

# arith**MATIC**<sup>™</sup>

Image arithmetic software

Part of the dTective suite of forensic video analysis tools from Ocean Systems

## **User Guide**

[www.oceansystems.com](http://www.oceansystems.com)  
[www.dtectivesystem.com](http://www.dtectivesystem.com)



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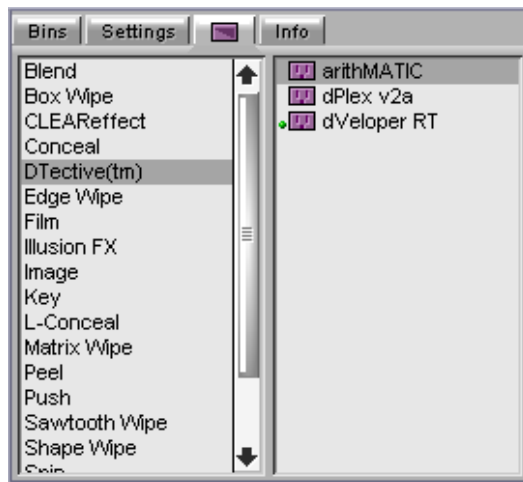
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## Installation Instructions

### Loading arithMATIC

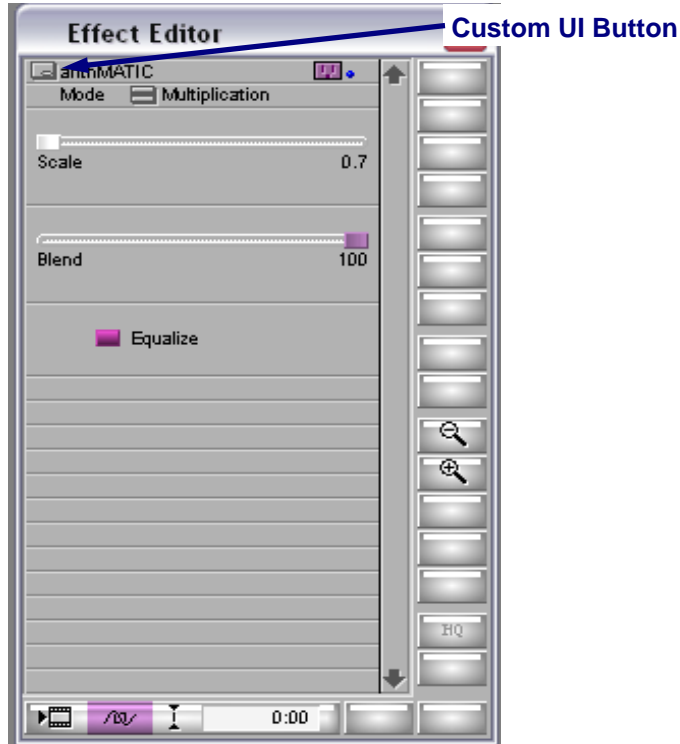
To load arithMATIC, you must place the arithMATIC.avx file into your AVX\_plugins directory (located on your C drive under Program Files\Avid). If you can't locate your AVX-plugins directory, do a search on your computer for it (Start>search>for files or folders). Once arithMATIC is loaded, start Avid Xpress and look in your effect palette. You should see arithMATIC in an effect category called dTective.



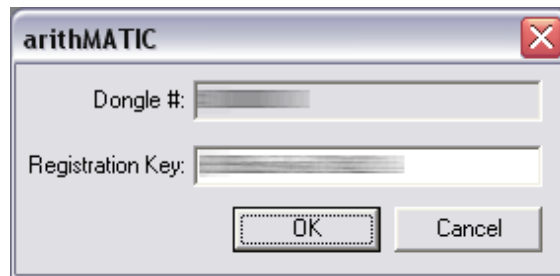
## Registering arithMATIC

By default, arithMATIC loads in demo mode. To unlock arithMATIC, open the effect palette (tools>effect palette). arithMATIC is located in the dTective category.

