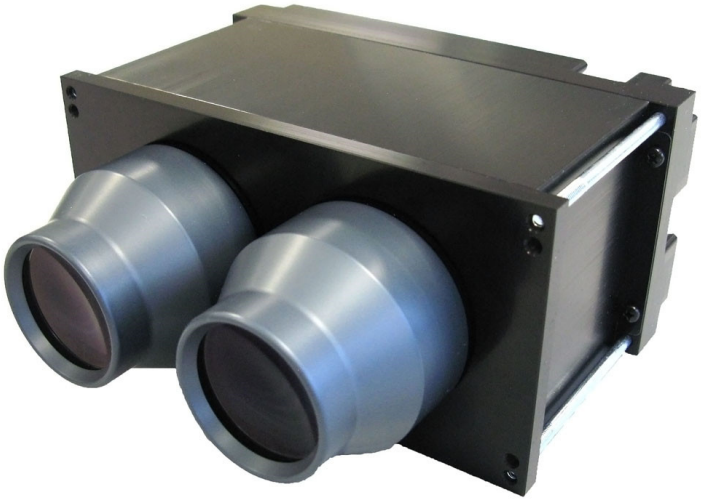
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User manual for:
Digital 3D viewer for panel mount
Model 15-04-D50-x





April 27, 2016, version 1.0

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1. Introduction

As we are currently speaking at the start of 2016, 3D or stereoscopic presentation of media on a private base is often achieved by VR like devices. These devices are good enough for the purpose of experiencing spectacular, interactive and an overwhelming depth experience. At the other side of the spectrum there are the 4K based passive or active glasses 3D TV's with their crisp sharp image presentation. For exhibit or public environment 3D presentations both above mentioned products have disadvantages when it comes to poor image quality, control abilities and robustness. Because they are not made for that purpose.
As de Wijs already has years of experience in building 3D slide viewing systems. The aim was to build a digital 3D viewer with the image quality that could compete with a good medium format slide viewer. However we made a compromise to meet to most specifications a exhibit / museum viewer should comply to. The resolution is not the highest currently available. The FHD LCD inside the viewer allowed us to easily control the viewer with simple single board computers or media players. Or, if needed, the viewer could be connected to a powerful desktop computer.

This viewer is a good balance between optics and the resolution of the screen to present a high quality, sharp and optically comfortable show of 3D content. The aim was to design a visitor tolerant viewing system and reach people of all ages to experience your well prepared and high quality 3D images or video's. The viewer is actually a monitor only and can be connected to any source having the ability to customize the video output resolution. The intention of this viewer is to build it into walls, panels or other custom build constructions.

1.1 Acknowledgements

Hugo de Wijs for his input on achromatic lenses, lens choices and 3D knowledge.
Daniel Rozsnyó for the of the design and production of the HDMI to Mipi LCD controller.
Ken Thompson for creating the open source presentation tool Pi-presents.
http://pipresents.wordpress.com
The Raspberry pi foundation for creating such a small and very useful source for the viewer: http://www.raspberrypi.org

2. Installation

The 3D digital viewer can be used to present a slide show or video. For exhibit designers, the viewer could be used as a stand-alone object or as ‘support’ to explain a scene or object close to the viewer.
Because of the small size of the viewer, in most situations only the lens barrels are visible, the visitor should not overlook viewer and miss the presentation!

When looking through the viewer, you get the best experience when there is nothing that is irritating or inhibits a clear view. Things that might irritate is bright spot lights pointing on the viewer causing the light to be reflected in your eyes. Or flashing lights close to the lenses. A black (cinema like) surrounding gives the best impression.

2.1 The viewer

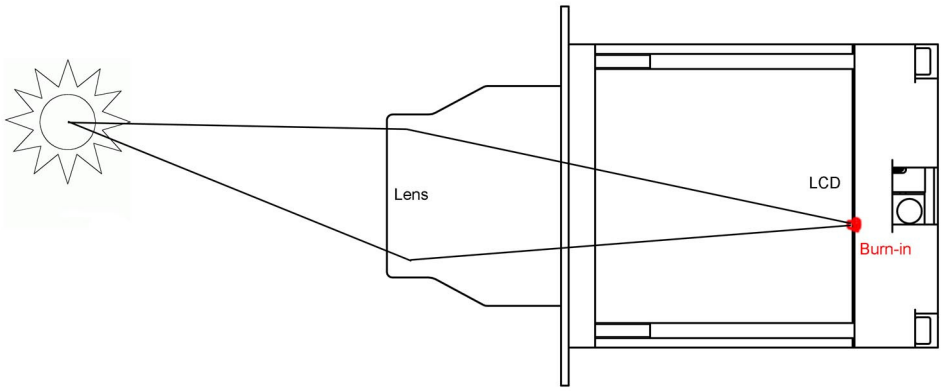
The viewer housing is constructed in such a way it gives the most freedom to integrate it in almost every situation.

