Software Download and Installations

Download AEO-Light version 2.2 Beta from here:
https://github.com/usc-imi/aeo-light/releases/tag/v2.2-beta
Pick the one you need, MAC or PC. Install the program. Download the instructions, too.

Specific tips for AEO-Light with MovieStuff RetroScan™ Universal

Resolution is the name of the game and the stock camera for the RetroScan Universal is able to deliver close to the needed resolution to image the high frequency end of the audio spectrum, so it is important that you do everything possible to maximize resolution and focus. Poor focus results in loss of high frequency response with the audio rolling off at about 4-5Khz. However, with proper focus, your results will sound amazing.

Very good results are obtained by making a compressed scan of the film and exporting your captured footage as an NTSC 420p movie. But, you will get even better results if you export your movie to HD Movie at either 720p or 1080p. However the improvements are subtle and may not even be apparent to the average listener, depending in large part on the initial optical quality of the recorded sound on your film print and the overall condition of the film print.

Also, spectral analysis of numerous samples of extracted audio showed no improvement in sound quality when the Uncompressed Capture mode was used. It only made the rendering times longer with no corresponding improvement in the results of the audio quality.

About the RetroScan Universal Unit That Was Used in These Tests

Uniform illumination throughout the frame image is very important for low noise sound extraction. To that end, two changes were made to the scanner that was used by the author of these notes. First, to intensify the light output, the MovieStuff supplied lens was installed over the LED module. Second a piece theatrical diffusion gel was laid on top of the LED light source sandwiched beneath the gate assembly. Testing indicated that the illumination was thereby more "flat" (±5 IRE units) top to bottom across the scan area with these changes. The diffusion gel reduces the transmitted light by about 1.5 to 2 f-stops. Keep that in mind as you follow these steps for sound extraction if you do not have an additional diffusion gel over your scanner's light source.

Tips for good results:

- In your RetroScan Capture settings,
    - uncheck *Auto Exposure* (to assure constant exposure level of the soundtrack even if the image area fades through black)
    - uncheck *Capture Uncompressed*

- In Export settings
    - Set MOV Output to *Compressed (fast)*
    - If you plan to use image sequence export, set Image Sequence Type to TIFF (AEO-Light 2.2 Beta only accepts image sequences in DPX or TIFF formats).
    - Warning: AEO-Light 2.2 will not extract audio from video that has been exported from RetroScan as *Lossless (slow)*.
- In the Scan window
    - uncheck *Grain Reduction*
    - Set Gain to "0"
    - Set the *Shadow Detail* slider somewhere between –20 and –14.
- On the camera lens
    - Set the f-stop at the dot between f8 and f4. Your best setting may vary.
- On the scanner
    - Set the Exposure knob at 11:30 clock face position (slightly to the left of straight up). Your best setting may vary.
    - On the back of the scanner set the *Speed* switch to *Fast* (of course you can select *Slow* if you prefer that).

None of these settings, especially the Exposure or f-stop, is cast in concrete. You may want to experiment with f-stop and Exposure, and possibly Shadow Detail, for the best sound results. In any case, the most important thing is that you do not overexpose the soundtrack image – a bit under exposed is better so that you're sure that the soundtrack does not "bloom" white. If it blooms you will lose fine detail in the soundtrack and hence the high frequency audio will fall off.

Lens Setup and Tip for Setting Precise Focus

Extension Rings

Set up your lens with extension rings as shown in the illustration to the right. This arrangement will give you the correct image size to capture the entire width of the film including the soundtrack. If you prefer, remove one brass ring to capture a slightly wider image to include a hint of the perforations on the left and the full soundtrack on the right.

<u>Precise Focus Trick</u>

It is much easier to optimize the focus on a still image than a moving image. Here's a way to set the focus on the scanner without the film being in motion. This method sets the camera to real time video visible in the set-up monitor.

1. Maximize the RetroScan HD software window.
2. Advance the film to a segment where frames of the movie are in the scanner and there is lots of fine detail.
3. Unplug both of the motor power leads on the back of the scanner.
4. Attach a light-weight bungee cord between the tops of the supply and takeup reels to maintain tension between them and thereby maintain a flat film over the gate's light source.
5. Press Ctrl+Shift+Alt and "A". The letter "A" will appear on the right side of the RetroScan monitor.
6. Click *Set-Up*
7. Switch motor control to *FORWARD*. The lamp should turn on.
8. Turn down *EXPOSURE* brightness so that your image is not "blooming".
9. Focus the image. Hint: Set the focus ring on the lens at about 1.5, then establish a preliminary focus with the scanner's elevator knob. Finally make a fine focus adjustment with the focus ring on the lens. If the lamp times out before you are finished, toggle the *FORWARD* switch to turn it back on.
10. When you are satisfied with the focus, switch the motor control to off.
11. Click *Set-Up* to turn it off.
12. Press Ctrl+Shift+Alt and "A" to turn off the streaming monitor mode.
13. Remove the bungee cord from the reels.
14. Set *EXPOSURE* brightness back to normal.
15. Plug in both motor power leads.

Scanning and Exporting the Film

Turn on *SET-UP* in the RetroScan HD software and, with the film running, adjust the camera left/right slide so that you see the entire width of the soundtrack on the right side of the monitor and a slight hint of the perforation holes on the left of the frame. This should give you about a 10% frame overscan at the top and bottom of the monitor. Overscan is necessary in order for AEO-Light to do its magic.

Rewind and scan your film and watch that the brightness in the soundtrack area does not bloom. White bloom will wash out and compromise your high frequency response. Avoid adjusting the exposure during the scan because rapid changes in brightness will cause low frequency disturbances in the extracted audio.

Export your movie to an HD Movie at 1080p, usually at 24 fps.

Extracting Sound

- Start AEO-Light and accept the licence.

- At the top of the AEO Light Main Window, set the frame rate of your film project, usually 24fps.

- At the top left of AEO Light click *Choose Film Source*.

- At the bottom right of the Film Source window, choose "*Video files (*.mp4 *.mov *.avi)*" in the dropdown box. Browse for your exported video in the RetroScanExports folder and click Open.

- Click *Yes* in the *Buffer Input?* popup.

- Drag the MainWindow and monitor windows apart so that you can see both.

- Follow the instructions in the AEO-Light 2.2 Beta manual to set up for the audio extraction.

- Important: in the Extract Audio tab, always click and use *Calibrate*. That removes the cause of frame rate clicking or thumping in the extracted audio that is the result if uneven illumination in the scanner's gate.

After you have extracted the audio to a WAV file, you can play it with other applications. A nice tool for looking at and listening to your soundtrack is Audacity. Audacity is free and powerful. You can find it for free download here: http://www.audacityteam.org/download/.

Joining Sound with Picture

AEO-Light 2.2 Beta does not output picture with sound. You can do that with a movie editing software package such as Blackmagic DaVince Resolve, Apple Final Cut, Adobe Premiere and many others.

About the Resolution

Because the capture area was expanded to include the soundtrack, the picture area covers fewer pixels in the camera. The picture area is roughly 80% of the usual scanning area. Therefore if you output to HD 1080p, the picture itself will only occupy about 1536 x 864 pixels instead of the usual 1920 x 1080 pixels. Not to worry. That output is approximately double that of NTSC movie output of 720 x 480 and still more than the resolution of 1280 x 720 you get with HD 720p movie output. So, if you are going to output to a standard definition NTSC or HD 720p file or video in your final project output, you still have plenty of resolution to work with. If, however, you want more pixels for the picture output, you can re-scan the film with the normal lens setup for a full frame HD scanned image.