Video Stabilizer

User Manual

Introduction

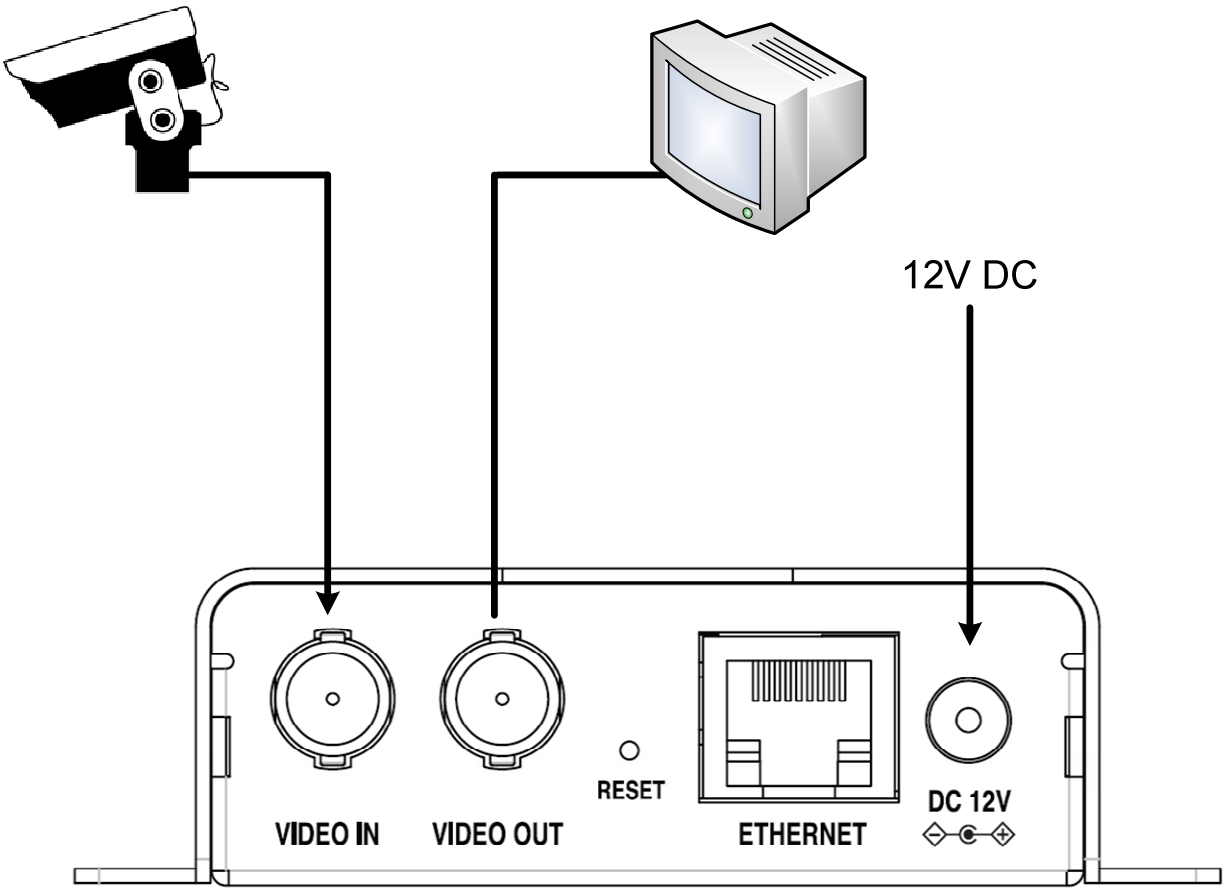
The Video Stabilizer utilises advanced Digital Image Stabilizing algorithms to minimize the effects of camera shake. These algorithms have been optimized to run in real-time on a dedicated digital media processor that fits inside a box that can rest on the palm of your hand.

The video stabilizer has been designed to be totally plug-and-play, meaning you can get started simply by plugging in and switching on.

This quick-start guide will help you get your video stabilizer up and running quickly, as well as lead you through some of the advanced options provided by this unit.

Connecting Up

Connect the video stabilizer as shown in the diagram:



The video stabilizer is intended to be connected in-line between the video source and the video display.

Connect the power to the unit with the supplied power adaptor. Your video stabilizer should now be operational and stabilizing video. There is no need to perform any other set up. (Note the Stabilizer takes about 1 minute to start operating – this is caused by the internal Linux operating system booting-up. During the start-up time the stabilizer remains in loop-through mode).

In the event of a power failure to the video stabilizer unit, the video will pass through the unit un-stabilized.

The Ethernet connection is only for advanced configuration (see Advanced Configuration) and is not required to get started.