Integrating the viewer in your situation:

- using the front panel plate is the easiest way to build the viewer in a wall or panel.
- For your custom application, you can replace the front plate for your custom prepared front cover. Grooves in the side of the lens barrels allow to lock up your front plate between the barrels and the housing of the viewer.

2.2 Caution required for the next points!

- Avoid sunlight to enter into the viewer through the lenses. The lenses act like burning glasses and the sun will damage the LCD inside. When you mount the viewer in a panel check if the sun would be able to point to the lenses at any time of the day!



- As long as the viewer is NOT build in on its final presentation location, cover the lenses to avoid accidentally burn-in of the LCD (point mentioned above). As well as protection against scratching the lenses.

- The lenses are not fixed tight in the viewer housing to allow you to exchange the front plate for any reason, until you finish the build-in preparation. Secure the lenses to prevent unscrewing the lenses by the public.

- The HDMI cable and micro USB cable are fragile connectors. The internal connectors of the LCD controller are mounted securely but allow limited force on the plug perpendicular to the insert of the plug. So always pull out the plug in-line with the connector. Use the cover at the rear of the viewer to be sure that forces on the cable will never result in a break-off of the internal small connectors.

2.3 Content source

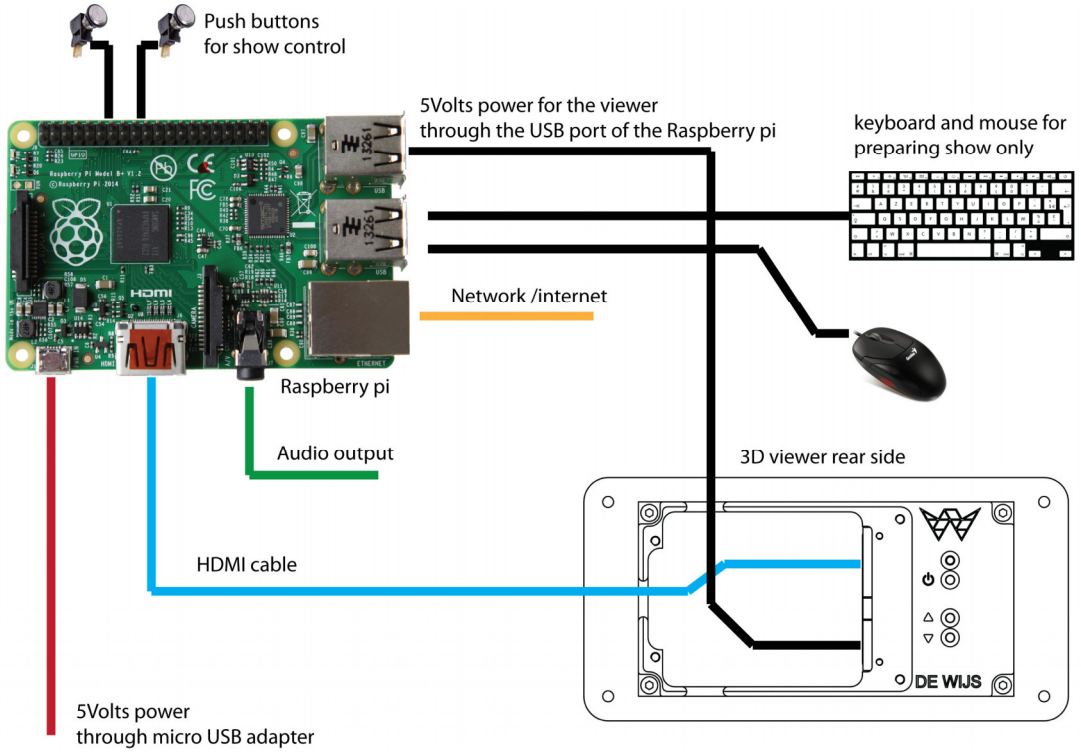
The viewer is build around a smart phone LCD display having the resolution of 1080x1920 pixels with the size of 5”.
The image data that is transferred through the HDMI cable needs to be arranged in such a way that the display is addressed as portrait orientated display instead of normal desktop landscape HD display. So 1080 pixels horizontally and 1920 pixels vertically.

