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White paper

Edge Detect Camera

British Columbia, Canada (21 November 2006) — The Edge Detect Camera is used to quickly and accurately locate the edge of a plate once it has been loaded on to a computer to plate (CTP) machine. The Edge Detect Camera is an improvement over the previous method of edge detection using the focus laser.

Key Features

- The Edge Detect Camera is active while the drum of an output device is spinning (or accelerating).
- The camera can detect the edge of a plate faster than the focus laser.
- The camera is accurate within ±25 microns.
- The camera can detect the edge of a plate anywhere on the drum.

Overview

The Edge Detect Camera locates the plate edge before imaging each plate. The image is then registered to this edge to ensure on-press registration between the different color separators. The Edge Detect Camera is designed to operate as quickly as possible, because every second counts towards improving the output device's overall performance. To meet the accuracy requirements, the Edge Detect Camera uses a magnifying lens and stable mechanical mounting. The camera location is calibrated with respect to the thermal imaging head.

The Edge Detect Camera detects plate edges in the following sequence:

- Once the previous image is completed, the camera (carriage) starts moving to the estimated edge position for the next plate.
- As soon as the new plate is loaded, the drum starts accelerating towards plotting speed.
- Strobe LEDs are precisely synchronized to the location of the plate edge, where the edge must be detected. This position is flexible – edge detection can occur at any position around the drum.
- The GMCE Xilinx captures the single video frame that contains the strobe.
- The GMCE firmware analyzes the image using an image processing algorithm specifically developed to accurately find the plate edge.
- Based on the image processing results, the camera is repositioned until the edge has been found.

The camera is closely integrated with the GMCE version of the CTP control electronics. The diagram shows the various components used.