Configuration

Your stabilizer unit is shipped with the default options configured at the factory. The default options are suitable for most applications, but some installations may warrant slightly different configuration. The following section details how to change the parameters from the default settings, and the effect that they have.

Network Connection

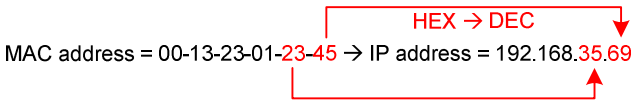
The advanced parameters are accessed by connecting the unit to a PC (via an Ethernet switch, or a crossover cable), and accessing the device from a web browser. Before the device can be accessed from a web browser, the default IP address must be established.

The default IP address, as set at the factory can be determined by locating the serial number and hardware MAC address, which are normally printed on the bottom of the unit. The serial number and MAC address are printed on a label that resembles the following:

The factory default network settings can now be inferred as follows:

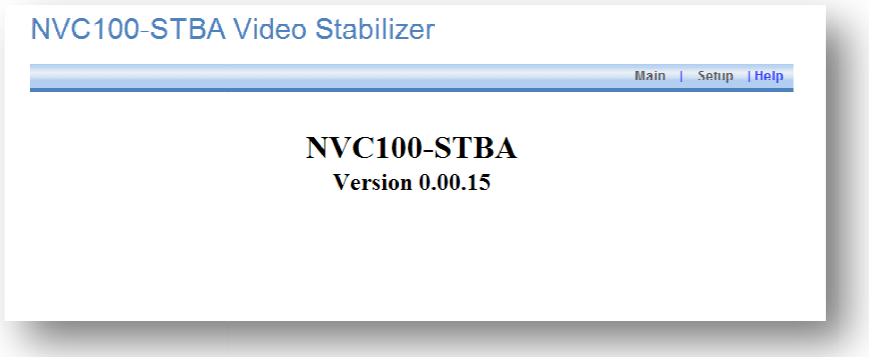
IP address:	192.168.xx.yy
Network mask:	255.255.0.0
Gateway:	192.168.0.1
User ID:	root
Password:	pass

Where xx.yy can be calculated according to the following diagram:



Configuration Page

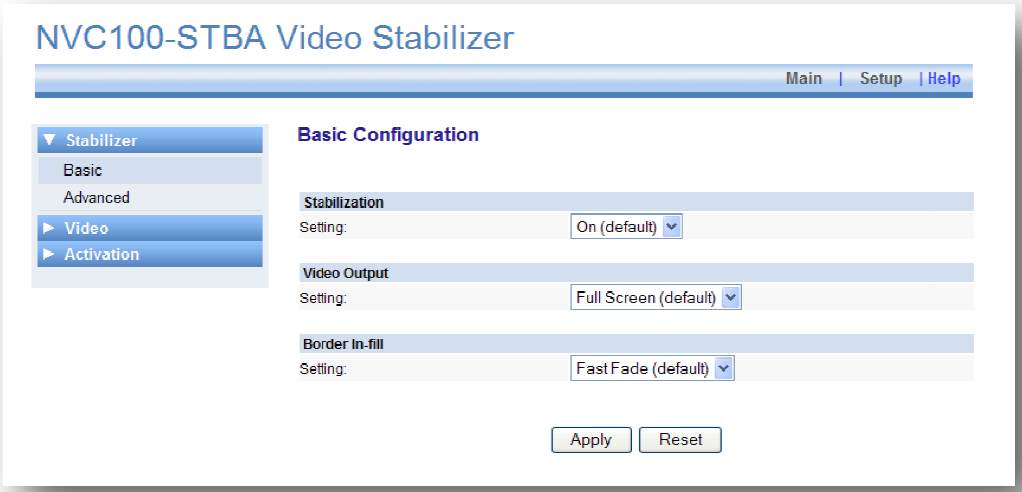
To access the configuration page, enter the IP address into a web browser. The stabilizer unit will display a welcome page:



Click the “Setup” link to access the configuration page. Remember the default username and password are **root** and **pass**, respectively.

Once access has been granted, the stabilizer unit will display the configuration page:

Basic Configuration



Stabilization Mode

The stabilization mode has 2 options:

On: [Default] Stabilization is enabled.

Off: Stabilization is disabled (video pass through).

