Kodak

Magnus VLF

Edge Detect Camera Installation and Calibration

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Revision History

Revision	Date	Author	Comments
1	26 May 2006	A.Blignaut / A.Warnes	Initial release
2	29 May 2006	A.Blignaut	Added comments and suggestions from D.Lowe, M.Wight, and A.Warnes.
3	06 Jun 2006	A.Blignaut / G.Wu	Added Print Console settings for ver. 4.6
A-A	28 June 2006	A.Blignaut	Parts correction, procedure update. Released.
A-B	30 Aug 2006	A.Blignaut / G.Wu	Strobe LED positions changed. Step added for camera post installation. Print Console setup added for away side registration options.
B-A	4 Jun 2007	A.Warnes	Updated for new camera, single LED board, setting the strobe duration, added vacuum groove blackening
B-B	20 Nov 2007	A.Blignaut	Kit and camera assembly part numbers were incorrect. Fixed.

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1. OVERVIEW

For devices where a camera has not been installed, installation of the edge detect camera consists of installing the cables, the camera post, and the camera assembly. For devices where an existing camera is being replaced, only the camera assembly is replaced.

After installing or replacing the edge detect camera, the camera must be recalibrated.

2. PREREQUISITES

Before installing the edge detect camera on any Magnus VLF device, check that the device:

- Is a Series 2 device,
- Has a version D GMCE board installed (version D is not compatible with the Ex-Creo designed DRUM_DRIVER_2 drum amplifier (503-00257B, 503C1C069K, or 503-00196A),
- Has a version C universal carriage installed,
- Has controlled release 4.1 (or higher) installed.

3. PARTS/TOOLS NEEDED

If you are doing a first time camera installation, use:

- 518-01882B : Upgrade kit for TH3 devices

OR

- 518-01881B : Upgrade kit for TH2 devices

If you are replacing a defective camera, use:

- 500-05190A: Camera assembly only (generation 2 camera)

Note: The generation 2 camera assembly can be distinguished from the old camera in the following ways:

1. The new assembly only has a single LED driver board fitted.
2. The new assembly has a knurled knob to fasten the metal bracket that holds the LED driver board.

4. INSTALLING THE EDGE DETECT CAMERA

Note: For new camera installations, follow steps 1 through to the end. For camera replacements, remove the defective camera from the post and begin with step 11.

The thermal head must be removed before the camera hardware can be installed. This procedure involves installing the two cables from the GMCE in the power box to the thermal head area, installing the camera post, and installing the camera assembly.

1. Disconnect the cable track from the carriage, lay it out, and open it.
2. Connect the two connectors on cable 220-01508A: one to GMCE J18 (marked LED_BRD), and the other to GMCE J14 (marked SPR_IO).
3. Connect hotlink cable 10-9095A to GMCE BNC2, marked CAM_IN_1.
4. Choose a cable that runs from the GMCE to the head as a guide.
   On TH2 systems the hotlink cable coming from J1 might be useful. On TH3 systems the fiber optic cable coming from U126 might be useful.
5. Following the ‘guide cable’, route the two camera cables along the cable bundle going that exits the power box. Follow the “S” pattern of the existing cables between the power box and the device frame. Use cable ties to secure the camera cables to the cable bundle.
6. Continue to follow the ‘guide cable’ through two bulkheads and eventually up the cable track. Use cable ties to secure them all along the way, except inside the cable track. Leave about 45 cm (17.7 in.) of cable extending past the top of the cable track for 10-9095A, and about 50 cm (19.7 in.) of cable extending past the top of the cable track for 220-01508A.
7. Close the cable track and reconnect it to the carriage.
8. Install the camera post onto the away side (right side) of the universal carriage using two countersunk screws and two cap screws. Before installing the camera post, the yaw adjustment front Vee push rod must be pushed to the left to prevent interference with the camera post.

Note: To prevent the post from rocking off the mounting pads, install the countersunk screws first.