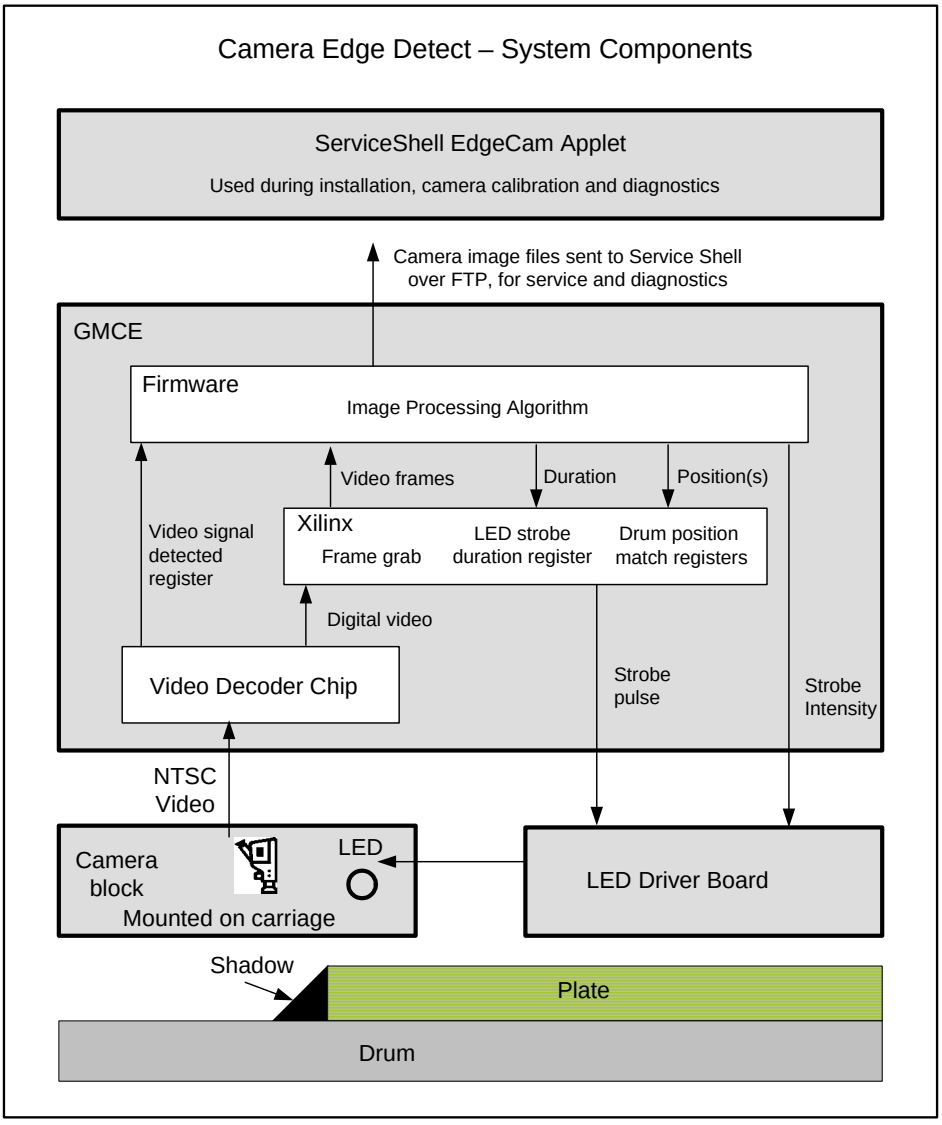


Figure 1: The Edge Detect Camera system components.

Camera images are viewed on the workstation using the Service Shell software. All images are archived to facilitate system troubleshooting. During installation, camera video may be exported to the workstation at the rate of 1 frame per second.

The GMCE firmware includes calibration routines that accurately locate the camera, relative to the imaging head. The camera scale or magnification is also calibrated to account for different media thicknesses.

The firmware implements an edge search routine that locates the plate edge. The firmware uses either the edge detect strip as a reference, or a drum texture algorithm for away edge detect. Once the plate location is known, the firmware calculates the required drum position to match the requested plate edge position and program the LED strobe.

To ensure fast reliable response, there is close coupling between drum and carriage control with the camera. The LED strobe is synchronized to the drum position using feedback from the tach encoder. The GMCE Xilinx then captures the video frame that contains the strobe. The Xilinx stamps each captured frame with the precise drum and carriage positions where the capture occurred. Therefore, in the case of side edge detect (portrait), multiple images can be captured in a single drum revolution.

The Camera

The camera is fitted in a custom housing which includes 2 sets of LEDs. The LEDs are angled to cast a shadow for home and away edge detect.

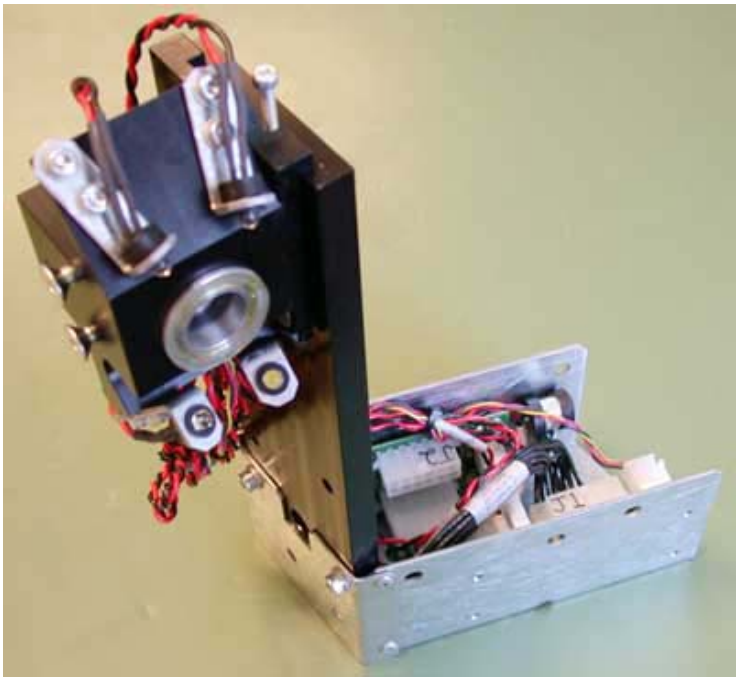


Figure 2: Edge Detect Camera

Cycle Time Reduction

The Edge Detect Camera offers reduced cycle time compared to the focus laser. Most of the time savings is obtained by starting the drum acceleration earlier in the plot sequence.

