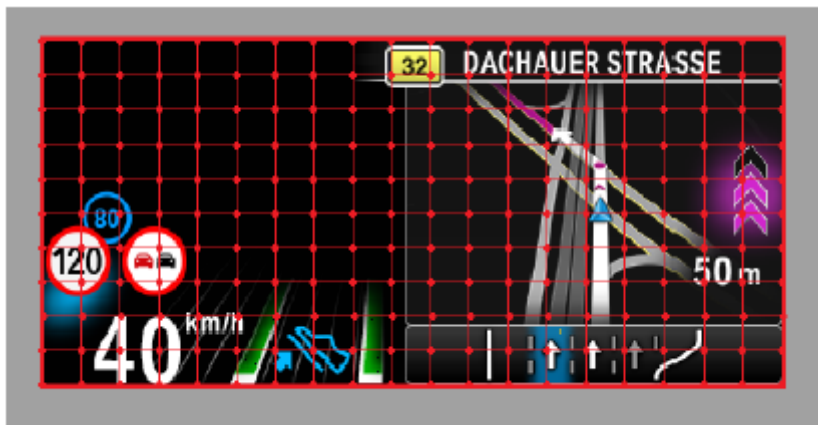


Warping Areas

The display area comprises the whole image including the grey border, as depicted in the figure below.

The bitmap image area is the area within the grey border. This is the area of interest and which should be warped. The reference points are evenly distributed over the bitmap image area.

The illuminated display area is the part of the display, which is backlit and projected to the windshield. This is the area where the warped image will be rendered into. If the bitmap image area is larger than the specified illuminated display area, then the warp image will be scaled to fit into the illuminated area boundaries.



The Warping Library needs the following parameters to be configured which are related to the warping areas:

- Display Size X/Y: area of the display size
- Bitmap Area X/Y: area for the warping screen
- Bitmap Shift Area X/Y: shift values of bitmap area center point
- Illuminated Area X/Y: area of the illuminated area
- Illuminated Shift Area X/Y: shift value of illuminated area center point
- Warping Area (parameter is no longer used in the calculation of the warp image, but the values are checked for boundary correctness - use same values as for illumination area).
- Warping Shift Area (parameter is no longer used in the calculation of the warp image, but the values are checked for boundary correctness - use same values as for illumination shift area).

The Bitmap Shift Area describes the connection vector between the origin of the bitmap coordinate system (0,0) and the center point of the bitmap image - the Bitmap Area Center Point. This center point represents the center point of the image area.

Example

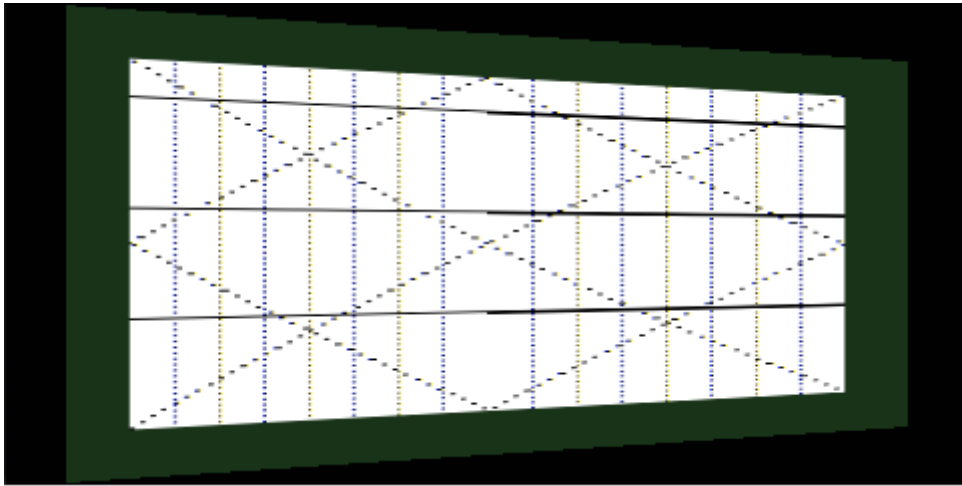
Warp image is influenced by the size of bitmap area and illuminated area.