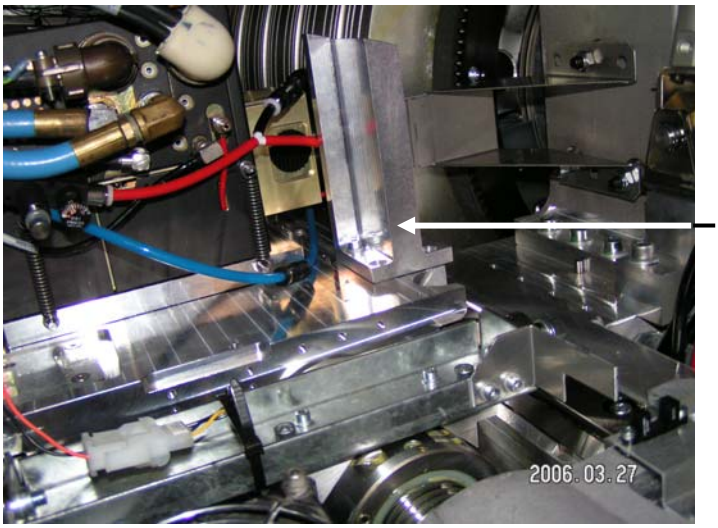


Figure 1: Installing the camera post

9. Connect the hotlink cable and LED power cables to the camera assembly:

   a. Run 220-01508A through the strain relief clamp (or use a cable tie) in the LED driver board cage. After that, connect the ends as labeled—the connector with 12 wires goes to J1 (CTRL_IN) on the "first" LED driver board, and the connector with 2 wires and a jumper goes to J2 (CTRL_OUT) on the "last" LED driver board (or the same LED driver board when only 1 board is fitted). Secure the strain relief clamp or cable tie.

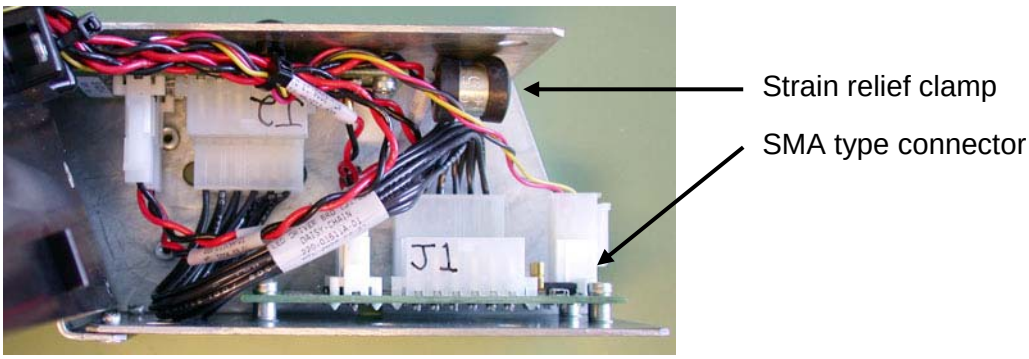


Figure 2: Camera assembly connections (dual LED driver board)

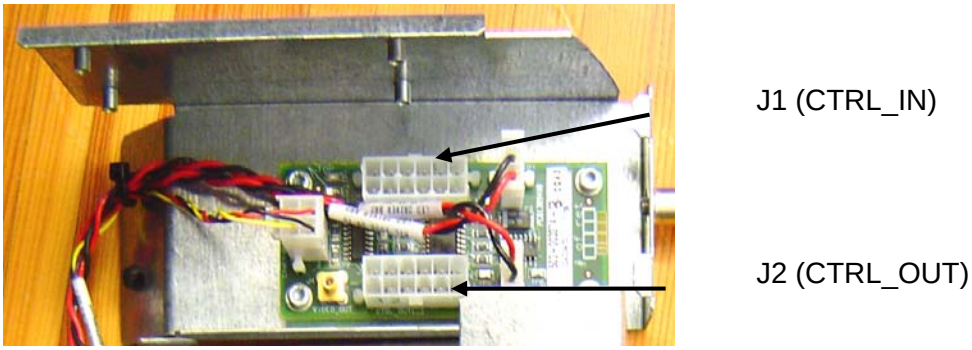


Figure 3: Camera assembly connections (single LED driver board)

b. Connect the small connector on 10-9095A to the SMA connector on the “first” LED driver board (J4).

10. Install the thermal head. Take care not to bump the head against the camera post while installing it onto the carriage.

11. Place the camera assembly on top of the camera post and fasten it with three screws (two socket head and one countersink). Take care not to pinch the camera wires between the camera assembly and the camera post during installation.
Use cable ties if necessary to secure cables 10-9095A and 220-01508A such that they will not interfere with any of the carriage moving parts.

