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Southern Vision Systems Software Product(s)

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IMPORTANT SAFETY INSTRUCTIONS

DO NOT DISCARD, READ BEFORE OPERATING

Please read the safety precautions carefully before using this product. Ensure that you use the product correctly according to the procedures described in these instructions.

The following safety precautions are intended to instruct you in the safe and correct operation of the product and its accessories to prevent injuries or damage to yourself, other persons, and property. Please read and ensure that you understand them before you proceed to the other sections of these instructions.

- Do not operate this device in a wet environment.
- Refer servicing to qualified service personnel only.
- Please read the Operating Manual carefully before operating. Follow all operating and other instructions carefully.
- This device should only be operated with the accompanying power adaptor.
- Do not use this product near heat sources such as radiators, air ducts, areas subject to direct, intense sunlight, or other products that produce heat.

WARNING

Do not play the supplied CD-ROM in any CD-ROM Player that does not support data CD-ROMs. The extremely loud sound that may result from playing the CD-ROM in an audio CD player (music player) could damage the speakers. It is also possible to suffer hearing losses from listening with headphones to the loud sounds of a data CD-ROM played on a music CD player.

Disclaimer

- While every effort has been made to ensure that the information contained in these instructions is accurate and complete, no liability can be accepted for any errors or omissions. SVSi reserves the right to change the specifications of the hardware and software described herein at any time without prior notice.

- SVSi makes no warranties for damages resulting from corrupted or lost data due to mistaken operation or malfunction of the StreamView camera, software, or accessories.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. Additionally, this equipment has successfully met all of the requirements for CE certification. These limits are designed to provide reasonable protection against harmful interference in a commercial installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Modifications not expressly approved by the manufacturer could significantly affect the level of harmful interference.

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1.0 SYSTEM REQUIREMENTS

Operating System	Windows 2000/XP Professional (recommended)
RAM	Minimum 512 MB required 1-GB (recommended for streaming to memory)
Processor	Pentium class or equivalent (1.4-GHz or faster)
Interface	Gigabit Ethernet with 9k jumbo frame support
Hard Disk Space	30 MB minimum + required video storage space (not recommended streaming to the OS drive)
Display	1024 x 768, Color (32-bit) minimum
Lens	1" C-mount 35-mm (requires C-mount adapter)

2.0 CAMERA CONNECTIONS

Figure 1. StreamView-LR with lens and tripod.

The front panel has only the 1"x32-tpi c-mount connector for attaching a lens to StreamView-LR.

Back Panel Connection	Function
Power	400-mA @ +12V through supplied AC adapter
Gigabit Ethernet	RJ-45 connector – cable supplied
External Trigger Input	Mini-SMB – external (+5V TTL) synch trigger input
Digital Out	Mini-SMB – +5V TTL output (user defined)

3.0 QUICK-START GUIDE

Your StreamView-LR Gigabit Ethernet camera comes with a power adapter, operating manual, Ethernet cable, and software CD. A host computer is required for camera set-up and for storing recorded video. StreamView-LR is designed to record high speed video direct to either host memory or host disk array over the gigabit Ethernet interface. The recommended minimum system requirements under section 1.0 above should allow recording 640x480 images at 200-fps with <1% dropped frames.

Using your StreamView-LR camera for the first time:

1. Install software from installation CD after reading Software User License Agreement.

2. Power-up the camera. The two LEDs on the back panel will come on continuously after the power-up sequence.

3. Connect the camera directly to the host or to a network. A cross-over cable is not required when connecting directly to the computer. StreamView-LR can be connected through 10/100 or 1000-baseT connections but performance will be significantly higher over gigabit Ethernet.

4. If camera is directly connected to the host computer, DHCP must be turned off on the host Ethernet network connection. Under the host computer's [Control Panel->Network Connections], select the Ethernet connection for the camera and right-click on "Properties." Under the [General->Internet Protocol (TCP/IP)->Properties] menu item, select [Use the following IP address:] and enter a fixed IP address that is not already being used on a network. Your network administrator can provide this data.
   Example: IP Address: 192.168. 1. 82
   Subnet Mask: 255.255.255.0
   Default Gateway: 192.168. 1. 1
   (Note: the IP addresses for StreamView-LR and for the host must be different. Do not use an IP address of 192.168.1.199 for the host computer since that is reserved for StreamView-LR.)

5. If you wish to change the camera IP address (e.g.-when a conflict exists on a local area network), double-click on the "StreamView-LR NetworkConfig" icon that was installed on your desktop during installation. The screen of Figure 2 will appear. StreamView-LR supports auto-discovery so that every camera connected to the host (either directly or through a network) will show up on the window above. To change the network configuration properties of a camera, select that camera and click [Change]. The screen of Figure 3 below will appear. If StreamView-LR does not appear on the list, cancel the StreamView-LR Network Config app and start it again.

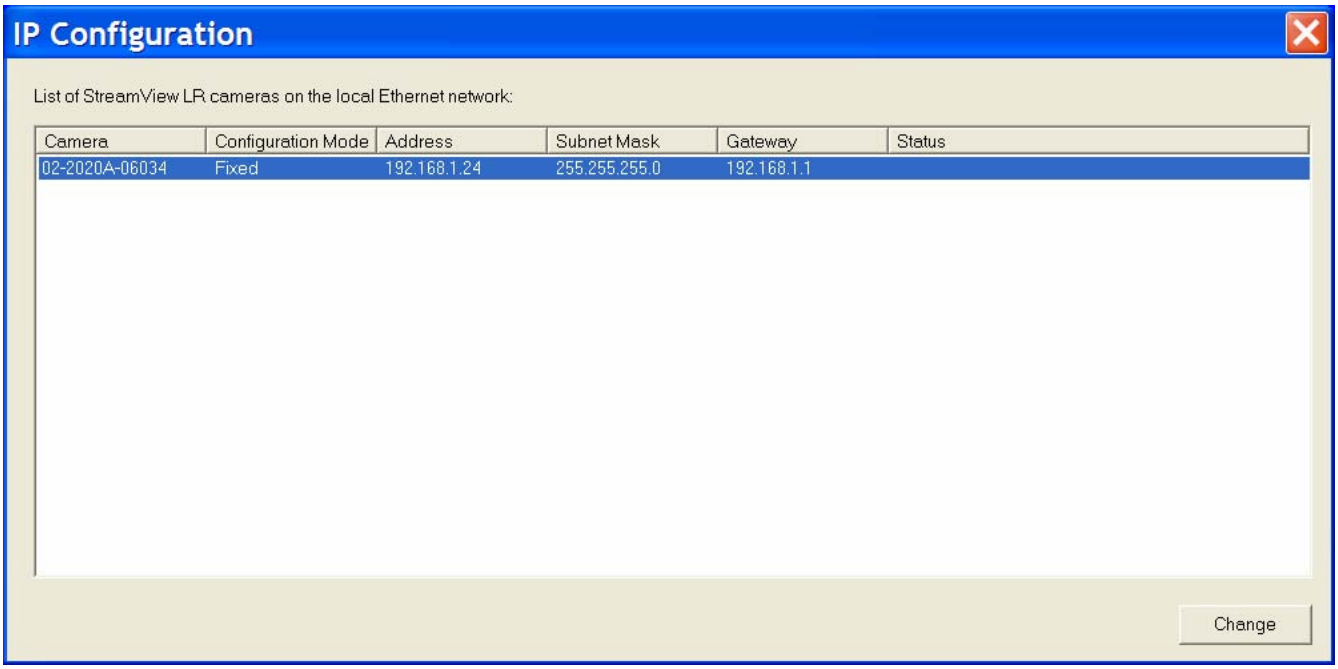

Figure 2 StreamView-LR network configuration auto-discovery window.