The choice of a content sources, filters out devices which are unable to deliver this vertical oriented resolution! Computer systems having a more advanced video processing output (separate video cards or graphic processors) are often automatically able to address this vertical display.
Simple small single board computers, depending on the operating system, require more knowledge to address the vertical display.
Be aware that there are a number of professional multimedia players are having fixed output resolutions to select from, that do not match with the vertical display!

Using a single board computer like the Raspberry pi

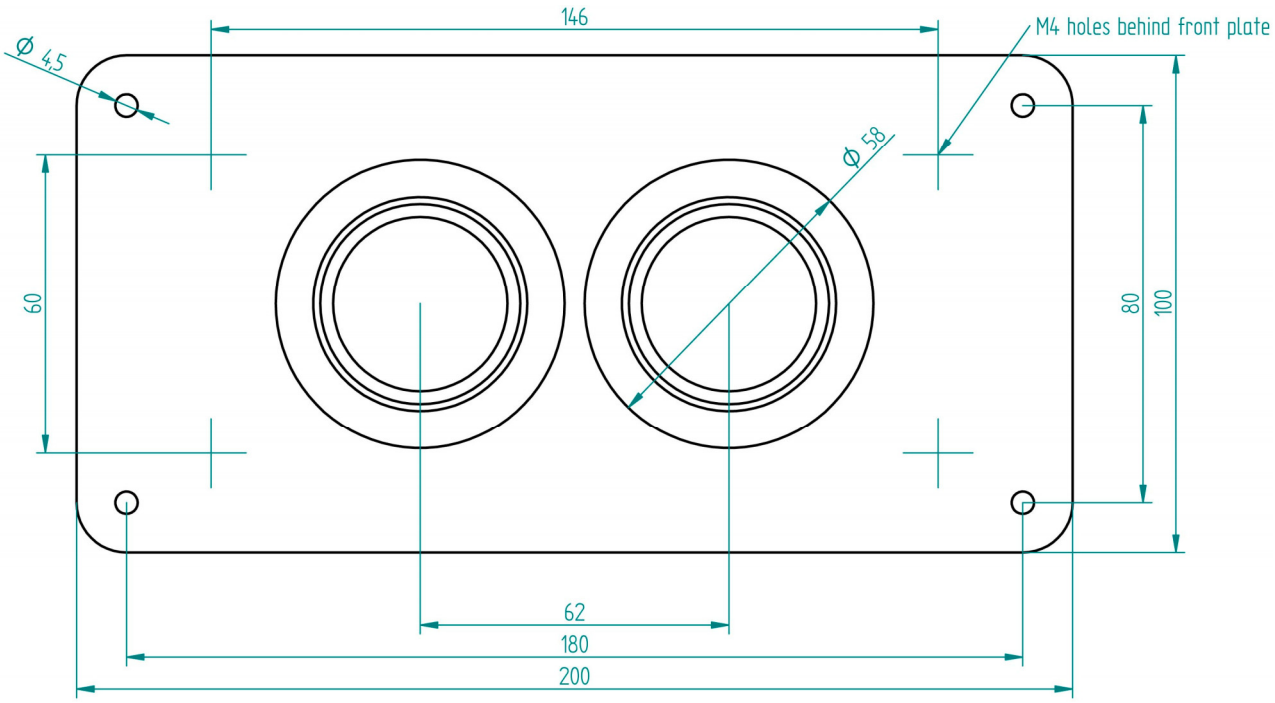
De Wijs offers a simple solution as content source; the Raspberry pi. The choice for this device has several reasons:

- affordable and very good available.
- The graphical output can easily be set to the required LCD configuration of the 3D viewer.
- The General Purpose IO header on this board allows push buttons to control a slide show or start a video.
- Open source software that can be adapted for your application.
  We use Pi-presents that gives a good solution for an interactive slide show with acceptable performance.