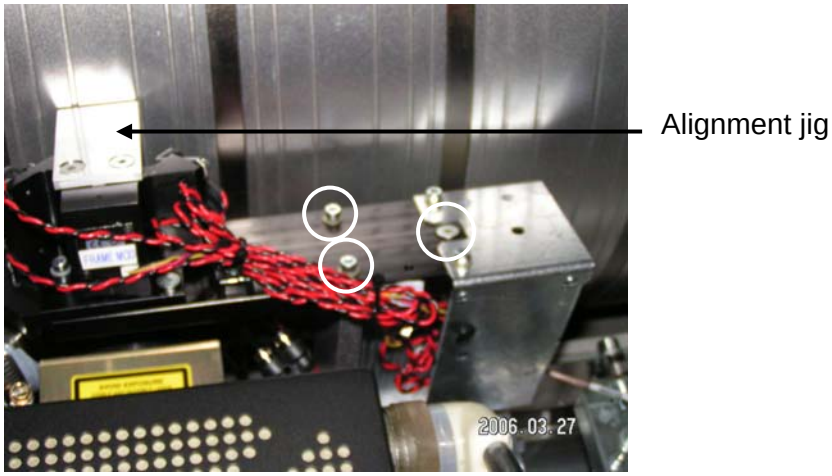


Figure 4: Installing the camera onto the camera post (old camera assembly)

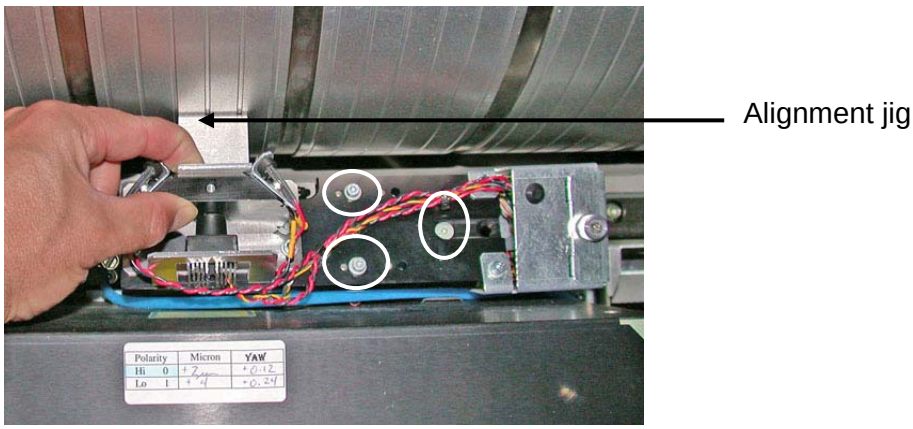


Figure 5: Installing the camera onto the camera post (new camera assembly)

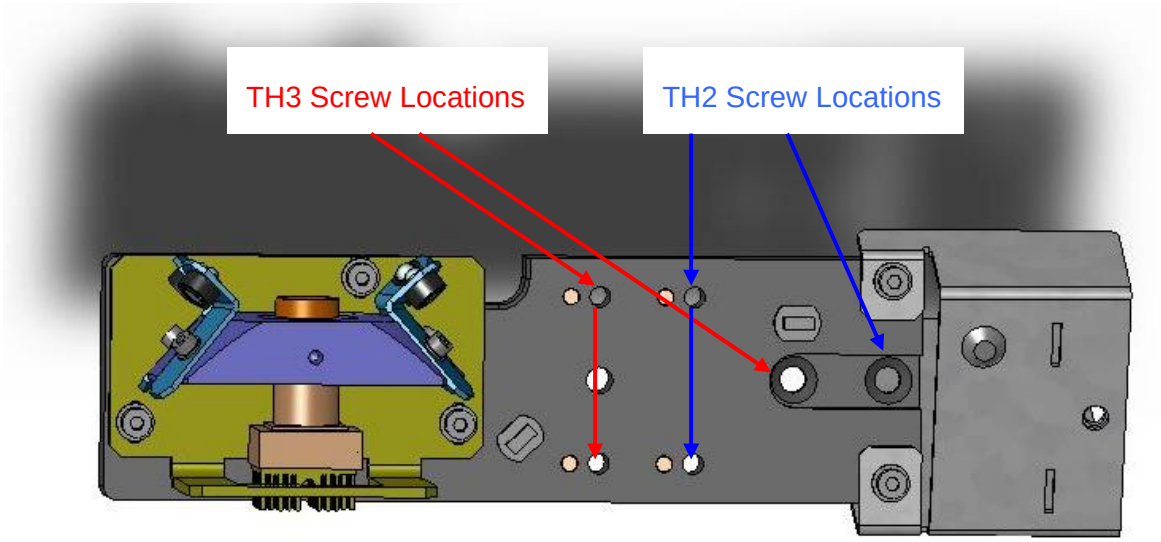


Figure 6: Different screw locations for TH3 and TH2

12. Attach the alignment jig to the top of the camera so that it is between the camera and the device drum as shown in Figure 4.
13. Push the camera down and towards the drum so that the alignment jig is against the drum.