Once connected, the window below will appear allowing you to set a new IP address or to enable DHCP.

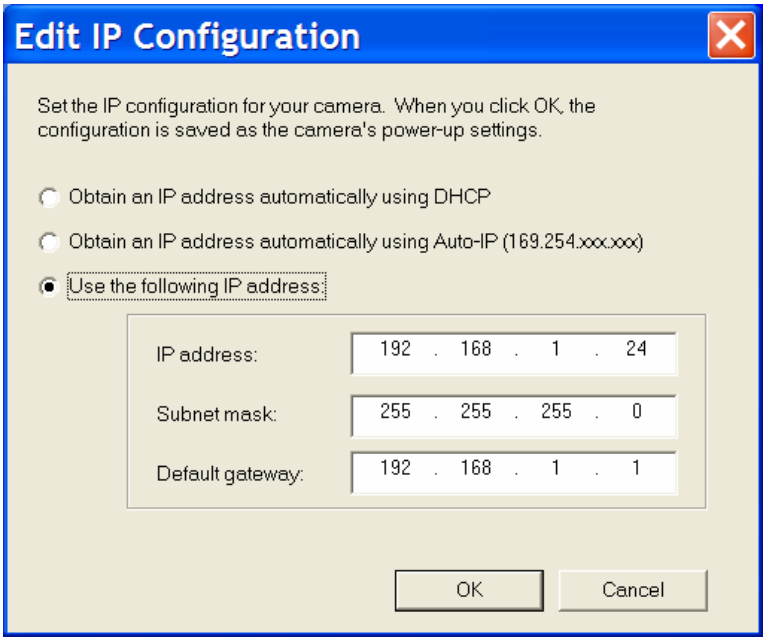

Figure 3 Editing StreamView-LR IP configuration.

The device to which StreamView-LR is connected must have a DHCP server in order to enable DHCP. A network router will have this capability but a laptop or desktop computer typically does not. If you are directly connected to StreamView-LR, you must use a fixed IP address. The message below will appear if you try to use DHCP without a DHCP server.

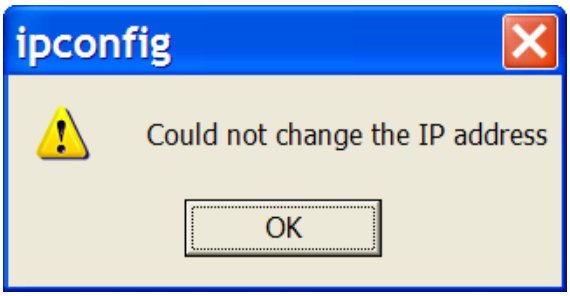

Figure 4 IP address incompatibility.

Once the IP address has been modified, click [OK] for the changes to take effect.

6. After software installation and IP configuration, the camera should be ready for use.

7. Select the [Camera->Open Camera] menu item. The auto-discovery screen will appear asking you to select the camera to connect.

8. Once connected, the camera will begin displaying video recorded at 60-fps, 16-msec exposure, and 640x480. Click [Stop] to halt capture and adjust recording parameters. **Important:** every StreamView-LR camera is shipped with a maximum transfer unit (MTU) size of 1500. StreamView-LR supports an MTU size of 9,028 for faster downloads. The camera **MUST** have an MTU setting less than or equal to that of the host network adapter. SVSi recommends setting the camera MTU size to the maximum value supported by the host network interface. At the time of this writing, several PCMCIA network cards support 7,000 and most PCI or PCIe network cards support 9,000 and higher. See the performance section below for a list of network cards tested with StreamView-LR. If the images being displayed are black or have horizontal bands through them, then the MTU size set for StreamView-LR is not compatible with the MTU size set on the host network connection. To set StreamView-LR's MTU size, on the [Capture] window, click on [Camera->Properties->Network]. The window of Figure 5 will appear.

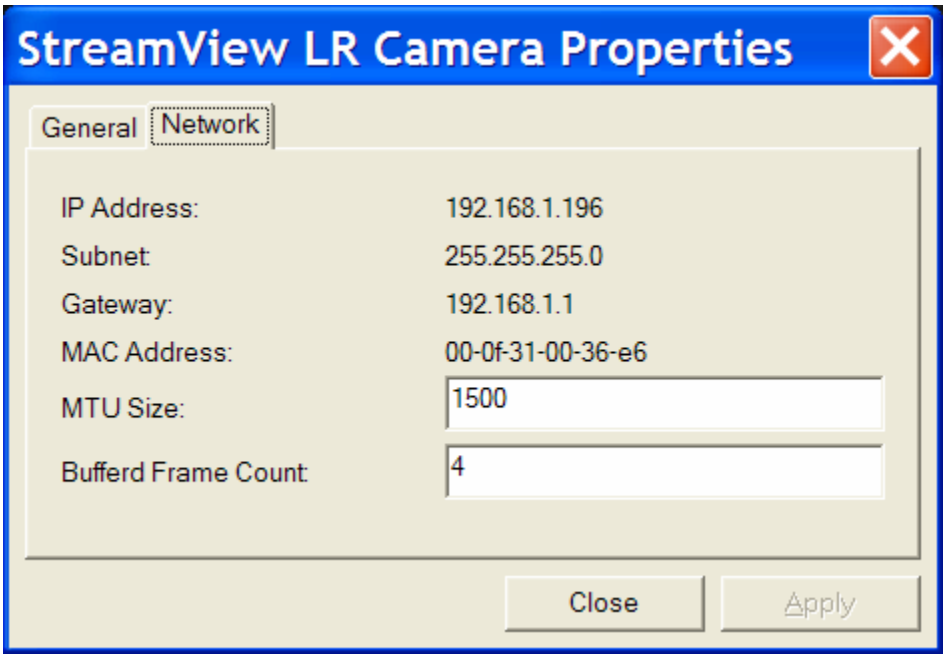

Figure 5 Setting StreamView-LR MTU size.

To set the network interface MTU size, click on [My Network Places->View Network Connections] then select the interface to which StreamView-LR is connected. The window of Figure 6 will appear. Next click on the [Configure] button and then the [Advanced] tab. Figure 7 will appear with a list of attributes for that network interface. Select [Jumbo Frame] and enable to the highest value.

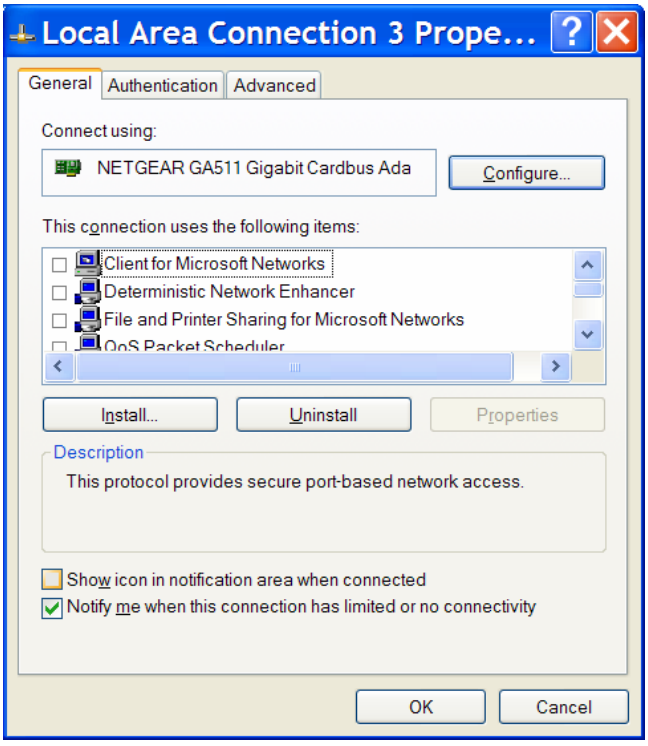

Figure 6 Setting the network interface MTU size to match StreamView-LR.