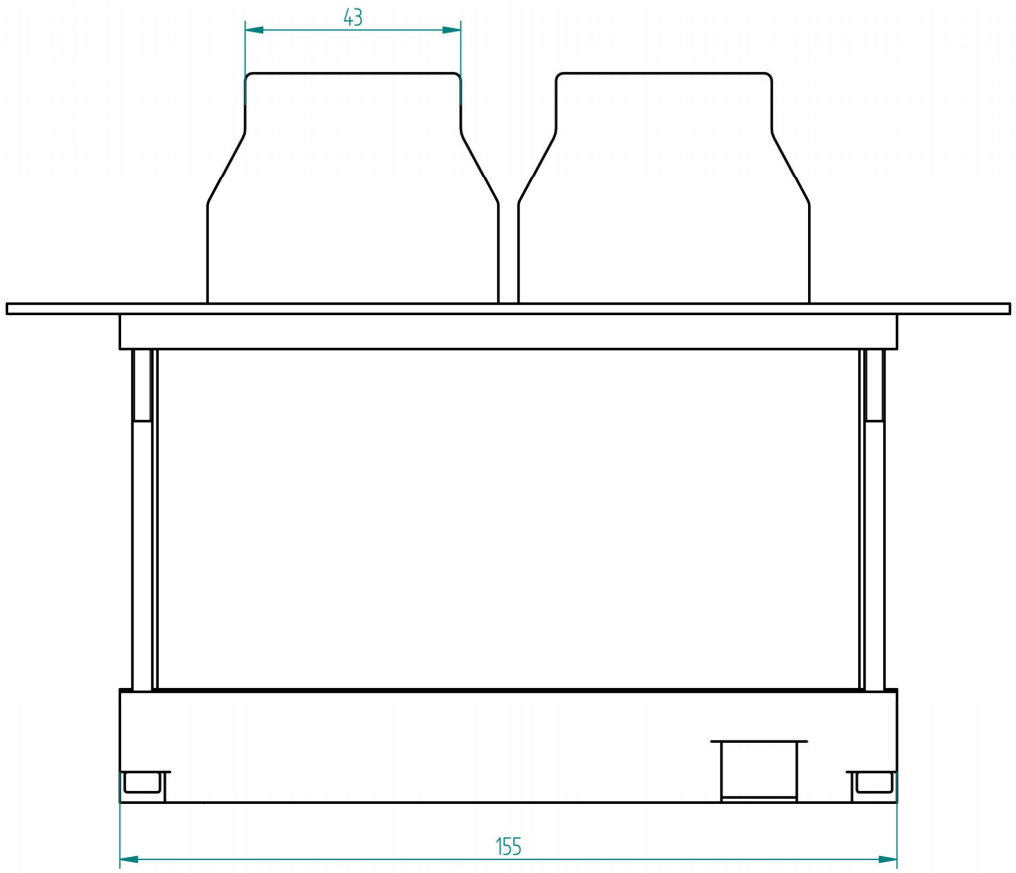


3 Technical data

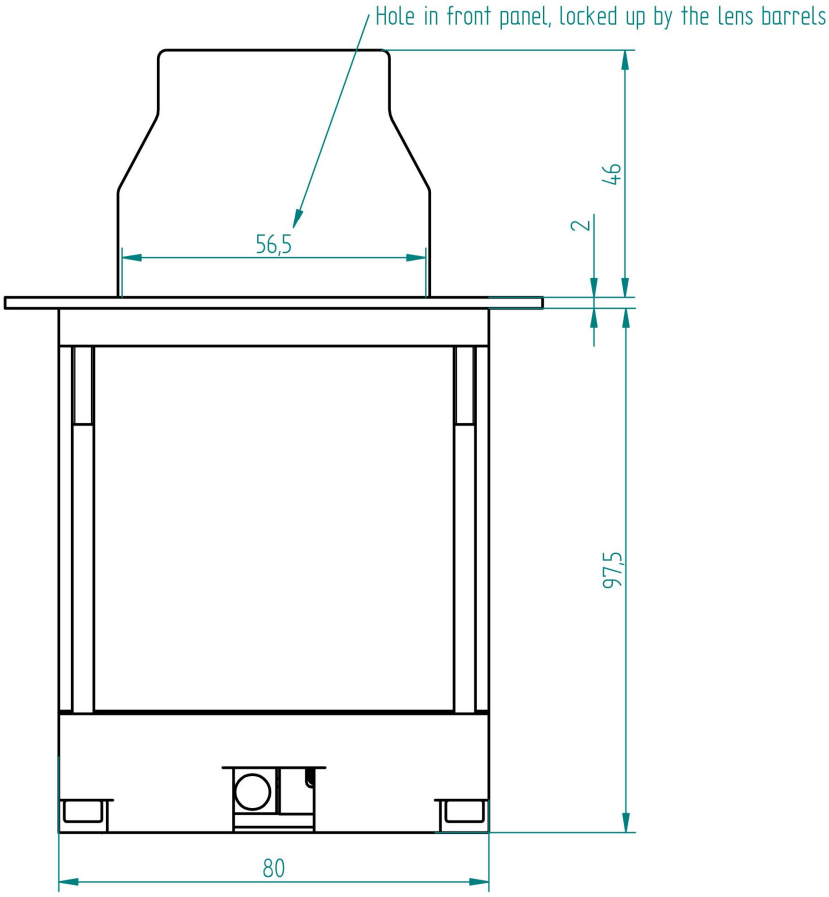
3.1 Physical dimensions (120 mm. lens version)