Next, drag the arithMATIC effect to a clip on your timeline, open the effect editor (tools>effect editor), and click the custom UI button.



Enter your registration number and click “ok”.



If you don't have your registration number, you will need to contact Ocean Systems at 1-800-253-7516. Please have your eight digit Avid serial number ready before calling. The Avid serial number can be found on your Avid dongle.

## System Requirements

In order to use arithMATIC, you need an Avid system on Windows that utilizes Avid's AVX plug in architecture.

## What is arithMATIC?

arithMATIC is an AVX plug in for the dTective system which allows you to perform mathematical operations on two pieces of video (though the plug in can also be used with a single track of video).

Listed below is a brief summary of the tools available in the arithMATIC plug in:

**Addition** - will allow the user to brighten an image by adding the corresponding pixel values from two tracks of video.

**Subtraction** - will allow the user to see what has changed between two images by subtracting the pixel values of the second video track minus the corresponding pixel values from the first video track

**Multiplication** - will also allow the user to brighten the image by multiplying the corresponding pixel values from two tracks of video.

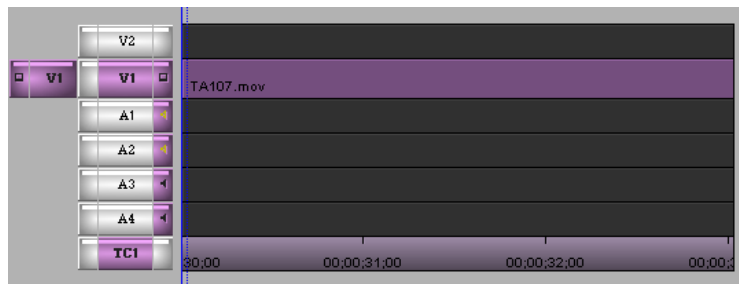
**Division** - will also allow the user to perform change detection in the image by dividing the pixel values of the second video track by the corresponding pixel values from the first video track.

**Scaling** - is a subset of the Multiplication function. It allows the user to multiply the two tracks by a number of greater than 1 to brighten the image and less than 1 to darken an image. Scaling works on all four modes.

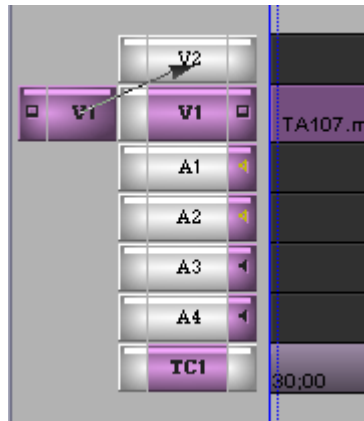


Next, open your first clip, mark an IN and an OUT for the duration you desire and drop the clip to your timeline on V1. Highlight the sequence and press the “T” key on the keyboard to Mark and IN and an OUT covering the entire sequence (this will ensure the footage on V2 is of the same length when dropped in).

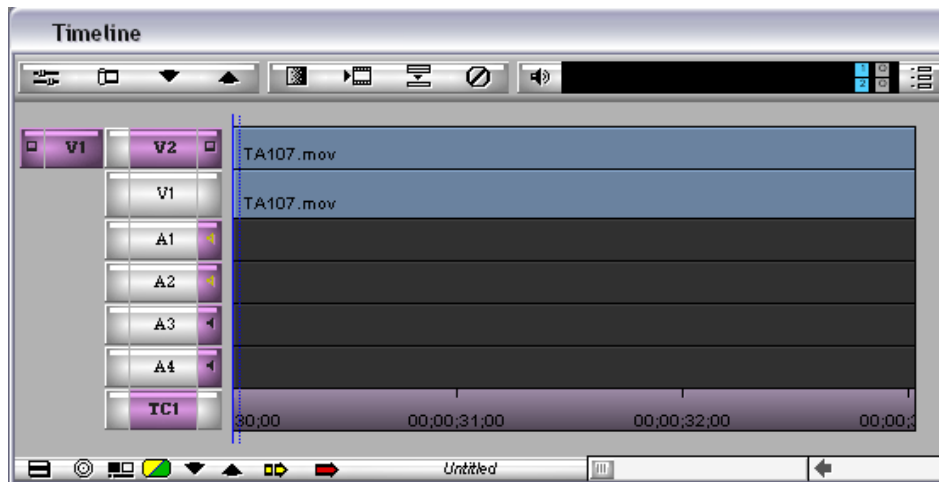
Your timeline should look like the image below.



