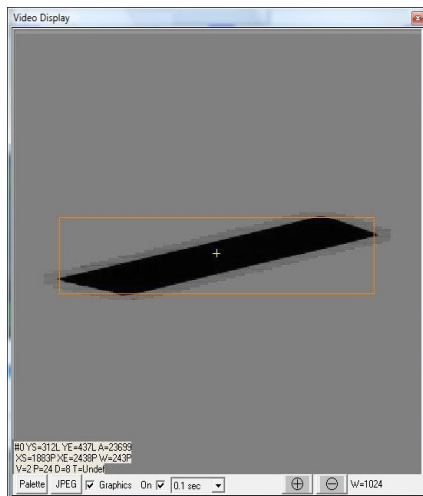
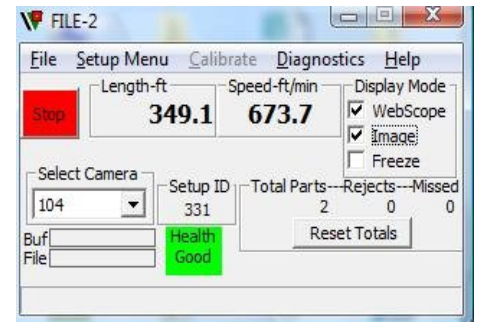


Using the Web-i for Surface Inspection



The Web-i smart camera is an affordable, powerful method of bringing surface inspection to your line. Capable of inspecting many different non-patterned products, its small size and rugged extruded aluminum housing allows it to be placed almost anywhere. If desired, it can run without a host computer for defect detection and alarming, but when connected to a host computer via a high-speed USB cable, it is capable of displaying ROI (Region Of Interest) images of defects in real-time, in either monochrome or false color. It also archives all images with complete data on all defects. A roll map is available as well. The raw camera output trace is also displayed.

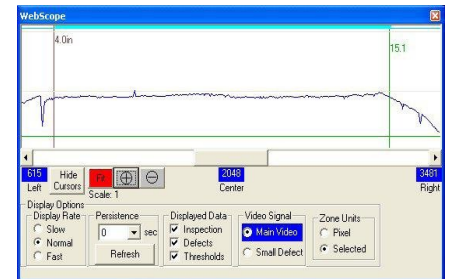
When the camera is operating and connected to a computer, three windows are provided. The first, shown to the right, informs the operator of web speed and the length of web inspected so far in the inspection. Other indicators show how busy the camera is and its health status. From here, an inspection can be started and stopped manually, but the Web-i also has the ability to start inspection based upon an external input, and can delay start and stop of inspection due to leader and camera location on the line.



To the left is the real-time video display, which automatically displays defects as they occur. The image shown is that of a piece of tape on a web. If you look closely, you can see the black stripe of the tape itself, along with a small portion of "regular" web bordering it for contrast. This minimizes storage space required on the hard drive. The background display can be changed from gray (as shown here) to white or black if desired. Note that the image can be magnified for closer inspection, and the "Palette" button allows you to change the image to that of false-color, which can show subtle details. Finally, you can also save the image as a JPEG for later use simply by clicking the "JPEG" button. Complete details of the defect (length, width, area, location, and type) is displayed at the bottom left, along with a defect box bordering the defect. If desired, this information can be turned off by unchecking the "Graphics" box. You can control how quickly the window updates using the drop-down window in the bottom of the display. This can be useful when lots of

defects are encountered.

Finally, there is also the WebScope window, which offers real-time observation of camera output traces, as well as thresholds and zones. Both the Video Display and WebScope can be shown or hidden at the user's discretion. The WebScope display can be zoomed as well, which allows for precise focusing of the camera. There are two channels of video information in the Web-i. The first, called Main Video, is essentially an amplified and noise-reduced version of exactly what the camera sees. Small Defect video, on the other hand, is the Main Channel video processed to provide rate-of-change information. Utilizing this channel, one can obtain much better Signal-to-Noise Ratio (S/N) on small, high contrast defects, allowing for easier detection and the capability to detect certain types of sub-pixel sized defects.



To make proper use of the Web-*i*, it is important to know both the product requirements (types and sizes of defects), web speed and width, and finally, the lighting requirements. For those not familiar with machine vision, it cannot be over-emphasized how important the lighting requirements are, for if lighting is not optimized, the inspection will suffer.



Typically, surface inspection of roll materials requires a linear **light source**. This can be a high-frequency aperture type (HFA), fiber optic, LED, or other variations. Webview stocks an entire line of light sources for inspection. In many cases, an HFA light source will provide excellent lighting at relatively low cost. Fiber optic light sources can be required when the inspection is demanding (very high speeds, for example), and LED light sources, although costly, offer the advantage of very little maintenance.

For transparent and translucent materials, **transmitted light** often offers the best lighting solution. In this geometry, the Web-*i* is located on one side of the web, and the light source on the other. The light source shines light through the web. The Web-*i* examines the illuminated web and can detect bright and dark defects on either side of the web in this way. Transmitted light offers excellent detection and easy alignment. Disadvantages can be insufficient light being transmitted through the web, which may require a more powerful light source to allow inspection at the resolution desired.

Some surface defects do not cause sufficient change in transmitted light to be observed. For example, many paper coatings, such as those used for release paper, are thin and clear. If a coating void appears, the difference in light transmission through the paper is so small as to be invisible. However, coating voids can often be seen as a change in reflectivity of the paper. To detect these kinds of defects, **reflected light** is required. Here, the use of reflection can become somewhat more complicated. Some defects are best seen in diffuse, reflected light, while others are only seen with specular reflected light. "Specular" means that the camera observes the actual reflected image of the light source itself on the web, somewhat like observing yourself in a mirror.

