Appendix 13 – Using the Redlake ES1.0 Camera

A13-1 Introduction

An overview on using the Redlake ES1.0 Camera with an emphasis on frame grabbing is given. Note that not all aspects of using the camera are covered in this document and it is recommended to consult the main report for further information.

A13-2 Setting Up The Camera

A13-2.1 Connections

Figure A13-1 shows the connections made to the Redlake ES1.0 camera. On the back end the power supply, trigger cable and frame grabber cables are attached to the camera. The other end of the frame grabber cable is split in two connectors, one attaching to the frame grabber and the other to the RS232 port located on the PIV computer. This splitting of connectors is due to the cameras operation mode being set via RS232 commands, while the frame grabber cable is mainly for transferring image data.

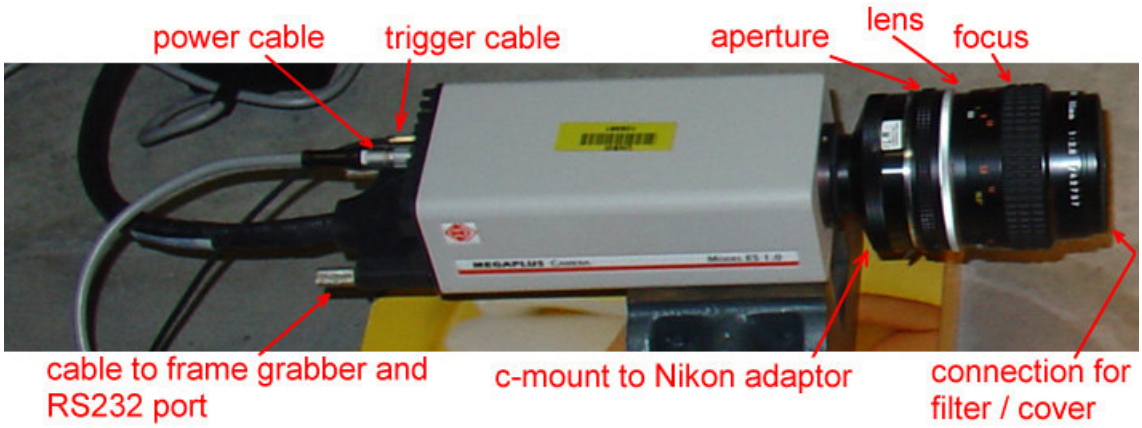

Figure A13-1 Redlake ES1.0 PIV camera.

On the front end of the camera the lens is located. This can either be a c-mount lens attached directly to the camera or another lens type attached via an adaptor such as a tiltable Scheimpflug adaptor or the c-mount to Nikon (f-mount) adaptor pictured in Figure A13-1. Not to be forgotten it is possible to place a protective cap or a filter at the end of the lens.

A13-2.2 Camera Control

The camera works by setting its operating parameters via RS232 commands. This causes the camera to either record pictures continuously or according to trigger signals which can be transmitted internally via the frame grabber or externally via the camera back panel connector.

A part of the camera's operating settings can be applied via a Kodak control software but in most situations it is easier to apply the settings directly via the Epix frame grabber software.

When starting the Epix software the camera interface usually appears automatically (if not choose PCXI → PCXI Open/Close from the menu and click open). A connection symbol at the bottom of the window will be shown once the camera is connected correctly. If the software can't connect to the camera check the COM port settings as shown in Figure A13-2. Camera settings can then be applied in the panels available in the field titled 'Redlake MASD ES-1.0/10bit 2 chan.' (e.g. as in Figure A13-3).

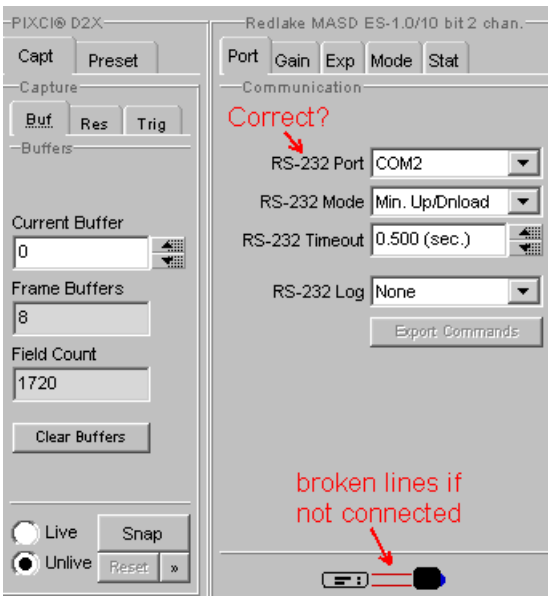

Figure A13-2 COM port settings in Epix.