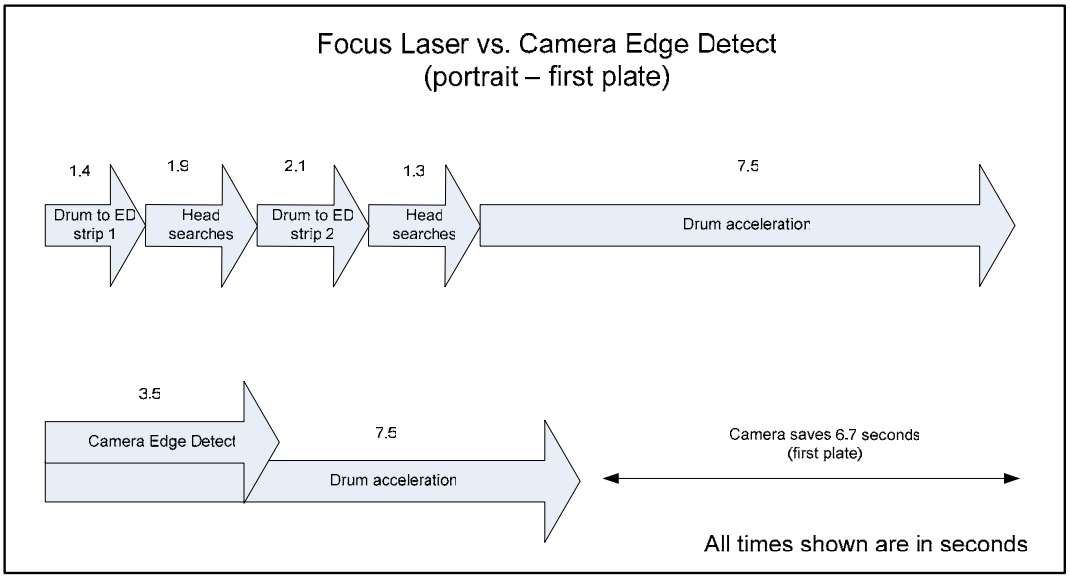


Figure 3: Focus laser vs. camera edge detect speed.

Typically the camera offers even greater time savings for the second plate because the drum remains at plotting speed. Focus laser edge detection for dual plates is much slower because the drum needs to decelerate to detect the plate edge, then accelerate again to achieve plotting speed. The exact time savings achieved depends on the gap between plates.

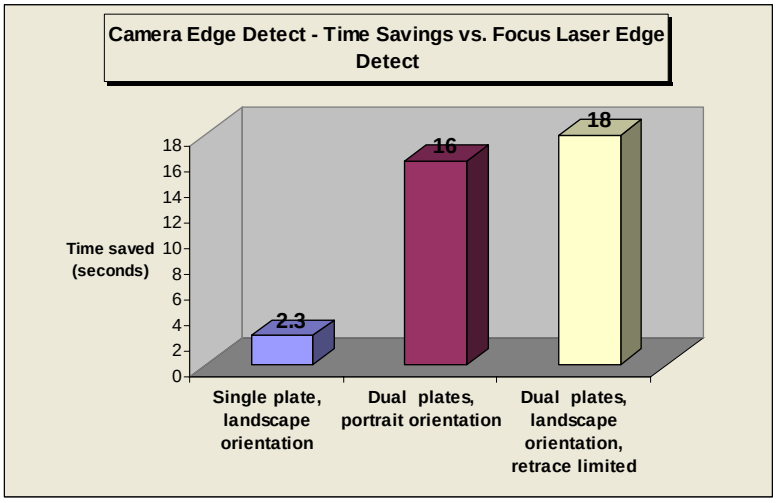


Figure 4: Camera edge detect time savings vs. focus laser edge detect.

The dual plate time savings (indicated in the preceding graph) depend significantly on the spacing between plates. Closely spaced plates accentuate the advantage due to keeping the drum spinning.

The Edge Detect Camera performs faster in instances where carriage retrace is limited. When the system is retrace limited, part of the drum acceleration occurs simultaneously with the retrace. For the focus laser method, the drum remains stationary until after the plate edge is detected.

Camera Registration Modes

For backwards compatibility with existing configurations, the Edge Detect Camera supports Leading Edge Registration and Side Edge Registration modes. Also, new registration modes have been added for the camera – see diagram below:

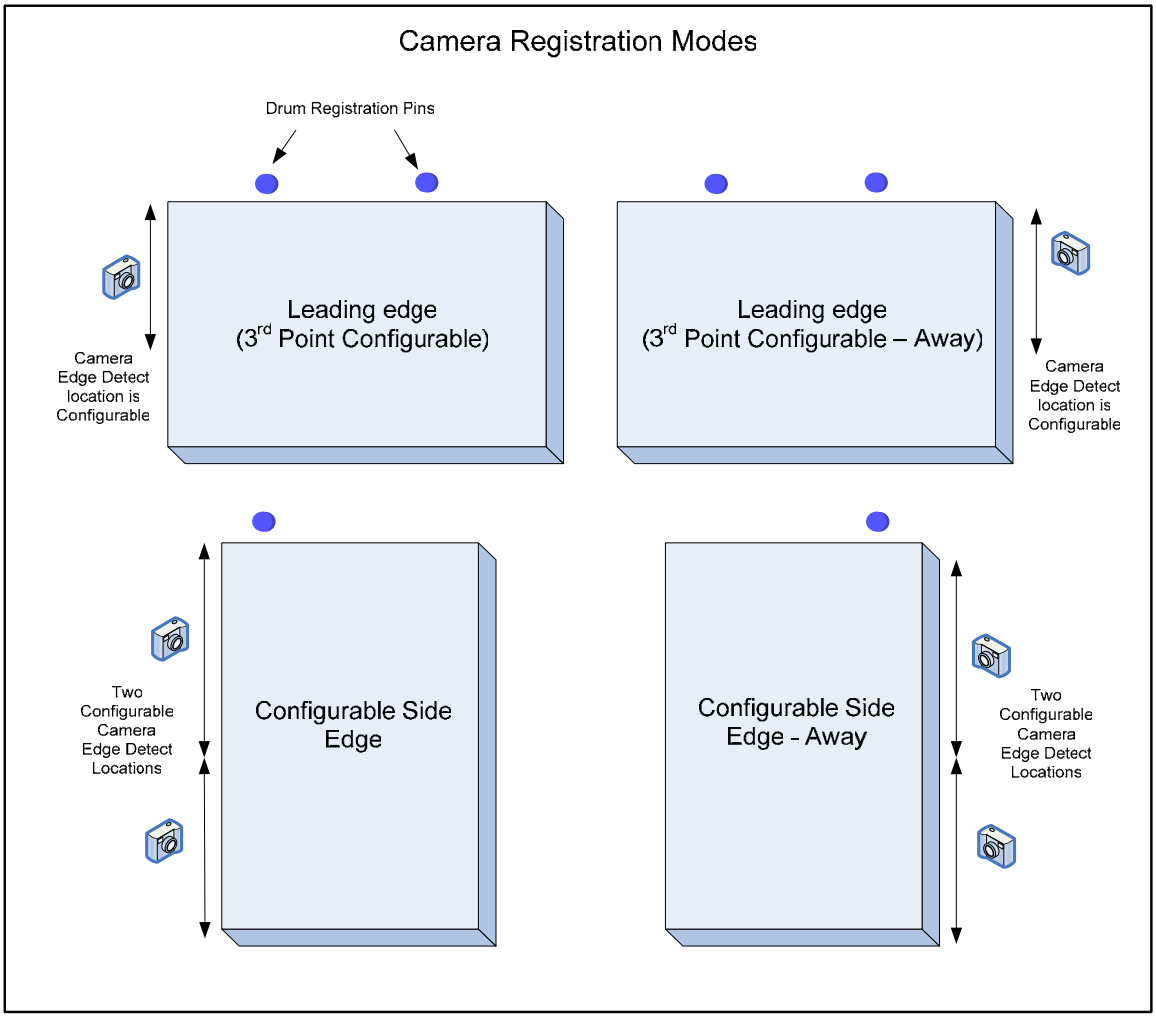


Figure 5: Camera registration modes

Where the plate is loaded on the drum registration pins is dependant on the *media size*. When the Edge Detect Camera is enabled, plates are always centered on the registration pins (for both landscape and portrait orientations). The one exception is for dual plates with dimensions that vary between 908 and 1032 mm along the drum. The outer edges of these plates are fixed in the same position as the 908 mm plate. The inner edges shift closer to the drum center as the plate size increases.

Away Edge Detect

Away edge detect is a licensable option.

Note that there is a very significant throughput reduction using away edge detect. This is due to the need to keep the carriage stationary at the away edge location, after imaging the previous plate. During normal (home) edge detect, the carriage is retraced while the plate is loaded.

For example – an 1880 mm (74") plate takes the carriage 45 seconds at 42 mm (1.6") / sec to retrace. The specification for this plate size is 30 plates per hour, or 120 seconds per plate. For away edge detect, the time increases to 21.8 plates per hour, or 165 seconds per plate.

About Kodak Graphic Communications Group (GCG)

The leading provider of graphic communications solutions worldwide, Kodak's Graphic Communications Group (GCG) offers image capture systems; professional color, copydot, and high-speed document scanning systems; inkjet printing and proofing systems; workflow and color management software; thermal imaging devices for film, plates, and proofs; high-quality proofing media, printing plates, and recording film; on-demand color and black-and-white printing systems; data storage products; and professional services. Creo joined the GCG in June 2005, when it became a wholly owned subsidiary of Kodak. With corporate headquarters located in Rochester, N.Y., Kodak (NYSE: EK) had sales of $13.5 billion in 2004 and is committed to a digitally oriented growth strategy.

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