790 and the purple border around this represents the inactive video area (see Figure 15).

Figure 15: A New 2x2 Grid

The aspect ratio and shape of the active area are set to match those of the currently active output mode of the VP-790.
5.2 Define Presets

To define the presets click the PRESETS button in the Grid Designer window. For a projector set above the center of a convex screen the setup is centered horizontally, top vertically; convex for Left to Right and Flat for Top to Bottom. Modifiers are set to none:

![Grid Designer window showing preset options](image)

Figure 16: Define the Presets

The preset options selected best describe the curved screen in this example.

If the same projector were to be projected onto a room corner, for example, we would set the same presets for the projector position and select flat (Left to Right, and Top to Bottom) for the screen curve; Modifiers would be set to none:

![Grid Designer window showing preset options](image)
Click the CREATE button to create the preset warp grid, as illustrated in Figure 17:

![Figure 17: Initial Warp Grid for Convex Screen](image_url)

The preset warp grid illustrated in Figure 17, displays the corrections for both the keystone problem due to the position of the projector and the screen curvature.

The preset settings are fairly subtle compared to the setup given in this example and are more suited to the more common setups with longer throw lenses and more subtly curved screens used more often in practice. Despite this, it is very simple to adjust this preset generated warp to match the setup in this example.

To do this quickly, Mirror in H in the Point Edit Control tools have been enabled automatically by the preset creation function.

Before adjusting the shape of the grid in any way using Mirror in H, make sure that the warped image is centered and has been scaled to the correct size for the screen. If this isn’t the case, center the grid:

1. Enable the Move All function in the Point Edit Control located in the Grid Editing section of the Evaluator Controls tool box.

2. Move the whole grid so that the center of the warped image is centered on the projection screen/surface.

3. Disable Move All.
Now perform the Scale Grid operation (also located in the Grid Editing section) until you get the closest match with this function that can be achieved. Be sure to test all adjustments to the grid on the actual surface using the Send Warp button located on the Evaluator Controls tool box.

5.3 Manual Adjustments

Use the automatically enabled Mirror in H and adjust the grid points to ensure that the test pattern image fills the corners and straight edges of the curved screen in this setup.

Move the positions of the two lower left grid points in the first column – the two lower right grid points in the last column (see Figure 18).

The mirrored counterparts are automatically adjusted due to Mirror in H being enabled.

Using “Mirror in H” reduces the number of required grid point movements for this particular setup.

Figure 18: Manual Adjustment of the Warp Grid

Note that in order to test the changes made to the warp map after making an adjustment, you have to update the VP-790.

To do this, set the slot to which you want to send the warp map and click SEND in the Evaluator Controls button.
At this stage, if the corners and edges cannot be further improved using Mirror in H (due to slight asymmetries in the curved screen setup), you can de-activate the function by unchecking it and then tweaking each point independently to get a perfect match.

For this kind of setup (with an unusually short throw), the center and corners currently match, but the curved lower part does not. The current grid with a curved screen in its lower part, does not match.

To fix this start by adjusting the 3x3 Curvature X slider (left to right curvature adjustment) to the right by a few notches. Doing so will affect the position of the red cue lines that reflect the overall shape of the warp (see Figure 19):

![Figure 19: Adjustment of the 3x3 Curvature X slider](image)

The warp grid takes a more "barrelled" shape now as indicated by the Cue Lines.

Once again, update the **VP-790** with the last changes to the warp map.

By setting the curvature of the warp grid to better match the bottom edge of the screen, we have also improved the uniformity of the warped image as a whole and how it looks on the screen.
Rarely will a given setup be symmetrically perfect so usually the warp grid will need to be fine tuned to get a perfectly uniform result that follows the edges of the screen perfectly. This can be accomplished by increasing the level of editing detail of your grid by clicking the Fine Grid Resample button. Each click of this button will double the level of detail of the grid editing in both the horizontal and the vertical dimension, up to a maximum of 17x17 grid points.