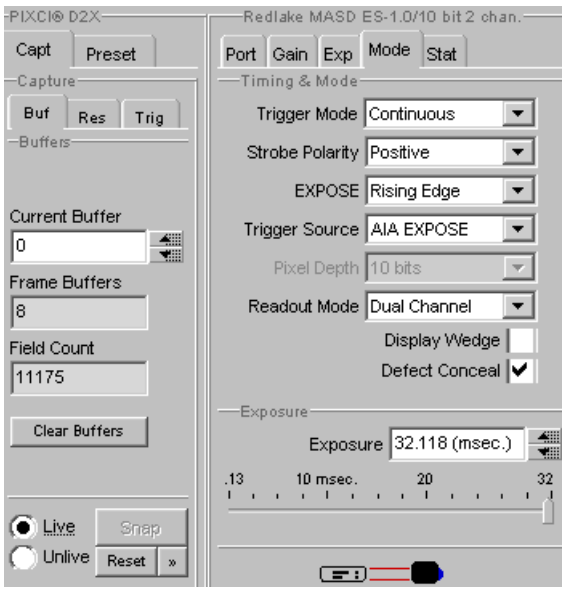

Figure A13-3 Camera settings (live picture shown).

A13-3 Grabbing Images

A13-3.1 Recording Single Pictures

Basically most camera settings are similar as when recording live pictures shown in Figure A13-3. The main difference is to choose the unlive option located in the bottom left corner of the interface. Clicking the snap button will then record a single pictures.

Note that having a trigger cable connected at the back of the camera sometimes kept the camera from taking pictures. In this respect it is also an option the change the trigger source from "AIA expose" (i.e. the frame grabber; trigger sent via the FG cable) to " Panel 'Trigger' " and trigger the camera via an external signal. It would be possible for example to initiate recording by press the manual trigger button of the function generator when connected to the camera.

A13-3.2 Recording Live Images

The settings for recording live images are shown in Figure A13-3. A live video stream will then be displayed by the Epix software.

This setting is very useful when initially adapting the laser intensity to what the camera can display. Note that the exposure time is set to the maximum for this procedure.

A13-3.3 Recording an Image Pair

Once the laser intensity has been adapted to something that can be seen on the camera without overexposing the CCD chip the next step will be to record an image pair and make sure that each laser flash ends up on a separate image.

For the exposures to be correct the camera back panel trigger signal must occur at the right time corresponding to TPD and TPW settings as shown in Figure A13-4. Information on these settings is given in the main report. If the function generator is set up as suggested (trigger 144μs before the laser flash) and the time between the laser flashes is >15μs the values shown in Figure A13-4 can directly be used.

The rest of the settings are made as in Figure A13-5. Note that the exposure option becomes inactive as it is no longer controllable.

For testing a single double frame recording can be made by clicking the snap button. The first grabbed picture will then be stored in the active buffer and the second grabbed picture in the proceeding buffer, accessible via the buffer panel (shown on Figures A13-2 and A13-3). The aim is that both pictures each contain one laser flash at approximately the same intensity.

It is important to know that the camera continuously writes image data into the camera buffer. Clicking the snap button will make the camera grab images on a "get what is in the camera buffer" basis so it can happen that the second image of a pair is grabbed into the first Epix buffer and the first image of the proceeding (!) pair grabbed into the second Epix buffer. These picture pairs will usually not match and cannot be correlated.