Now, open your second clip and mark an IN where you want to start your footage. Highlight your timeline and press and hold the left most V1 button. Drag the V1 button up to the V2 track to “patch” V1 to V2 as shown below.

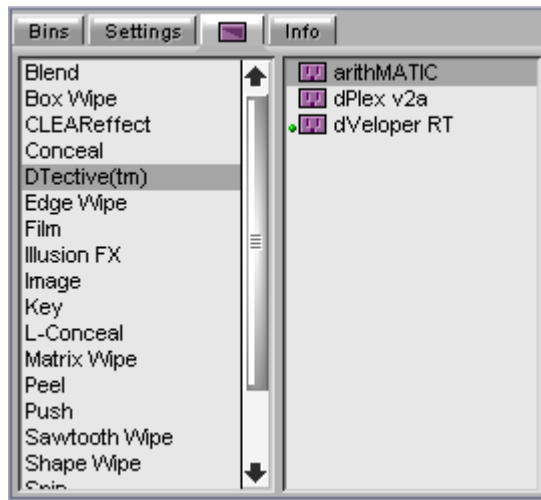


Click back on your source footage that you want to have placed in V2 and press the “B” key on the keyboard. This will place your footage on V2 and it will fit in the IN and OUT marks you set earlier on your timeline. If an error message appears saying “insufficient source material to make this edit”, clear the out point on your timeline and try again—the error is simply saying you don’t have enough source footage to fit between the IN and OUT marks you set on the timeline. Your timeline should look like the image below:

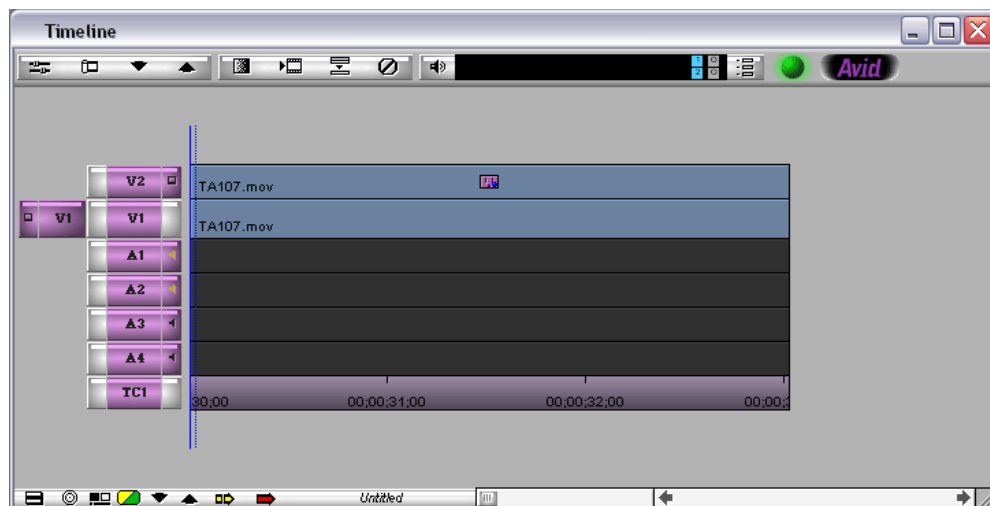


## Applying arithMATIC

With your timeline ready, you can now add arithMATIC to V2. Open the Effect Palette (Tools>Effect Palette) and click on the dTective category.