Video Output

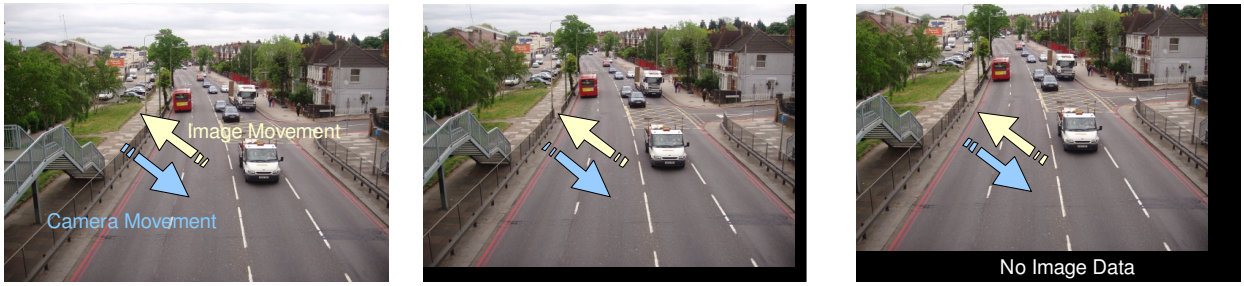
The video output mode has 2 options:

Full Screen: [Default] The output signal is the full-screen stabilized version of the input signal.

Split Screen Demo: The output signal consists of 50% un-stabilized, and 50% stabilized versions of the input signal, split vertically down the middle of the output. This mode is primarily used for demonstrating the effectiveness of the stabilization unit on a single monitor and would not normally be used in day-to-day operation.

Border In-fill

In order to keep the output frames steady and aligned to a reference frame, the output frames are shifted with respect to the input frames. As the camera moves around, so the output frames are shifted to keep the image features aligned to previous frames. This results in areas for which there is no image data available:



The Border In-fill mode controls what happens to those areas that do not contain any image data. There are 4 options available:

Fast Fade: [Default] Newer frames are composited on top of older frames. The old frames are faded away to black quickly (see diagram). This mode is most suited to PTZ and fixed cameras.

Slow Fade: Newer frames are composited on top of older frames. The old frames are faded away to black slowly (see diagram).

No Fade: Newer frames are composited on top of older frames. The old frames are not faded away (see diagram). Suitable for fixed cameras where there is minimal movement by people and cars around the edge of the scene.

Fixed: A fixed size black border is present on all sides which blanks out the moving edges of the image (see diagram). The size of the borders is equal to the maximum frame shift. See Advanced Configuration.

None: Old frames are not displayed. Regions of the output image for which there is no available data are filled with black (see diagram).

Fast/Slow Fade

No Fade

Fixed

None

Advanced Configuration

Camera Installation Mode

The Camera Installation Mode has 3 options:

Fixed/PTZ:	[Default] The stabilization algorithm parameters are optimized to give the best stabilization results for fixed/PTZ cameras.
In vehicle/Hand held:	The stabilization algorithm parameters are optimized to give the best stabilization performance for cameras where the camera fixture experiences continued, large displacements or scene changes. E.g. when shot from a moving vehicle.
Low Frequency Stabilization:	The above 2 stabilization modes are designed to allow tracking of intentional camera panning by not stabilizing low frequency movements (< 1Hz). The Low Frequency mode has a lower cut-off frequency to allow better low frequency stabilization at the expense of worse tracking of intentional movement (see Attenuation vs Frequency graph on the last page). This mode will automatically switch to the higher frequency mode when excessive movement in one direction is detected in order to allow better tracking of intentional movement. Once this movement has stopped it will revert back to the low frequency mode.

Auto Disable

There are 2 options for Auto Disable - neither is selected by default:

Pan/Tilt: This option disables the stabilization when excessive pan or tilt motion is detected. This makes it easier to control pan/tilt cameras because the Stabilizer ceases to oppose operator pan/tilt commands above the threshold. Once panning stops, there is a 3 sec timeout period before stabilization is reactivated.

Low Detail: When this option is enabled, the algorithm is disabled when a scene with insufficient detail for reliable stabilization is detected. This prevents the image position 'hunting' when there is very little scene detail or features. For example, when the camera is pointed at a completely blank wall the stabilized image will jump around slightly because it is locking on to the random video noise. Similar hunting problems can occur in other situations where a large part of the scene lacks suitable detail for Stabilizer lock:

- Other low contrast situations such as at night scenes.
- Scenes with an absence of detail in one direction such as venetian blinds.
- Scenes with a repeated pattern such as a brick wall.

Note enabling the Low Detail mode can result in the stabilization being disabled prematurely on low contrast or noisy video, which is why this mode is not enabled by default.

On-Screen Annotation

When this option is enabled, a message will appear on the screen whenever stabilization is disabled. It is not intended that On-Screen Annotation is permanently enabled. Generally, it should be used to help set up the Stabilizer in the following configuration situations:

- To see the effect of the Auto Disable pan/tilt and Auto Disable Low Detail functions.
- To see if the stabilization is being disabled because the camera motion is too fast.