Front view.



Top view



When you consider to make your own front plate. You need to make 2 holes side by side for the lenses. Heart to heart distance is 62 mm. and diameter of 56.5 mm. So when fixing the lens barrels into the housing again, will lock up your panel in the slot of the lens barrels.

Do NOT de-assemble the long M4 bolts that hold the whole viewer together. You might scratch the matt painted interior or LCD.

Side view.

The viewer can carry 2 types of lenses. Both fit in the housing of the viewer. Only the length of the barrel is different:

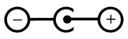
- 100 mm. achromatic, 33 mm. diameter. This lens magnifies 2.5x and is a good choice for viewing video content, having a 4:3 aspect ratio. The most upper and lower part of the LCD is less good visible for glasses wearers when using the full height of the LCD.
- 120 mm. achromatic, 37 mm. diameter. This lens magnifies 2.1x and allows all visitors to see the full size of the LCD into the corners without image distortion. Pixels are hard to see. It is a good choice for viewing square or landscape still images.

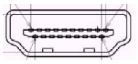
LCD specifications:
Sharp 4,97” LCD, model LS050T1SX01 FHD panel
8 bits, visible area: 61,884x110,016 mm.
There are 2 versions of this model, differences are minor. Both fit in the viewer.

LCD Controller specifications:
Controller board: RZSN0037, button board RZSN0038
Firmware version 2015:

3.2 Connectivity specifications

The viewer has 2 power connectors; a DC connector and micro USB

DC connector: 4,5 – 16 Volts dc. Round 5.5 mm. pin 2.1 mm. 
Micro USB connector: 5 Volts dc. 
Power consumption; 183mA at 12 Volts dc. 2,2 Watts

Digital video input through the HDMI connector type A, 1.0 
Edid version 1.3. Maximum cable length 1.5 metres.

The LCD controller inside the viewer also holds some GPIO pins as well as for future usage like screen saver functions. It requires a firmware update.

3.3 Digital video input specifications (timing)

The graphical resolution of the LCD is
(horizontal x vertical) 1080x1920 pixels at 60 Hz. 8 bits colour depth.
The timing parameters are as following:

	Active	Front Porch	Sync width	Back Porch	
Active	field 1080x1920 pixels	8	8	62	pixels
Front Porch	17				
Sync Width	1				
Back Porch	5				
	lines				

hdmi_timings=<h_active_pixels> <h_sync_polarity <h_front_porch> <h_sync_pulse> <h_back_porch> <v_active_lines> <v_sync_polarity> <v_front_porch> <v_sync_pulse> <v_back_porch> <v_sync_offset_a> <v_sync_offset_b> <pixel_rep> <frame_rate> <interlaced> <pixel_freq> <aspect_ratio>

hdmi_timings=	
<h_active_pixels>	1080
<h_sync_polarity	0
<h_front_porch>	8
<h_sync_pulse>	8
<h_back_porch>	62
<v_active_lines>	1920
<v_sync_polarity>	0
<v_front_porch>	17
<v_sync_pulse>	1
<v_back_porch>	5
<v_sync_offset_a>	0
<v_sync_offset_b>	0
<pixel_rep>	0
<frame_rate>	60
<interlaced>	0
<pixel_freq>	135000000
<aspect_ratio>	0