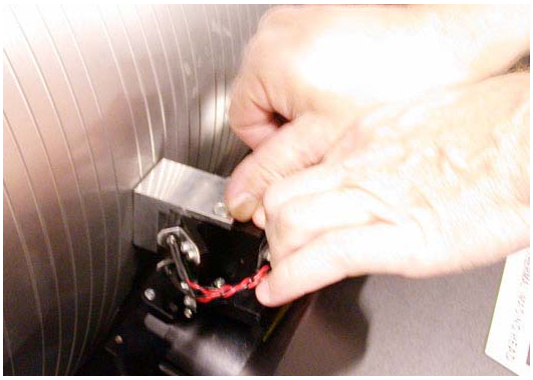


Figure 7: Camera alignment (old camera)

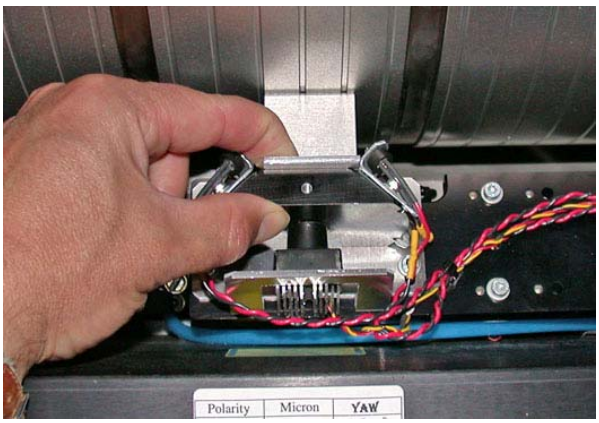


Figure 8: Camera alignment (new camera)

14. Tighten the three screws that hold the camera head in place.

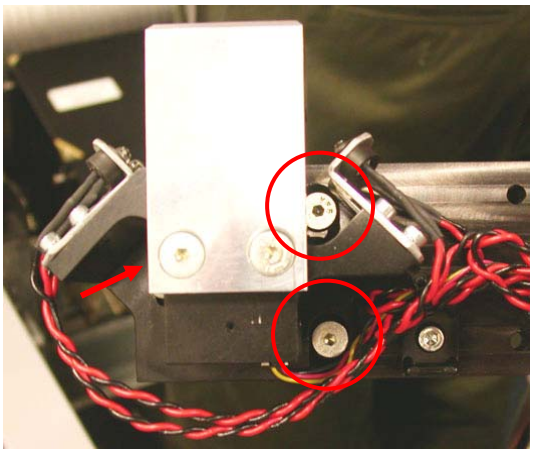


Figure 9: Tightening three camera screws (old camera)

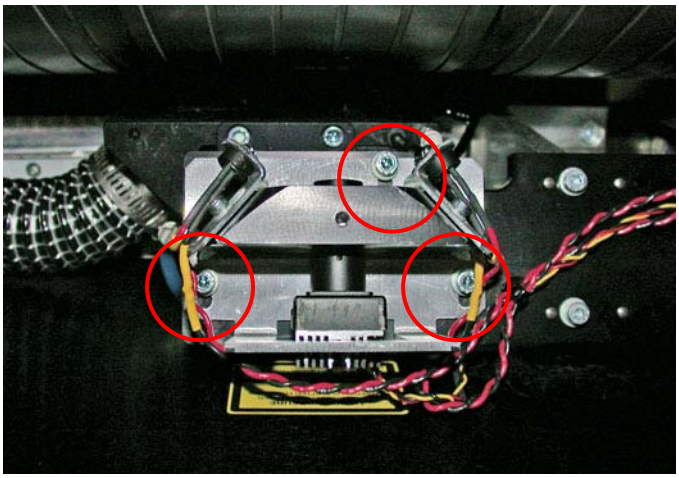


Figure 10: Tightening three camera screws (new camera)

15. Remove the alignment jig from the top of the camera and store it on top of the camera post for future camera alignments.