Besides offering the highest video streaming performance, higher jumbo frame settings allow for reduced host CPU usage. Some network cards (like the Netgear GA511 shown below) do not allow specific MTU sizes to be selected – only enabled or disabled. All of the PCMCIA network cards in Table I allow 7k jumbo frames. (Note: jumbo frame size and MTU size are equivalent.)

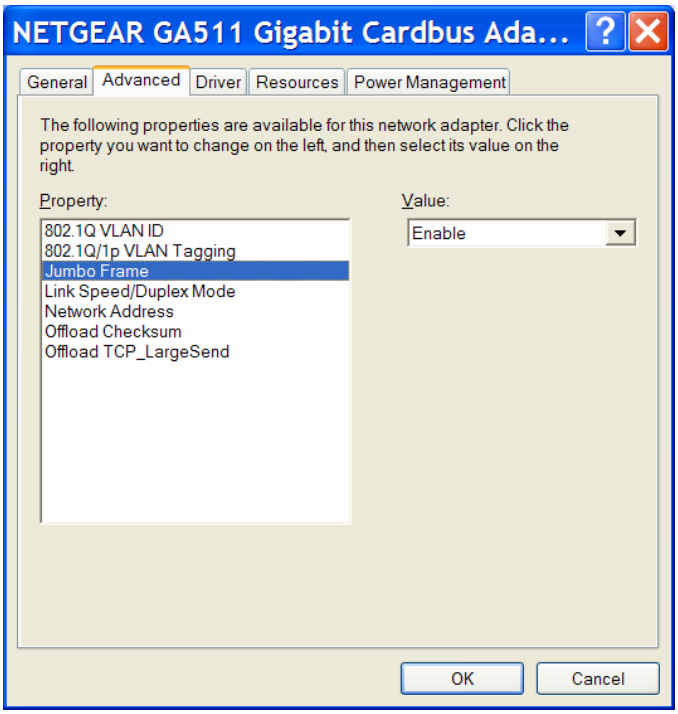

Figure 7 Enabling jumbo frames on the network interface.

The Buffered Frame Count of Figure 5 refers to the number of frames buffered inside StreamView-LR before transmission. Best performance is obtained with the gige filter driver installed and the Buffered Frame Count equal to 20. If the host computer appears to slow down or fail to respond, this Buffered Frame Count can be set to a lower value.

3.1 PERFORMANCE

StreamView-LR is capable of recording 640x480 images at 200-fps for hours on end with <1% dropped frames when both the camera and host computer are properly configured. The minimum system requirements are given in Section 1.0 and instructions on setting the MTU size are given in step 8 of the Quickstart Guide. SVSi can deliver a computer system along with StreamView-LR fully tested for no dropped frames. Please contact the factory for pricing and delivery.

SVSi has tested several gigabit Ethernet PCMCIA network cards for laptops as well as PCI and PCIe cards for desktops. These are listed below along with the maximum MTU size supported. Some newer laptops use the ExpressCard slot instead of PCMCIA. Performance (as measured by a decrease in the number of dropped frames) increases for larger MTU size.

Table 1 Recommended PCMCIA cards for laptops.

Manufacturer	Model	Max MTU Size	Interface
Netgear	GA511	7,000	PCMCIA
US Robotics	USR7903	7,000	PCMCIA
Trendnet	TEG-PCBUSR	7,000	PCMCIA
Bytecc	BT-ECL1G	9,000	ExpressCard

Table 2 Recommended network cards for desktops.

Manufacturer	Model	Max MTU Size
Intel	Pro/1000 GT (PCI)	16,000
D-Link	DGE-560T (PCIe)	16,000
Linksys	EG-1032 (PCI)	9,000

A customer-supplied computer will demonstrate very good performance when optimized according to the following steps:

1. Make sure the SVSi gigabit Ethernet filter driver is installed and enabled under the [View Network Connections->Properties->General] settings for the network interface.
2. Cancel out of any other applications that may be running during the video recording sequence.
3. Disable all other network settings (e.g.-Quality of Service, Client for Microsoft Networks, File and Printer Sharing, …) as in Figure 8 below. Only the SVSi filter driver and TCP/IP options should be selected.

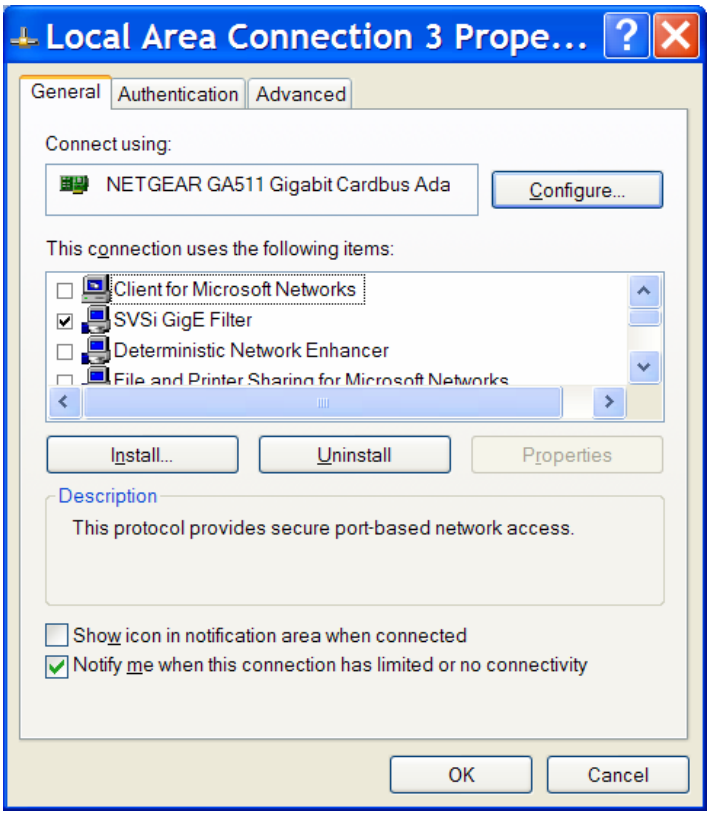

Figure 8 Optimize performance by disabling network connection settings.

4. Set the number of buffered frames under the [Camera->Properties->Network] settings to 20.

5. If the host computer or laptop has a CPU frequency select option (for instance, in order to preserve battery life) disable this feature. This should force the host to run at a higher clock frequency. For example, selecting "Maximum Performance" under Dell Quickset will disable this feature and force the processor at max clock speed even while battery powered. Do not adjust processor speed in BIOS unless absolutely necessary.

6. Disable Windows and all other firewalls (e.g.- McAfee, Symantec, Norton, …). To disable Windows firewall, select [My Network Places->View Network Connections] and right-click on StreamView-LR's network connection to get the [Properties] menu. Click the [Advanced] tab then [Settings…] and select firewall off.

7. Enable hyper-threading if the host processor supports it (most Pentium IV and later processors support hyperthreading enabled through the BIOS).

4.0 STREAMVIEW-LR OPERATING MODES

The StreamView-LR high-speed camera system is designed to record and playback imagery in a user-friendly manner. Implementation, specifications, data logging and display, and limitations on use for all modes are described below.

4.1 INITIALIZATION

When the StreamView-LR application is started, the default "Play" window appears as shown in Figure 2. Video files can be opened and played in this mode whether a camera is attached or not. AVI files must be 8-bit (monochrome) or 24-bit (color) and are limited to a 2-GB file size. The codec for the AVI file being played must be available on your computer. The sections below describe how to set up each mode for optimal data acquisition and display.