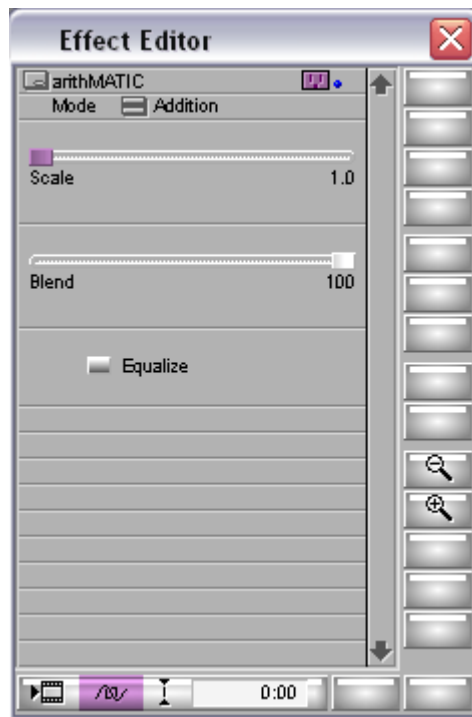
Click the arithMATIC plug in and drag and drop it to V2.



arithMATIC's Addition Mode

## Opening the Effect Editor

Highlight your sequence and open the Effect Editor (Tools>Effect Editor). arithMATIC opens in Addition mode by default, and you'll see a change in your video immediately.



**TIP:** Drag and drop the plug-in icon to your bin to save your effect settings.

Notice your video is significantly brighter than before, and both tracks of video have been blended together. In Addition mode, arithMATIC is adding the corresponding pixel values from video tracks one and two. The Scale slider is multiplying an additional constant value to overall sum. Sliding the scale slider to the right (up) will result in an even brighter image, while sliding it to the left (down) will result in a darker image. Furthermore, you can use the blend tool to alter the amount of blending that occurs between V1 and V2.

Image result with in Addition mode with a Scale of 1 and a blend setting of 100.



Image result with in Addition mode with a Scale of 2 and a blend setting of 50.

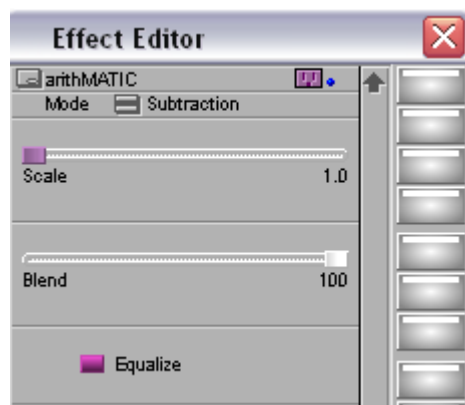


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## Using arithMATIC's Subtraction Mode

The Subtraction mode is a way to see what has changed in your overall image by subtracting the corresponding pixel values from two tracks of video.

The same timeline that was used for the Addition mode can be used for Subtraction (if you started reading this manual at this point, refer to page 8 to set up the project). Open the Effect Editor (Tools>Effect Editor) and change the mode to Subtraction, and make sure Scale is set to 1.0 and Blend is set to 100, as shown below.



Notice your video is now much darker—what you are actually seeing is only the pixels that have changed between the two images. Because the surrounding scenery in the two highway shots didn't move or change in any way, they have been subtracted from one another resulting in a pixel value of zero, which arithMATIC displays as black.

Using the Scale slider will add brightness to the image by multiplying a user defined number (or constant) with the overall sum. Furthermore, you can use the blend tool to alter the amount of blending that occurs between V1 and V2.

Image result in Subtraction mode with a Scale of 1 and a blend setting of 100.