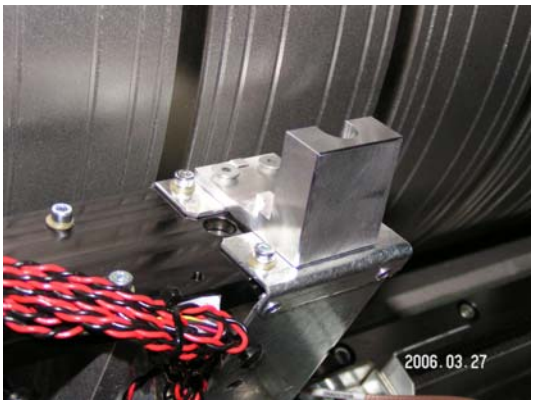


Figure 11: Alignment jig storage position (old camera)

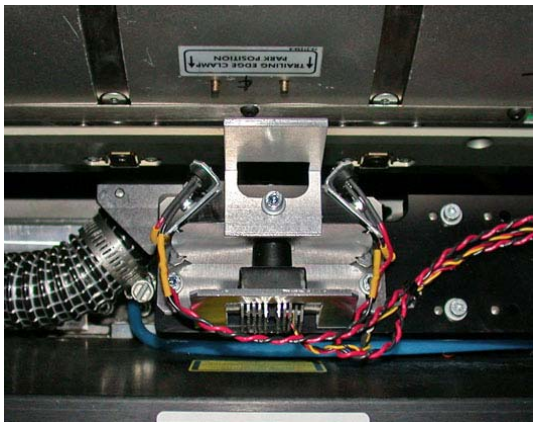


Figure 12: Alignment jig storage position (new camera)

5. DRUM VACUUM GROOVE BLACKENING

5.1 Procedure

The suggested procedure is:

1. Load a plate (in the same way that the customer loads this plate size)
2. Open the rear hood
3. Blacken the 2 vacuum grooves closest to the plate edge, for the **full** plate length. Note that the camera may take several images along the plate edge. Do not blacken the drum surface, only the groove.
4. Unload the plate
5. Blacken the 2 adjacent vacuum grooves that were previously hidden by the plate edge
6. Repeat for all plate sizes, and for the home and away plates.

Notes:

The camera may take pictures anywhere along the plate edge - the picture locations are NOT confined to the positions configured in Print Console.

Both the sides and the bottom of the vacuum groove should be blackened.

5.2 Background information on why drum blackening is needed

When the plate edge overlaps slightly over a vacuum groove **reflection** from the far side vacuum groove **eliminates the plate edge shadow**. There is then insufficient contrast between the plate and the drum and the camera finds the edge in the wrong place.

In the pictures below the vertical white line is where the image processing algorithm finds the plate edge.

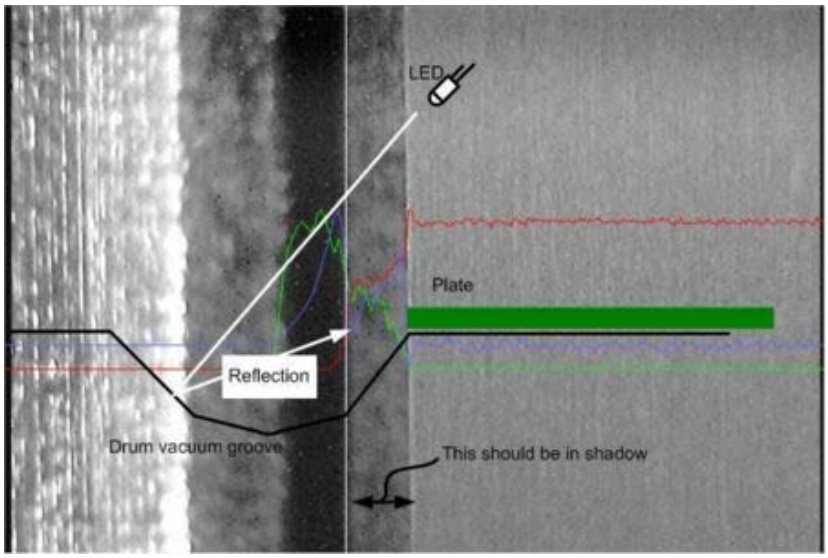


Figure 13 Vacuum Groove Reflection (note how there is no shadow next to the plate edge)

Blackening the vacuum groove eliminates this problem because (a) it cuts down on the reflection and (b) provides more contrast between plate and blackened groove.