4.2 PLAY MODE

The "Play" window is shown below playing a video sample.

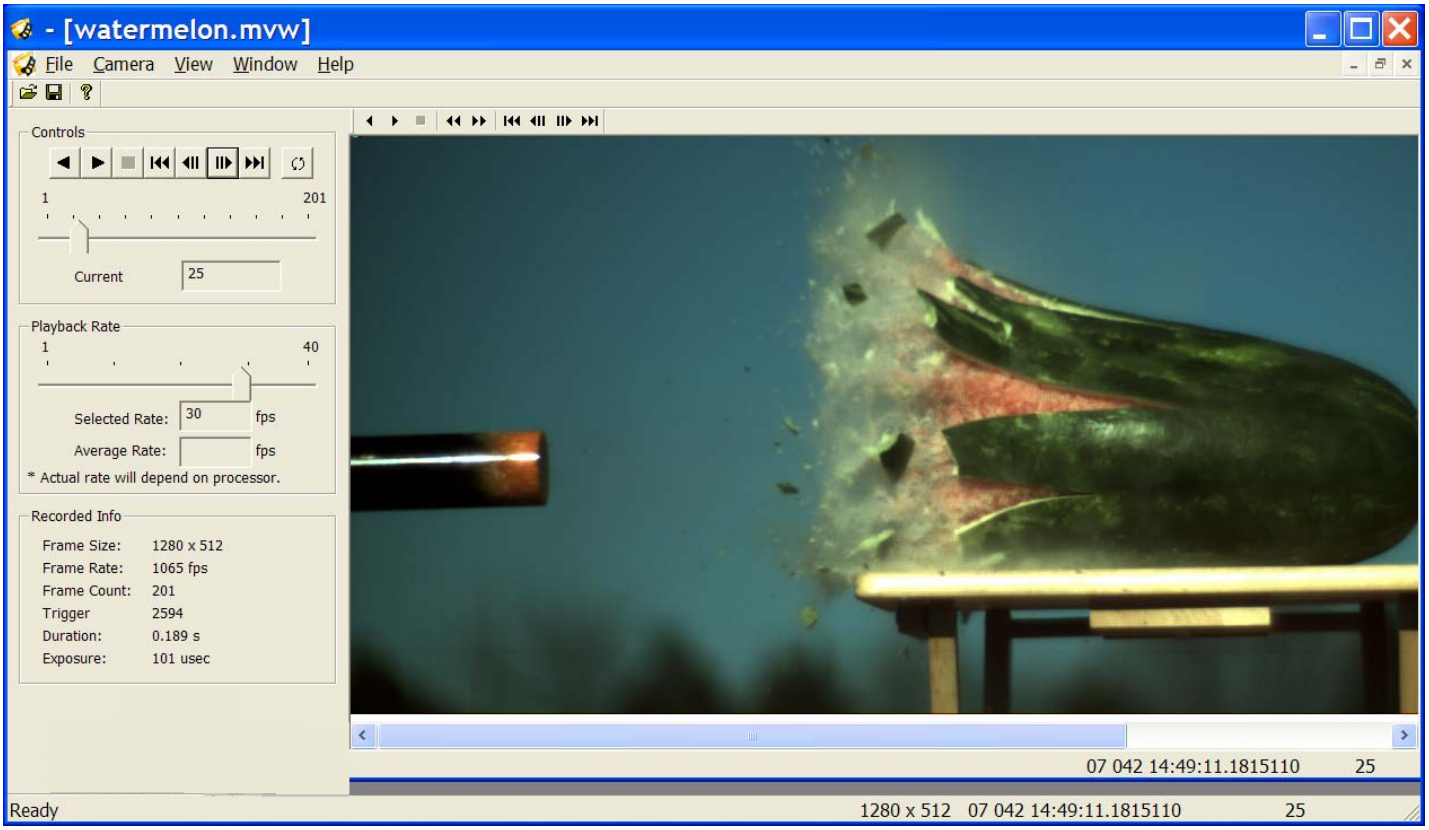

Figure 9 StreamView-LR 'Play" window.

Common video controls (Forward/Reverse/FF/Stop) are available on the main "Play" page and on each individual window. Multiple windows can be opened at once. The current frame is indicated below a sliding bar that can be dragged to a particular frame. Another sliding bar allows the Playback Rate to be set up to 40 frames-per-second (fps). Media files can be played in a loop by selecting the  button.

Information about the original recording parameters of the video are shown in the "Recorded Info" are and include: frame size, frame rate, number of frames, and time duration. Frame size and frame number are also shown in the lower right of the main page.

The player supports playing native StreamView RAW files (*.mvw) and AVI files (limited to 2-GB). It can also display single images (bitmap, jpeg, tiff, and raw). Use the File Open command to select the file type and the file to open. The "Save As" command allows you to save the video files with different options. You can save a previously recorded StreamView file as a new StreamView file with different frame parameters; you can save it as an AVI file; or you can save it as a series of images. See the description of the "Save Data" dialog below on the various options.

Note: because of the large file sizes generated during a typical record session, SVSi recommends recording and playing in the default *.mvw file format. This file format gives the fastest download times and smallest file sizes. SVSi's StreamView-LR software is available for free and can be downloaded from our website for customers playing the default format. Once actual frames are identified for public dissemination, then AVIs, BMPs, or TIFFs can be generated from the "Play" page.

4.3 CAPTURE MODE

The "Capture" window is shown below. To access this page, click on the [Camera-->Open Camera] menu and the auto-discovery window of Figure 2 appears. Select the camera of choice, click [OK], and connection will be established. The Open Camera command will search for all cameras connected either directly or through a network. If StreamView-LR is not found, click [Refresh] to update the list. Once connected, StreamView-LR will begin acquiring and displaying images.

The [Stream] button brings up the Stream Wizard that presents a series of windows that walk the user through selection of frame-size, frame-rate, exposure, recording time, trigger source, and other options such as auto-exposure and sector recording. The Stream Wizard is designed to make set-up and operation as simple as possible. The [Live] button simply updates images to the screen and does not store them either in memory or disk.

StreamView-LR's sensor is compatible with 1/3" C-mount lens. A C-mount to F-mount adapter will be needed to adapt to the bayonet mount on most 35-mm lenses. By adjusting the size of the frame streamed to the host computer, frames can be captured at rates between 30-969-Hz. Selectable frame sizes as shown in Table I are 640x480, 320x240, and 640x64.