Maximum Frame Shift

This is the maximum amount in image pixels that the algorithm will shift the frame horizontally and vertically in either direction from the normal position. Both horizontal and vertical shifts are settable in the range [24 – 256], the default is 128.

Usually the only reason to select low Frame Shift values is when the Border In-Fill is in Fixed mode because as the borders are increased in size the viewable image area gets smaller by the same amount.

Warning: Setting these values too low will prevent the algorithm from stabilizing properly. The lower the setting the less stabilization range is possible.

Video Configuration

Video Standard

Select between NTSC and PAL video standards.

Color Settings

Change the Brightness, Contrast, Hue, Saturation and Sharpness of the video.

Delay Settings

Change the vertical and horizontal capture delay of the video. These settings affect the vertical and horizontal position of the displayed image, allowing the black borders to be equalised on either side and top and bottom of the image. (This adjustment may be necessary because some analogue video signals do not conform exactly to the blanking timing of the video standard and consequently a black stripe may be visible on one side of the image.)

NOTE set Border in-fill to ‘none’ when adjusting the Delay Settings so that the effect of the horizontal and vertical delay can be seen clearly.

Restoring Factory Defaults

Restoring the factory default settings is done by first removing the power and then restoring power while holding down the reset button on the front of the unit. The reset must be held down for at least 10 seconds after power has been restored.

Troubleshooting

Problem	Solution
The video output is not stabilized for about 1 minute after connecting the power supply.	This is quite normal – the unit remains in loop-through mode while the internal Linux Operating System boots-up. The loop-through mode ensures that no video loss is incurred during this time.
The video is not synchronizing	Make sure the correct video standard is selected (NTSC or PAL) on the Video Settings page of the Web browser interface.
Sometimes the image jumps about and does not 'lock on properly'	The stabilizer cannot find any features in the image to lock on to or the features repeat (brick wall) or lack detail in a particular direction (venetian blinds). Stabilization can be suppressed in these cases by selecting the Auto Disable – Low Detail option on the Advanced Configuration page.
The stabilization is not very good with slow camera sway	The default stabilization algorithm does not suppress slow movement to allow tracking of intentional PTZ (Pan/Tilt/Zoom) movements. (See frequency response graph in the specification). Selecting 'Slow Stabilization' mode in the Camera Installation settings on the Advanced Configuration page will improve low frequency stabilization but will make PTZ tracking performance worse.
Sometimes incorrect data can be seen in the border area	When border infill is enabled, blank areas of the image left by the stabilizer shifting the image are filled in with old image data. Sometimes this does not match well with the live part of the image. This is especially apparent when the camera is panning and old data is left for a long time. Disable border infill if this is causing distraction by selecting 'None' or 'Fixed' from the Border Infill setting on the Basic Configuration page.
The image is not being stabilized properly	Make sure the Maximum Frame Shift settings are not set too small. For example, if the camera shake is causing the image to move up and down by 50 pixels but the Maximum Vertical Frame Shift is set to 32 pixels, the algorithm will not be able to stabilize the image properly.
The picture jumps around during fast panning	Try enabling Auto Disable – Pan/Tilt on the Advanced Configuration page. This will suppress stabilization when fast Pan/Tilt motion is detected.
The unit is exhibiting strange behavior	Try restoring the factory defaults.

Specifications

Stabilization

Stabilization tracking rate	Approx ±3000 pixels/sec.
Stabilization range	Variable up to ±256 pixels
Stabilization frequency	0.1-30Hz (see graph)
Video delay	< 80 ms.
Stabilization	X-Y movement at sub-pixel accuracy.
Automatic algorithm	Locks on to background features. Ignores moving objects and burnt-in text.
Border	Image in-fill. Removes distracting image border movement by using in-filling data from previous frames.
Lock-on time	< 80ms from change of image.

Video

Video Input & Output	Composite, 1V, 75Ω, BNC connector.
Video standards	PAL/NTSC selectable via the web-browser interface
Video loop-through	Automatic loop-through when power is off and during start-up
D1 resolution digitization	720 x 576 PAL, 720 x 480 NTSC

General

Plug and Play	Works straight out of the box. Simply connect it in-line between camera & monitor
Start-up time	About 1 minute – Stabilizer remains in loop-through mode while the Linux Operating System starts
Configuration	Web browser interface for configuration of advanced modes
Network	Ethernet 10/100 Mbps
Environmental	0-60°C, <85% RH
Power adapter included	Universal 12V plug-top adapter, 100-240V.
Power consumption	2.5W (~210mA at 12V DC).
Weight	145g.
Size	L = 98mm, W = 99mm, H = 26mm.