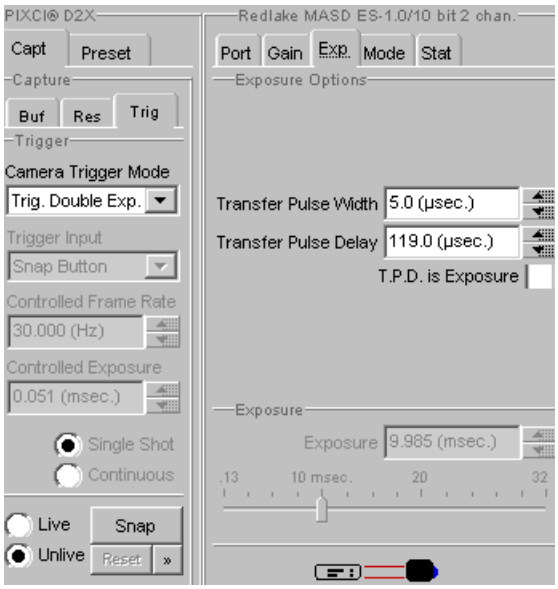

Figure A13-4 TPD and TPW settings.

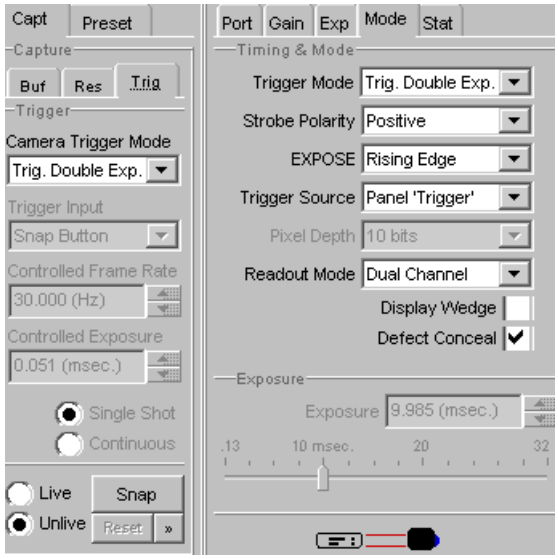

Figure A13-5 Image pairs settings.

A13-3.4 Recording a Sequence of Image Pairs

Recording a sequence of image pairs is done using the same camera setup as when recording single pairs. When starting a sequence recording the frame grabber will grab pictures from the camera as fast as it can write them.

As the camera only keeps an image available for the frame grabber until the next exposure is made the frame grabber must be fast enough to follow, hence all images must be written to the PIV computers RAM, which limits the number of possible

pictures in a sequence. Neglecting this rule can result in skipped images and entire sequences which cannot be correlated. For the same reason it can also occur that the first image of a sequence is a "single" without a matching partner.

The sequence recording dialogue shown in Figure A13-6 is called by clicking through the menus (second top menu bar) Capture → Sequence Capture... → Video to Memory Buffers. Next to defining the number of images to store it is important to click the capture fastest option. The sequence of images will be recorded into a new window.

The recorded images are saved to files on the harddrive by choosing the commands File → Save Image Sequence. It is best to save the files as 16-bit tif images.

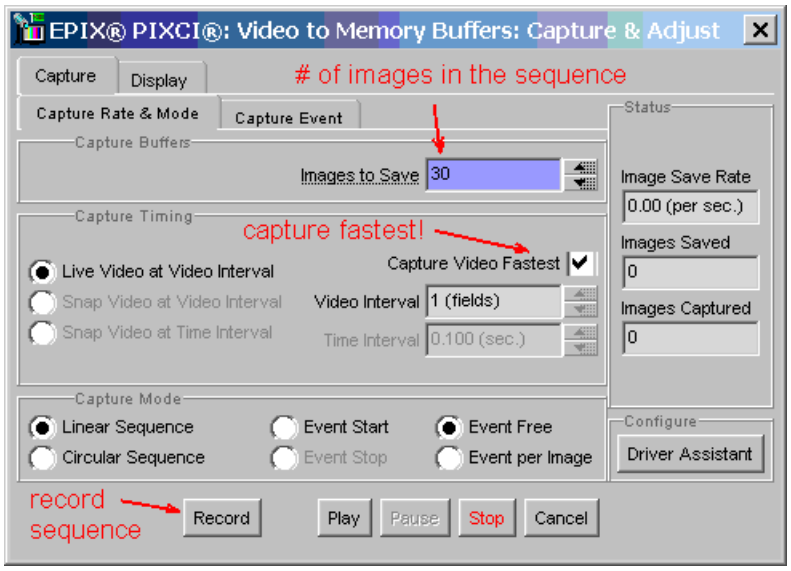

Figure A13-6 Recording a sequence to memory.