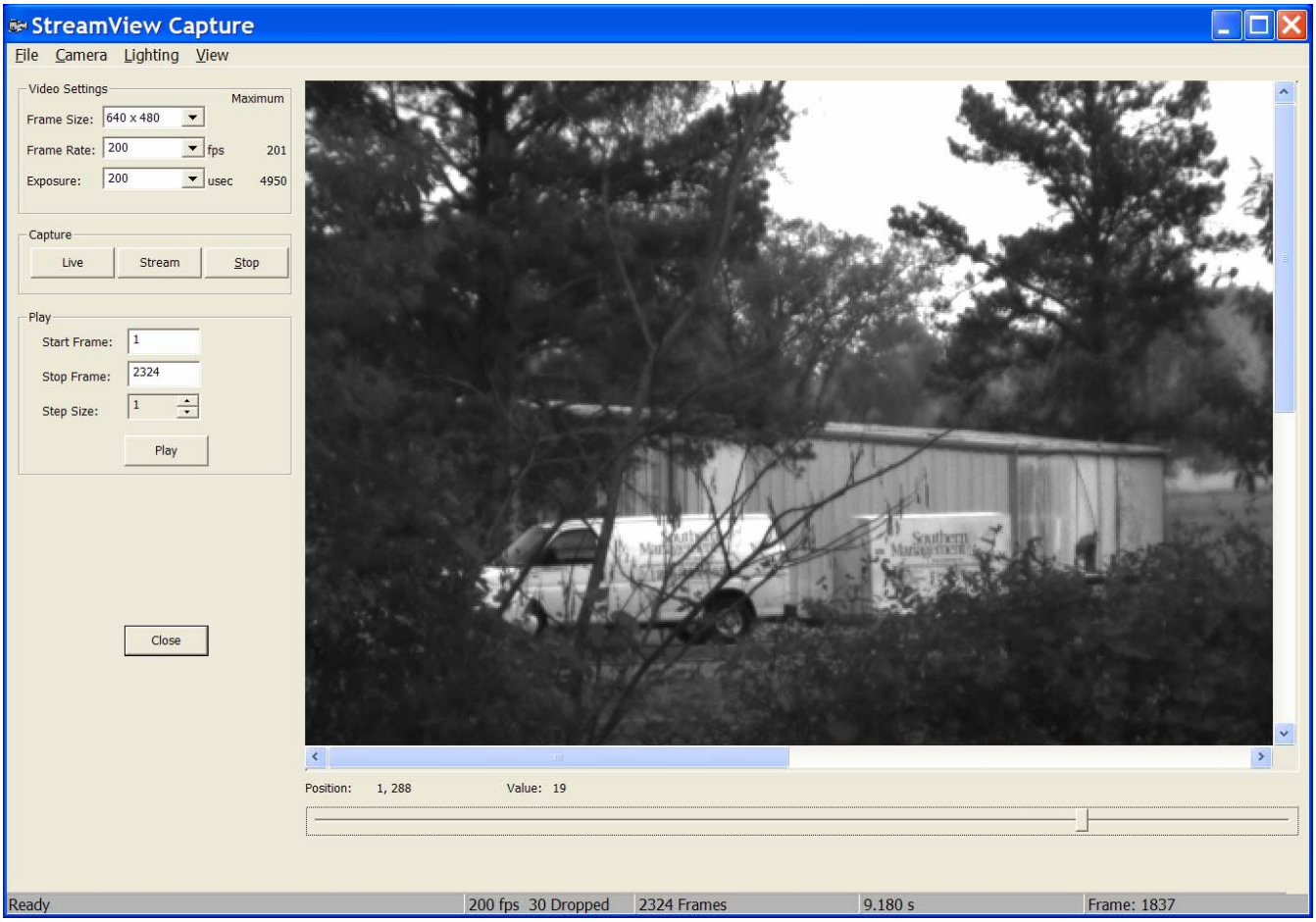

Figure 10 StreamView-LR Capture window.

Information about frame size, frame rate, and exposure are shown on the left side of the window. Information about the current frame-rate, number of frames dropped during the recording session, total number of frames stored, current record time, and current frame number are shown in the status bar along the bottom. With 9,000 MTU size and a sufficiently fast processor, no frames should be dropped at frame-rates as high as 200-fps. As soon as the "Capture" page appears, StreamView-LR starts capturing and displaying 640x480 frames at 200-Hz and 5-msec exposure time. User-adjustments are allowed to frame size, frame rate, exposure, and gain on this page only when stopped. Once these parameters are entered manually, the others will be modified as needed and clicking [Live] will display images with these changes. [Live] does not store imagery and is intended for alignment and setup purposes. Once lighting, focus, and exposure are adjusted, clicking [Stream] will bring up the Stream Wizard with a number of consecutive pop-up windows that walk the user through the process of recording video.

The display update rate depends will vary between "Live" and "Stream" modes. In "Live" mode, no images are stored and the display is updated at a faster rate. In "Stream" mode, images are updated to the display once a second. The status bar along the bottom is also updated at 1-Hz during streaming.

Table 3 Exposure and frame-rates for various frame-sizes.

Frame Size (pixels)	Exposure	Max Frame Rate
640 x 480	10µsec-5msec	200-fps
320 x 240	10µsec-2.5msec	370-fps
160 x 120	10µsec-1.25msec	640-fps
640 x 64	10µsec-1msec	969-fps

StreamView-LR has the option of adjusting the imager gain setting independent of exposure. Gain settings are accessed under the drop-down [Camera->Set Gain] menu item and are limited to +20dβ, +10dβ, and 0dβ. For low-light levels, the "+" dβ levels increase imager gain but at the expense of higher noise. **Figure 7** below shows how to access these gain settings.

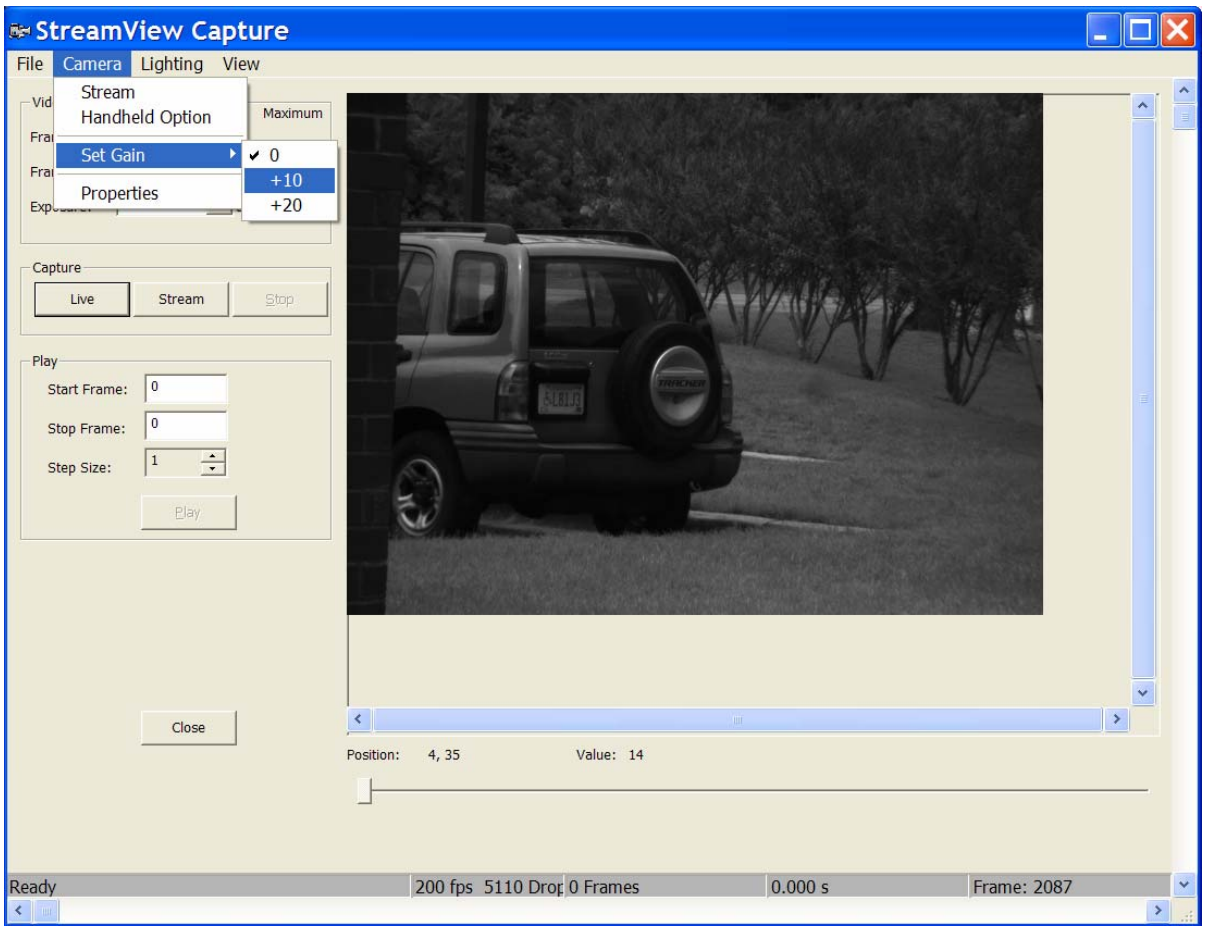

Figure 11 Gain settings.