Reference points are distributed over display area

Display Area: 480x240

BitmapArea: 480x240 | BitmapShiftArea: 240x120

IlluminatedArea: 480x240 | IlluminatedShiftArea: 240x120

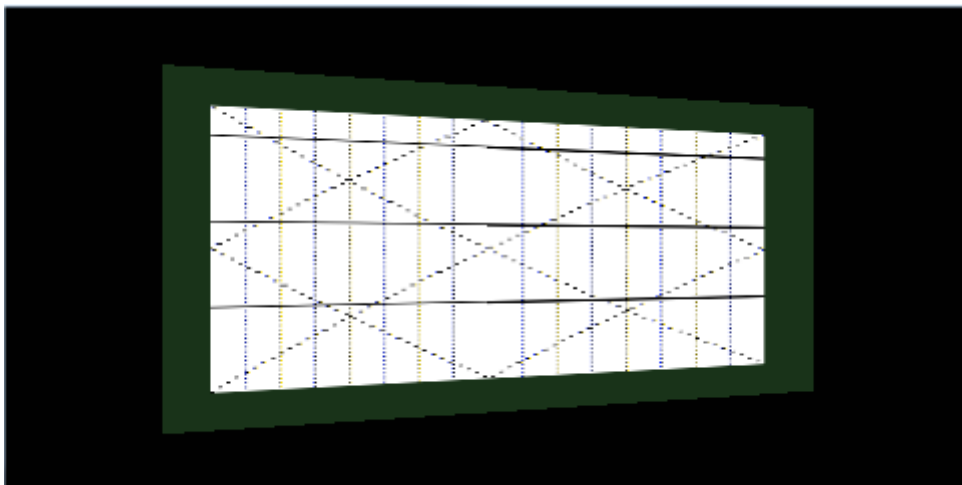


Content shrinks to fit inside illuminated area

Display Area: 480x240

BitmapArea: 480x240 | BitmapShiftArea: 240x120

IlluminatedArea: 409x190 | IlluminatedShiftArea: 240x120

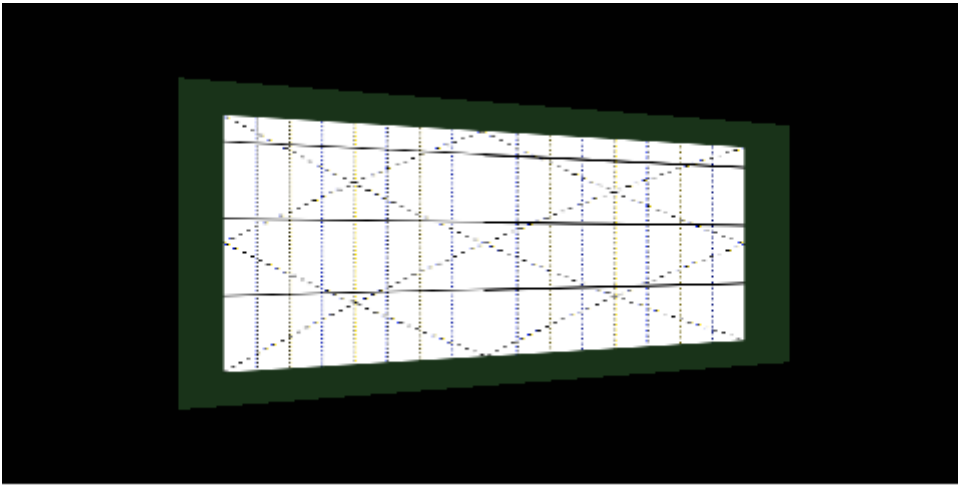


Bitmap area changes, content shrinks even more to fit inside illuminated area

Display Area: 480x240

BitmapArea: 409x190 | BitmapShiftArea: 240x120

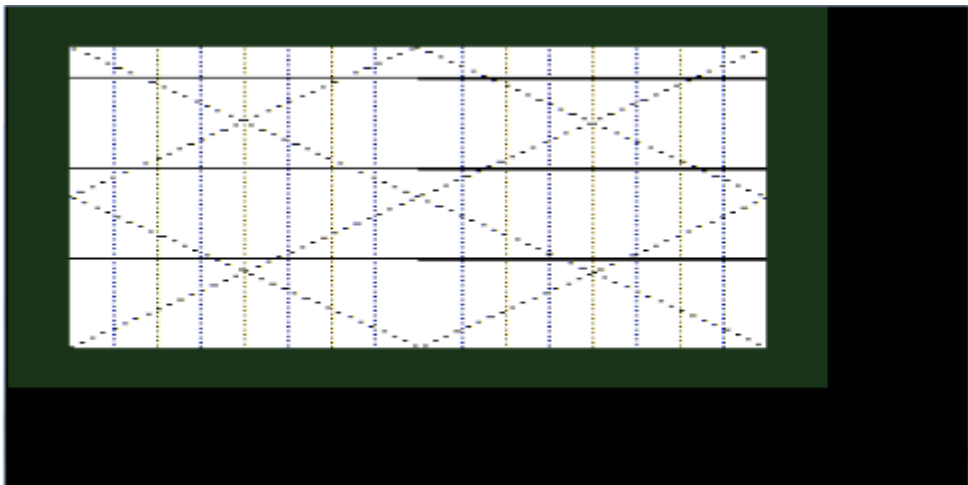
IlluminatedArea: 480x240 | IlluminatedShiftArea: 240x120



Position of the warp image inside the illuminated area can be influenced by the corresponding BitmapShiftArea parameters. Similarly, the