If you accidentally click this button too many times and don’t wish to edit the grid at the detail level selected, you can either click the Undo button or the Coarse Grid Downsample button. Both buttons are located in the Grid Designer window.

Figure 20 shows the same warp grid as in Figure 19 but it has been resampled twice using the Fine Grid Resample button:

![Figure 20: Resampling the Warp Grid](image)

To edit the warp grid at this level of detail, disable all Point Edit Control functions, in particular the Snap Assist functions due to the closer proximity of adjacent grid points in a higher detailed warp grid. Once you are happy with your warp grid setup, save and exit the unit and select the appropriate input on the VP-790 to be displayed perfectly on the curved screen.
5.4 Uploading the Warp Map to the VP-790

To update or upload the Warp Map onto the VP-790, you need to connect it to your PC. To do so:

- Connect the PC to your VP-790 via the Ethernet (see Section 5.4.1)
- Connect to the VP-790 via the Warp Generator software (see Section 5.4.2)
- Upload the Warp file (see Section 5.4.3)

5.4.1 Connecting via the Ethernet

You can connect to the VP-790 via Ethernet using either of the following methods:

- Direct connection to the PC using a crossover cable (see Section 5.4.1.1)
- Connection via a network hub, switch, or router, using a straight-through cable (see Section 5.4.1.2)

5.4.1.1 Connecting the Ethernet Port Directly to a PC (Crossover Cable)

You can connect the Ethernet port of the VP-790 to the Ethernet port on your PC, via a crossover cable with RJ-45 connectors.

This type of connection is recommended for identifying the VP-790 with the factory configured default IP address.

After connecting the Ethernet port, configure your PC as follows:

1. Right-click the My Network Places icon on your desktop.
2. Select Properties.
3. Right-click Local Area Connection Properties.
4. Select Properties.
   The Local Area Connection Properties window appears.
5. Select the Internet Protocol (TCP/IP) and click the Properties Button (see Figure 21).
6. Select Use the following IP Address, and fill in the details as shown in Figure 22. You can use any IP address in the range 192.168.1.1 to 192.168.1.255 (excluding 192.168.1.39) that is provided by your IT department.

7. Click OK.

5.4.1.2 Connecting the Ethernet Port via a Network Hub (Straight-Through Cable)

You can connect the Ethernet port of the VP-790 to the Ethernet port on a network hub or network router, via a straight-through cable with RJ-45 connectors.
5.4.2 Connecting to the VP-790 via the Warp Generator Software

To connect to the **VP-790** via the Warp Generator Software to upload or update the Warp map, do the following:

1. Click the Connect button on the top left hand side of the Warp Generator main window (see **Figure 23**).

   ![Figure 23: Click the Connect Button](image)

2. One of two windows appears:

   - The Connect to Unit window, if you are connecting for the first time or via a new IP number, see **Figure 24**.
     Type the IP address, click on the Add an Address button, select the IP number in the area below and then click the Connect to Unit button

   - The Auto Connect window, if you have been using the same IP number, (see **Figure 25**).
     Click the Yes button

   ![Figure 24: The Connect to Unit Window](image)
   ![Figure 25: The Auto Connect Window](image)
The Warp Generator software is now ready to use, see Figure 26.

![VP-790 Warp Generator Main Window Connected](image)

**5.4.3 Uploading a Warp File**

You can upload or update a Warp file via two different paths:

- The Evaluator Controls Window, when creating a new Warp file
- The Warp Generator main screen for an existing Warp file
5.4.3.1 Uploading via the Evaluator Controls Window

After updating/preparing the grid you can send it to the selected Warp Slot by clicking the SEND button in the Send Warp area.

![Evaluator Controls Window]

Figure 27: Sending a Map to a Slot

The warp map is now stored in one of the VP-790 Warp memories (from 1 to 8) and appears as a warp file in the Warp files area in the main window. Once the Warp file appears in the window, you can upload that Warp file into a different slot.