4.3.1 STREAMING VIDEO

Clicking the [Stream] button of Figure 3 brings up the Stream Wizard and starts the process of streaming video to either memory or disk array. Because the data bandwidth depends on network connection, host speed and resources, and Windows operating system, there is no guarantee that frames will not be dropped when recording over a long period of time. Typically, with 9,000 or larger MTU sizes and a sufficiently fast host processor (>2-GHz), no frames will be dropped even over several hours of recording. The StreamView-LR software reports the number of dropped frames per recording session but does not indicate where in the recording session the drops occurred.

The first frame of the Stream Wizard is shown below and asks the user to select from a drop-down list of frame sizes.

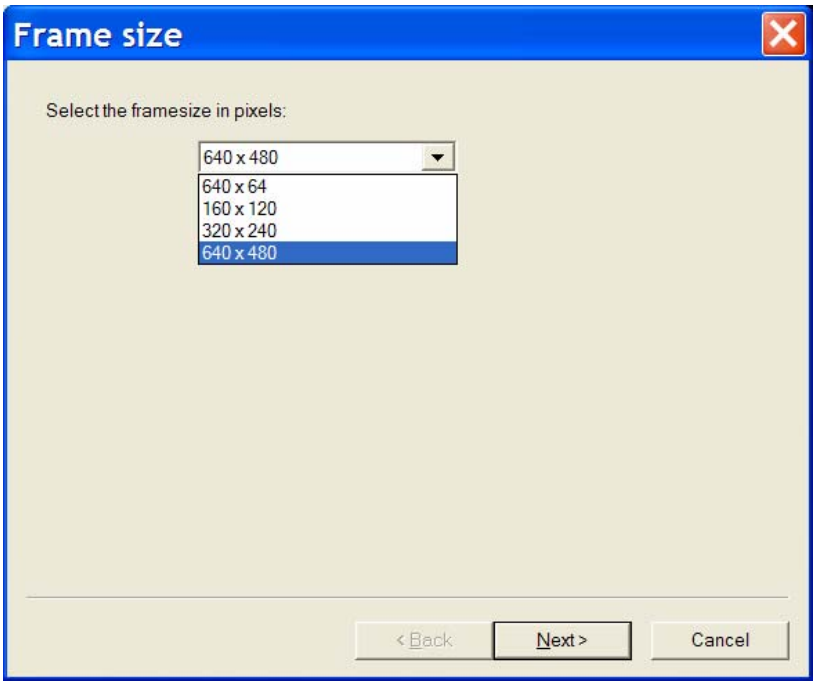

Figure 12 Frame size selection in the Stream Wizard.

The maximum streaming frame-rate depends on the frame size chosen. The drop-down list of frame-rates in the next window of the Streaming Wizard (shown below) is modified based on the user's frame size selection. The user may choose from this drop-down list or manually enter a value within this range.

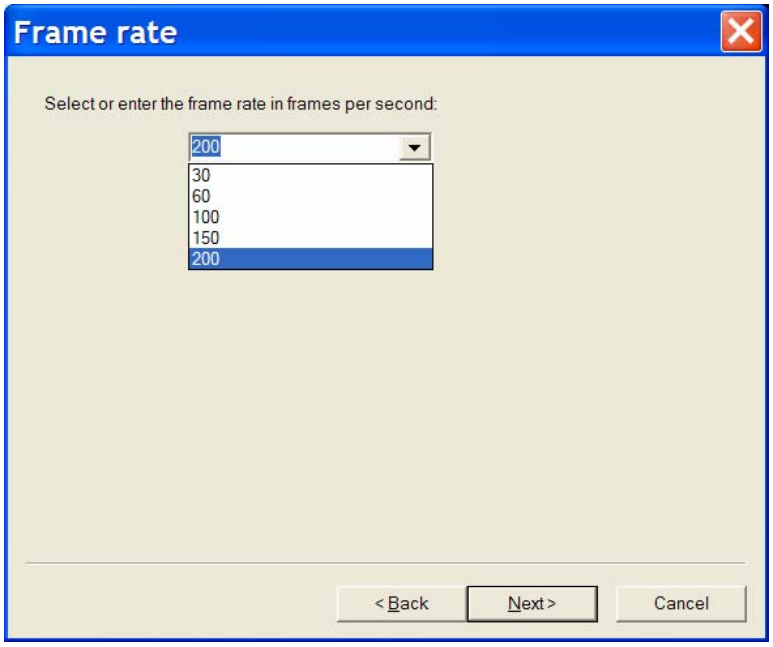

Figure 13 Frame rate selection in the Stream Wizard.

Once you have selected the frame rate, the exposure window below contains a drop-down list of exposure times. Here you may select from the list of shutter speeds or manually enter any exposure time in microseconds.

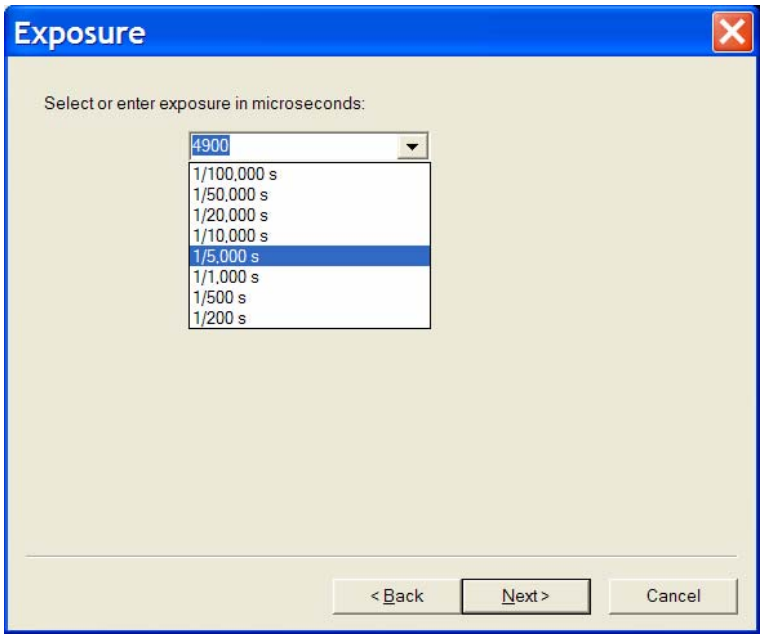

Figure 14 Exposure time selection in the Stream Wizard.

After selecting the appropriate exposure time, auto-exposure can be enabled through the window shown below. If enabled, StreamView-LR will evaluate every image as it is captured to determine if the exposure needs to be adjusted in order to keep the image histogram fixed at its current value. Auto-exposure is useful in situations of changing illumination such as outdoors with passing clouds. Please

note that auto-exposure requires several frames to adjust the exposure correctly and is not an instantaneous effect.