Reflected light requires the web to be kept quite steady. Neither the camera or the web at the inspection point can have excessive jitter. Also, the web cannot be allowed to change in distance from the camera, as this will offset the reflected area. Therefore, it is always best when inspecting in reflected light to inspect the web wrapped on a roller.

Generally, the light source is positioned as close to the web as possible, with some allowance for web movement, breaks, and the like.

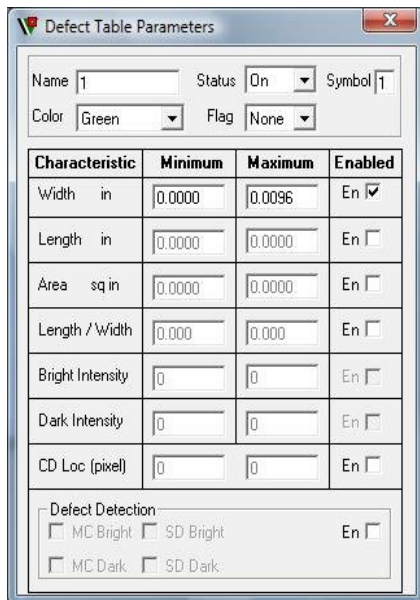
Once the lighting geometry is worked out, the Web-*i* can be installed. The Web-*i* comes standard with a 50 mm lens, which requires a standoff distance of approximately 1.25 times the desired field of view. For example, to view a 60" wide web, with one inch extra on each side for wander, the Web-*i* needs to be mounted approximately 78" from the web. If this distance is not available, other lenses can be substituted to allow the camera to be positioned closer to the web; contact Webview for details of this.

The camera is required to be focused and aligned properly for use. See the *Web-i Operating Manual* for information on how to do this.

In most cases, it is desired to track the web movement precisely, for later culling of defects. Although the Web-*i* is capable of operating using its own internal clock to scan the web, generally, an external **tachometer** is installed to monitor web movement. Webview can supply tachometers for this purpose. In the usual format, the tachometer is mounted on a 12" circumference measuring wheel which then rests on a driven roller, or the web itself. As the web moves, the tachometer provides pulses to operate the camera and also for keeping track. Using a tachometer allows precise length to be measured, so that defects can be located and sized properly.



In the majority of installations, it will be desirable to classify defects in some way. Using the Web-*i*, defects can be classified by any combination of width, length, area, aspect ratio, crossweb location, relative darkness or brightness, and also by which threshold they crossed. Using these criteria, one can discriminate between defects quite easily. Once classi-



fied, the end user can setup the camera to only alarm on certain kinds of defects. To the right, a screenshot of the window used to setup a defect is shown.

To use the defect table, simply decide on a name, color, and symbol for your defect (used in reporting), then set your criteria in the boxes desired. Ensure you check the “Enabled” box to make your criteria active on each line used, then ensure status is set to “On”. To cause the camera to output an alarm signal when this type of defect is encountered, set “Flag” to alarm. Even if the alarm flag is not set, any defects encountered meeting the criteria in the table will be saved and displayed, unless status is set to “Off”.

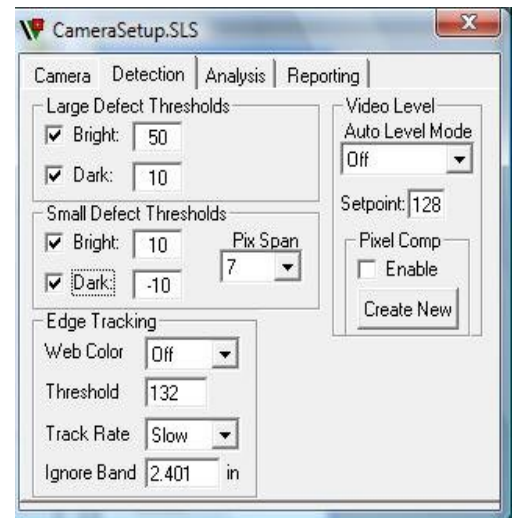
You can create up to fifteen different defect types. Using the defect tables is described in much more detail in the *Web-i Operating Manual*, supplied with the camera.

To complete the setup of the camera, it is necessary to set thresholds and

zones. Thresholds are the limits beyond which the camera signal will be recorded as a defect. They can be set up using WebScope, and Bright and Dark thresholds are available on each video channel, and when activated are seen as orange and green horizontal lines on WebScope.. Generally, the Bright threshold is set somewhat above the average camera signal when viewing the web, and the Dark threshold somewhat below. If the camera signal crosses these thresholds, a defect will be declared and displayed. Thresholds are activated and set using the “Detection” window, shown on the right. Check the thresholds you want to use, then set them by changing the number in the box to the right of the checkboxes, observing WebScope. Other options on this page are described in the *Web-i Operating Manual*.

Zones represent the portion of the field of view you actively want to inspect for defects. Zones are usually set to observe the web, minus any part that might be trimmed off later. Zones are represented in WebScope by vertical lines, orange for the left zone, and green for the right zone. Any area to the outside of these lines is ignored. To set the zones, you simply hold down the <Shift> button and use the mouse. <Shift><Left Click> sets the left zone, and <Shift><Right Click> sets the right zone.

Once you have made your changes, they should be saved to the computer, and also must be sent to the camera. B This is accomplished using the menus in the main Web-i window.



Webview offers inspection systems for both part/piece and web inspection. We invite you to view our website at:

www.webinspection.com

Copyright © 2008 Webview, Inc. All Rights Reserved.