This picture shows how blackening the vacuum groove solves the reflection problem:

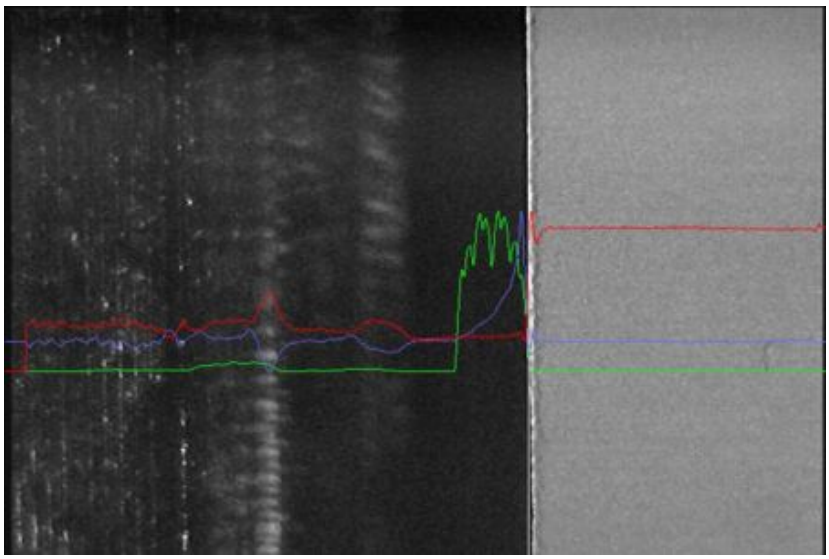


Figure 14 Plate edge shown against a blackened drum vacuum groove

6. CHECKING THE CAMERA IMAGE QUALITY

6.1 Service Shell Edgecam Applet

Camera images may be viewed in the Service Shell “Edgecam”applet, which is located under the ‘Tools’ tab. The following functionality is available:

- Viewing the latest image captured by the camera, for example after the **video on** monitor command.
- Browsing through the images captured during the course of a camera edge detect. These images are indexed by date and time and are very useful when identifying camera edge detect problems.
- When browsing previously saved images, check the “Show Graphs” checkbox to see visually where the image processing found the edge (marked by a vertical white line).
- Exporting images to assist in remote problem solving. Images may be saved either as Windows Bitmap .bmp files which can be viewed on any Windows PC, or as .raw files which are compressed and contain additional data that is useful for remote debugging.
- Import images previously saved in the .raw file format so that the images and associated data can be viewed.

Note that as part of an edge detect sequence several pictures will be taken. The exact number of pictures depends on the exact configuration, two pictures are typically taken for landscape plates and 4-5 images are typically taken for portrait (or ‘side edge registered’) plates.

6.2 Strobe Configuration Parameters

Note: The new camera ((500-05190A) requires CR4.1 firmware or higher (firmware version 1.22.56 or higher). If the new camera is installed then check that the correct firmware version has been installed.

The strobe intensity and duration are configured by the following parameters

- set edgecam StrobeDuration
- set edgecam StrobeIntensity (should be 15)

StrobeDuration varies between 1 and 20 us. The exact value will depend on the CCD sensitivity. It is important that the image is neither too bright nor too dark because this can confuse the image processing algorithm. The pictures below serve as a reference to selecting the correct brightness.