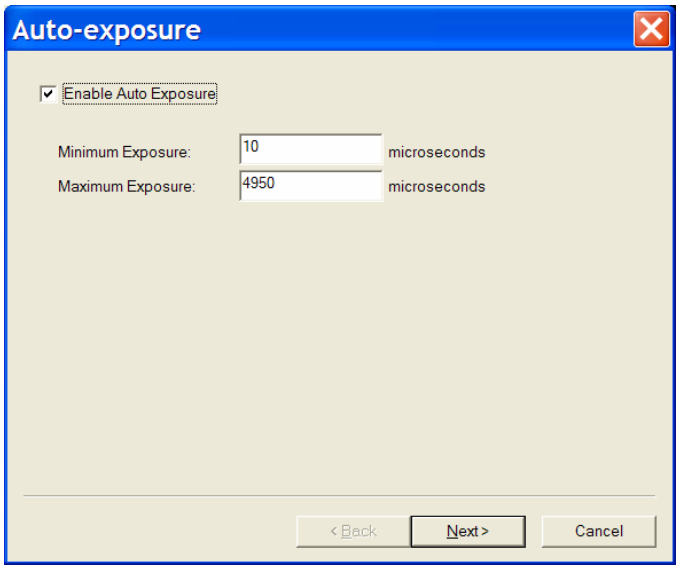

Figure 15 Auto-exposure window in the Stream Wizard.

The next window in the Stream Wizard asks whether the user wants to stream to host memory or host disk array. If recording for several seconds, streaming to host memory is the preferred option since the video can be played back immediately out of memory. When streaming to disk array, the user must exit the "Capture" page and open the stored file in "Play" mode.

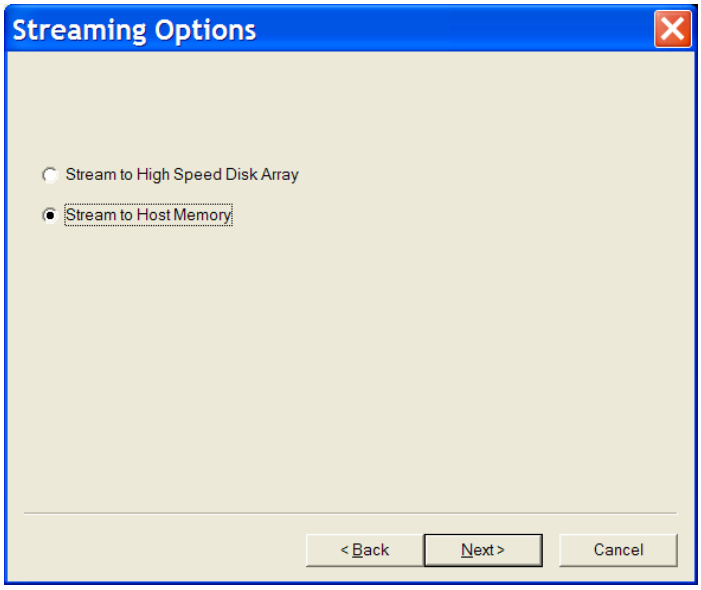

Figure 16 Selecting video storage medium in the Stream Wizard.

The current software limits recording to 1-GB of host RAM which will accommodate approximately 12-secs of 640x480 video at 200-fps. Longer recording times require the host computer to have a disk array. SVSi can provide disk arrays for up to 10-hours of high-resolution high-speed video. Please contact the factory for any custom storage requirements.

4.3.2 STREAMING VIDEO TO MEMORY

Once the option to stream to host memory is selected, the following Stream Wizard window will show asking for the quantity of available memory to allocate for recording video. The software queries the host operating system to determine available RAM memory and provides the user the slider bar below for determining the recording time. StreamView-LR reserves 256-MB of host RAM for the operating system and other programs. SVSi suggest when possible that all other programs be terminated during a video recording session to ensure that the host operating system is not trying to allocate memory dynamically.

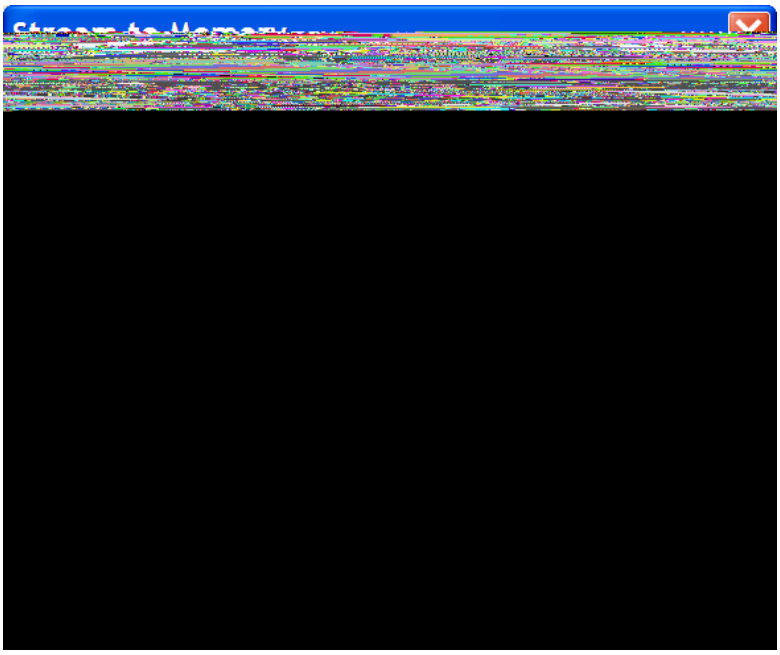

Figure 17 Selecting record time for streamed video.

After selecting the recording time using the slider bar, clicking [Stream] will cause StreamView-LR to begin recording video to host RAM. To stop the recording process, click on the [Stop] button. Video is now preserved in host memory but has not been written to disk yet. StreamView-LR treats the available memory as a rolling buffer so that, even though only 6.5-secs of recording time was selected, you may record for several minutes until [Stop] is hit after which only the last 6.5-secs of video are stored in memory.

Once recording has been stopped, clicking the [Play] button will playback recorded video at whatever frame-rate the host processor can support (typically 15-25-fps). The event-of-interest can be framed by entering the appropriate [Start] and [Stop] frame numbers and clicking [Play]. These start/stop values are remembered when storing video from host memory to host disk so that storing the full video sequence requires re-entry of the desired start/stop frame numbers. Please note that, if the StreamView-LR "Capture" page is closed before storing video and re-opened, the video will NOT be preserved in memory. To store video to host disk, select [File->Save] and the video stored in host memory defined by the start/stop frame numbers will be written to disk. After storing video, the "Capture" page can be closed and recorded video played back in the "Play" page.

4.3.3 STREAMING VIDEO TO DISK ARRAY

If recording times in excess of a few seconds are required, the following Stream Wizard window allows the user to define the destination and recording time for streamed video.

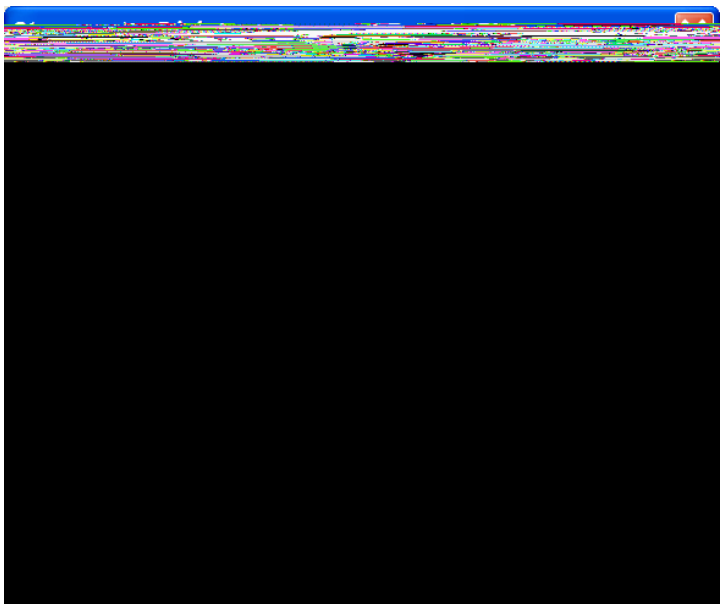

Figure 18 Selecting destination and recording time for streaming to disk array.