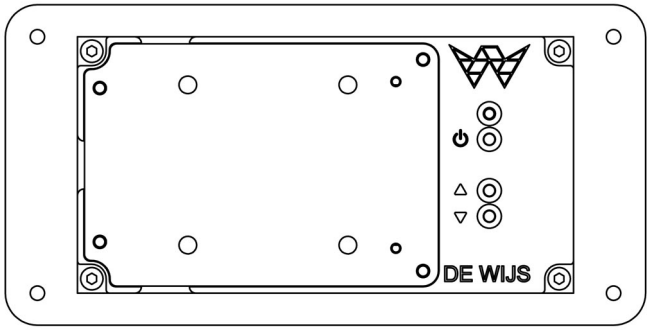
3.4 Raspberry pi config.txt entries

When choosing for the Raspberry pi as content source. The video output should be configured to control the 3D viewer. By default the Raspberry pi is not set correctly and won't show any image in the viewer at all.
The bellow entries are to be copied to the start-up config.txt file of the Raspberry pi to configure the video output to the right parameters

```
disable_overscan=1
overscan_left=0
overscan_right=0
overscan_top=0
overscan_bottom=0

hdmi_force_hotplug=1
hdmi_timings=1080 0 8 8 62 1920 0 17 1 5 0 0 0 60 0 135000000 0
hdmi_group=2
hdmi_mode=87
max_framebuffer_width=1080
max_framebuffer_height=1920
display_rotate=3
hdmi_ignore_edid=0xa5000080
```

3.5 Buttons and indicator LED explanation.



Power up:
When applying power to the viewer, the controller for the LCD starts up and tries to show an image on the LCD if the source is correct.

Brightness buttons: ▲▼
pressing these buttons at the rear of the viewer changes the brightness of the backlight of the LCD. The brightness level is stored after setting. When power is turned on or connected again, the latest brightness level is restored.

To preserve the lifecycle of the LCD screen, it is good not to set the brightness of the LCD to maximum. Keep it to about 75%

Power button: ⏻
- Pressing the power button shortly, turns off the LCD backlight. The LCD itself is not turned off and the viewer still appears to be available for the source.
- Pressing the power button long, will turn off the viewer completely.
- Keeping the power button pressed and applying power will bring the viewer into service mode for updating the firmware.

LED indicator behaviour:
- Green continious: normal operation, correct signal on the HDMI input is applied.
- Red continious: No cable connected, or no signal.
- Orange: Viewer is initializing / configuring short after starting up. LCD controller is not ready yet.
- Red blinking for 3 times short: wrong input signal / timing on HDMI.
- Red blinking slowly: error inside the LCD controller of the viewer, restart required.

3.6 Maintenance

Cleaning
The outside of the viewer can be cleaned with regular cleaning liquids, not too aggressive or polishing. The lenses are not water tight. Clean the lenses with a soft cloth.

Dust visible on the LCD
Turn on the viewer to see the dust particles.
Take the lens barrels out of the front of the viewer.
You can blow with compressed air, not higher than 2 bars, inside the housing of the viewer towards the LCD. Not too deep and avoid touching the sides to prevent scratches on the inside walls.
When re- assembling the lens barrels in the front, it might happen new particles drop on the LCD. You can repeat the above steps until the result is satisfying.

Miss alignment of the image splitter.
Between the left and right image on the LCD runs a thin metal plate from the LCD to your nose / between the eyes. This avoids the left or right eye to see parts of the image of the other side. The position of this splitter is accurate but might be, for some reason be out of alignment, you might see a very small piece of image of the other side (left or right).
To resolve do the following:
For whatever source you have, we supply a test image that looks like this:



- Set your source to show the above image in the viewer.
- Look through the lenses and see the direction and amount of miss alignment of the splitter (metal plate).
- Now unscrew both lenses out of the housing.
- With your fingers you can push the splitter (through the lens holes) to the left or right to get the splitter aligned. You actually bend the plate a little.
- Check with the lenses if the alignment is right or repeat the previous step.
- Clean the interior of the viewer with compressed air.
- Re-assemble the lens barrels to the viewer and the alignment is finished.