position of the illuminated area is given by the IlluminatedShiftArea. For better visualizing this, no pre-distortion was applied.

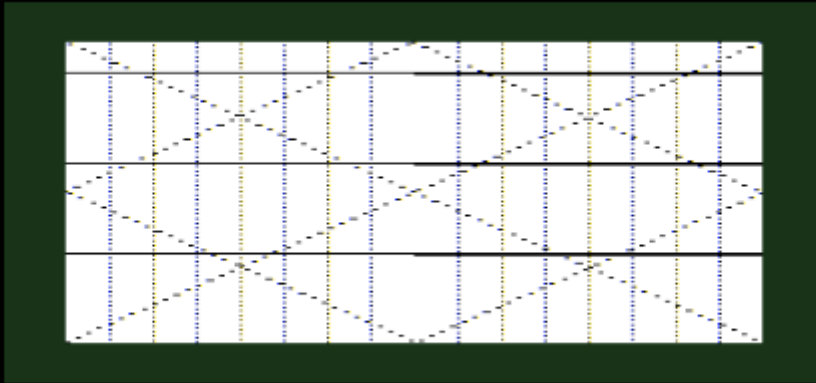
Top left aligned

Display Area: 480x240
 BitmapArea: 409x190 | BitmapShiftArea: 205x95
 IlluminatedArea: 480x240 | IlluminatedShiftArea: 240x120



Center aligned

Display Area: 480x240
 BitmapArea: 409x190 | BitmapShiftArea: 240x120
 IlluminatedArea: 480x240 | IlluminatedShiftArea: 240x120

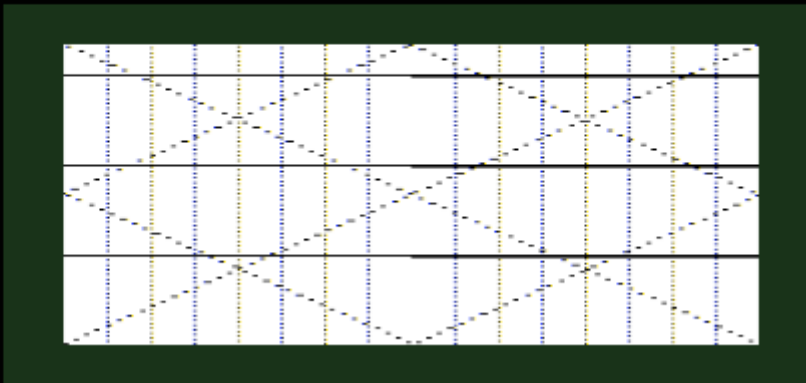


Bottom right aligned

Display Area: 480x240

BitmapArea: 409x190 | BitmapShiftArea: 276x145

IlluminatedArea: 480x240 | IlluminatedShiftArea: 240x120



For the presented use cases, the warp image bounds were not specified. (see [Warp Image Bounds](#) for more details)

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