Although the destination disk does not have to be a RAID array, SVSi recommends this configuration as the only one that can achieve the sustained write rate required for 640x480 @ 200-fps. We also recommend against installing the operating system on the disk array intended for video recording.

The StreamView-LR software evaluates the destination drive to determine how much storage space is available and calculates a record time based on this value. Video can be streamed continuously for the required recording time after which recording stops or it can be streamed continuously until the host computer is told to stop with only the required record time stored in memory. Once stopped, the video cannot be replayed in the "Capture" page so that the "Play" page must be brought up for playback.

In the "Play" page, select [File->Open] and then browse to the destination drive. A window similar to Figure 16 below will appear. StreamView-LR creates multiple files during a recording session so that if recording is interrupted (e.g. – loss of power) all the video is not lost. The master file (named <Streaming.mvw> here) regulates opening and closing of the individual files and is the file that should be opened in the "Play" page.

Figure 19 Files created during video streaming.

Once the master file has been opened, the user can define a subset of the stored video and create a video file with just those images. Valid storage formats in the "Play" page are raw (.mvw), AVI (.avi), or a sequence of bmp, TIFF, or raw images.

4.3.4 HANDHELD OPERATION FOR STREAMVIEW-LR PORTABLE

StreamView-LR Portable is available with a rechargeable battery pack and trigger handle for portable applications. With this optional upgrade installed, high speed video at 200-fps is recorded to host RAM whenever the trigger is depressed. Releasing the trigger causes the recorded video to automatically be stored to disk. Multiple video clips can be stored in this fashion until the host hard disk is full. To enable the handheld portable mode, select the [Camera->Handheld Option] menu item shown in Figure 20 below. The frame size will be fixed at 640x480 and frame-rate at 200-fps.

Although StreamView-LR Portable can be controlled with the standard software, the [Handheld Option] is designed for simple reliable operation. With [Handheld Option] selected, drop-down menus for frame-size and frame-rate are disabled although exposure can still be adjusted. The battery pack comes with a charger requiring less than an hour to full charge and lasting up to 3.5-hours.

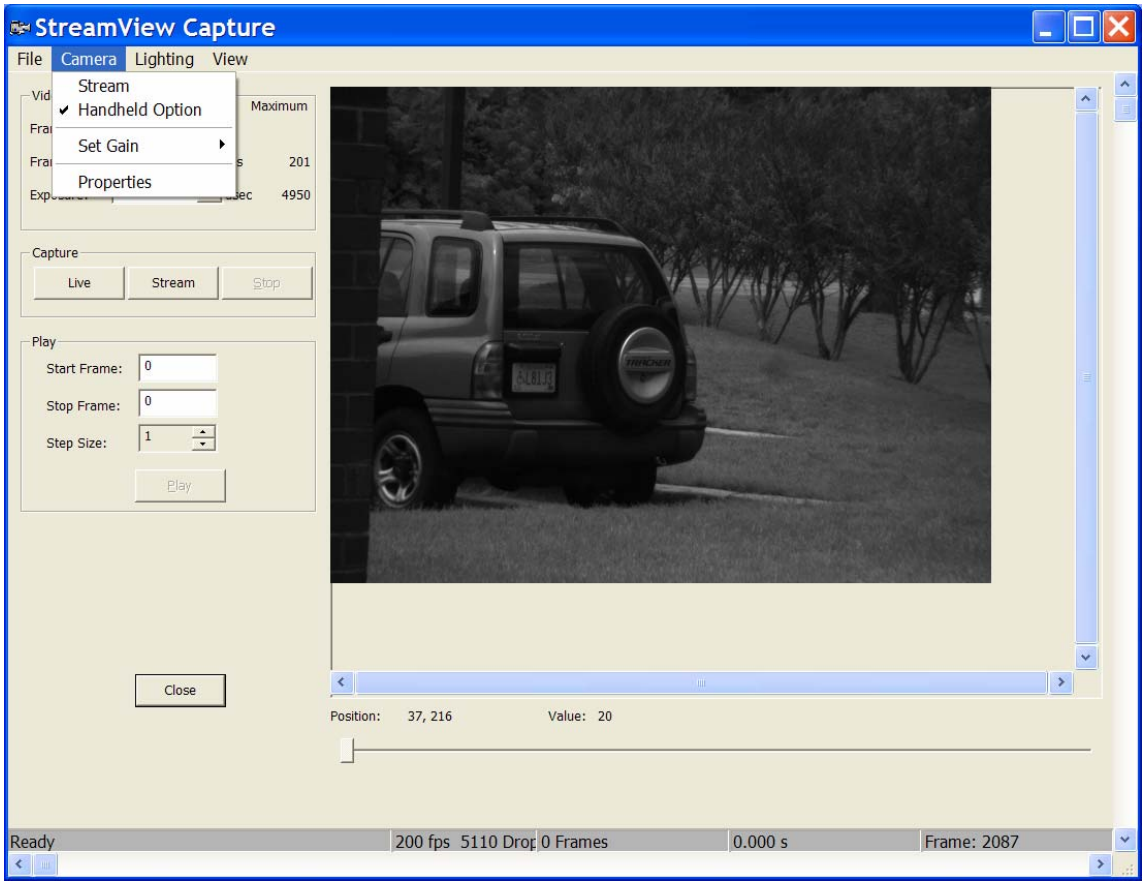

Figure 20 Selecting [Handheld Option] for StreamView-LR Portable.

StreamView-LR is a versatile tool for high speed video capture and slow motion analysis. It is designed to be intuitive and provide trouble-free operation. Please contact Southern Vision Systems, Inc. at sales@southernvisionsystems.com or (256) 461-7143 for technical support or for custom image processing applications.

Appendix A: Troubleshooting

The following table describes problem conditions you may encounter with the StreamView-LR camera and suggested actions to resolve these problems.

Problem	Action
StreamView-LR does not appear on the auto-discovery page upon start-up.	-Check to see that power cable is connected to camera and that the ethernet cable is connected to the camera and computer. -If still not initializing, unplug power connector to camera, re-connect, and re-start software. -If still not initializing, turn off gige filter driver under [Network Connections->Properties->TCP/IP] and restart software. -If this fails, contact factory.
[Live] or [Stream] on “Capture” page only shows black frames.	-Check that the exposure is high enough to detect the ambient light level and that the adjustable aperture is open enough to admit light. -If still dark, ensure that MTU size on camera is less than or equal that for network connection on host. -If still dark, turn off gige filter driver under [Network Connections->Properties->TCP/IP] and restart software. -If this fails, contact factory.
Host computer appears to slow down	Set Buffered Frame Count to 2.
[Live] or [Record] on “Record” page only shows gray frames but video plays back OK.	Ensure that Color (32-bit) is selected in “Display Properties” by right-clicking on desktop, selecting “Properties” and then “Settings” tab.
Error message “Insufficient hard disk space” appears during save of AVI, StreamView raw, or image sequence.	Not enough disk space. Delete unused files on the host computer and retry.
”Could not change IP address” error message shows after “Edit IP Configuration” page changes.	Camera is directly connected to a host computer that does not have a DHCP server. Fix the camera IP address at a known value (different from the host computer’s) and try again.
Network Connection status shows “Limited or No Connection” even though camera is recognized during Auto-discovery.	Reboot host computer and try again.