Image result in Subtraction mode with a Scale of 2 and a blend setting of 50.

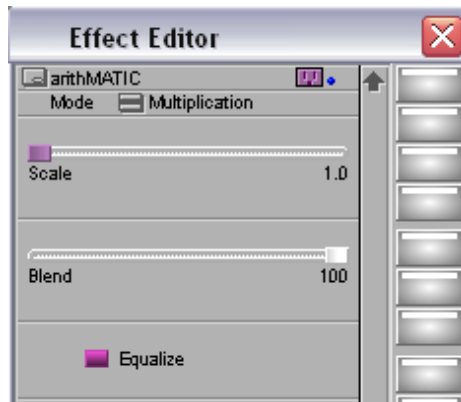


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## Using arithMATIC's Multiplication Mode

Like the Addition mode, the Multiplication mode is a way to brighten your overall image. The Multiplication mode multiplies the corresponding pixel values from two tracks of video. Further analysis can be done by using the scale slider, which will multiply a user defined number (or constant) with the overall sum.

The same timeline that was used for the Subtraction mode can be used for Multiplication (if you started reading this manual at this point, refer to page 8 to set up the project). Open the Effect Editor (Tools>Effect Editor) and change the mode to Multiplication, and make sure Scale is set to 1.0 and Blend is set to 100, as shown below.



Notice that with the default settings your video is now darker, and you can see both tracks of video blended together.

Using the Scale slider will add brightness to the image by multiplying a user defined number (or constant) with the overall sum. Furthermore, you can use the blend tool to alter the amount of blending that occurs between V1 and V2.

Image result in Multi-  
plication mode with a  
Scale of 1 and a blend  
setting of 100.



Image result in Multi-  
plication mode with a  
Scale of 2.5 and a  
blend setting of 50.

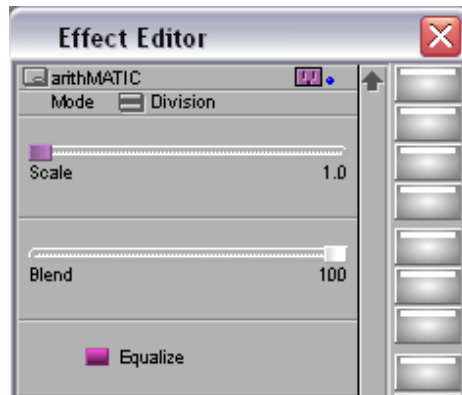


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## Using arithMATIC's Division Mode

Like the Subtraction mode, Division is a way to see what has changed in your overall image by dividing the corresponding pixel values from two tracks of video.

The same timeline that was used for the Multiplication mode can be used for Division (if you started reading this manual at this point, refer to page 8 to set up the project). Open the Effect Editor (Tools>Effect Editor) and change the mode to Division, and make sure Scale is set to 1.0 and Blend is set to 100, as shown below.



Notice your video is now much darker—what you are actually seeing is only the pixels that have changed between the two images. Because the surrounding scenery in the two highway shots didn't move or change in anyway, they have been divided from one another, resulting in a pixel value of one (any number divided by itself always equals one). arithMATIC displays this pixel value as white.

Using the Scale slider will add brightness to the image by multiplying a user defined number (or constant) with the overall sum. Furthermore, you can use the blend tool to alter the amount of blending that occurs between V1 and V2.

**About the Equalize button:** When you divide one image by another similar image many values are going to be between 1 and 0, and there won't be a lot of visible variance to the image. The Equalize setting works by equalizing the image so you can better see the difference. This can best be seen by sliding the Scale slider to a number less than one. With Equalize turned off, you may see what appears to be video noise, but with Equalize turned on the noise is eliminated.

Image result in Division mode with a Scale of 1.0 and a blend setting of 100.



Image result in Division mode with a Scale of 1.5 and a blend setting of 50.



Image result in Division mode with a Scale of .5, a blend setting of 100 and Equalize disabled.



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