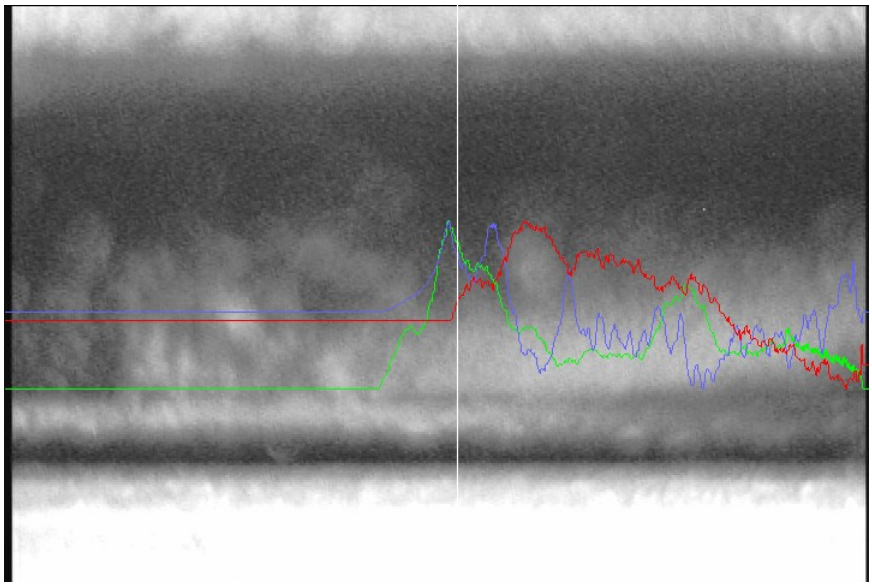


Figure 15: Overexposed (reduce StrobeDuration)

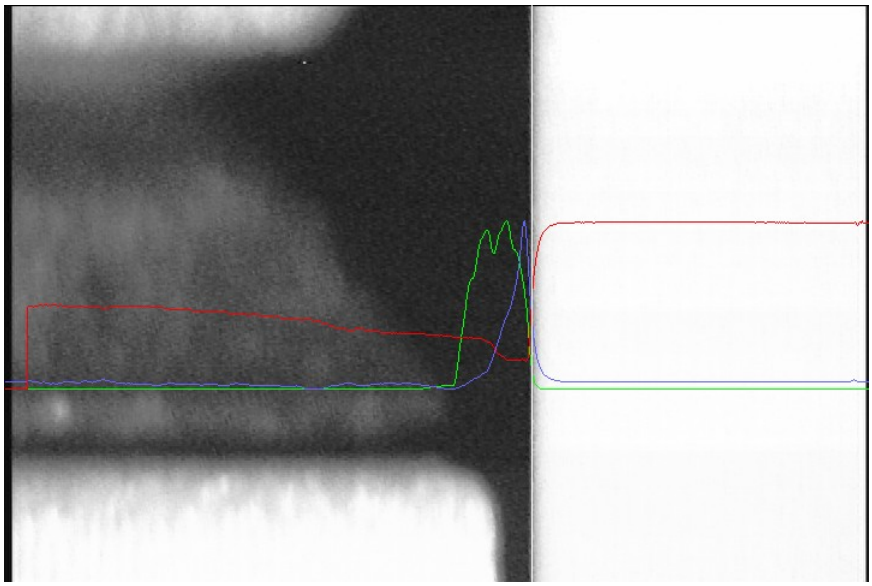


Figure 16:: Overexposed (reduce StrobeDuration)

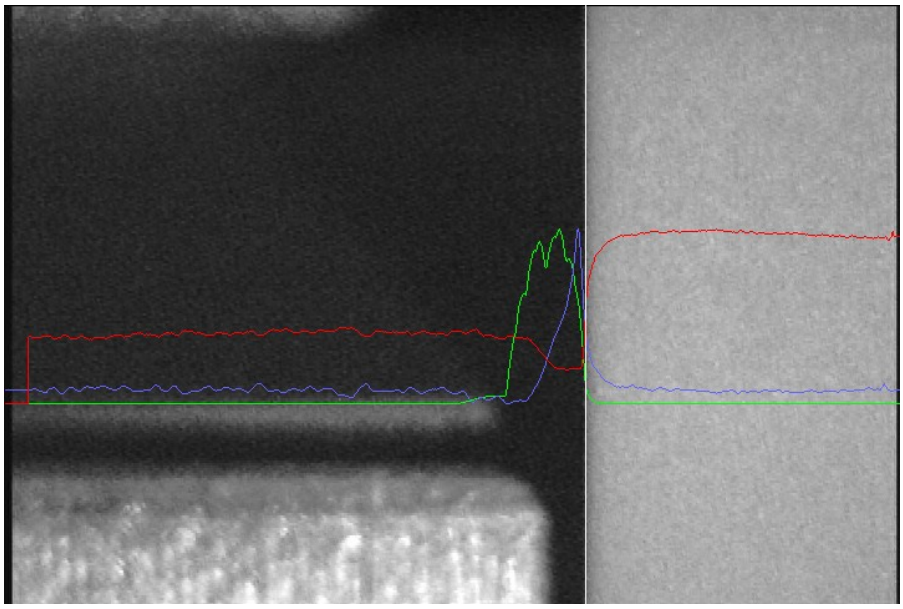


Figure 17: Optimal StrobeDuration

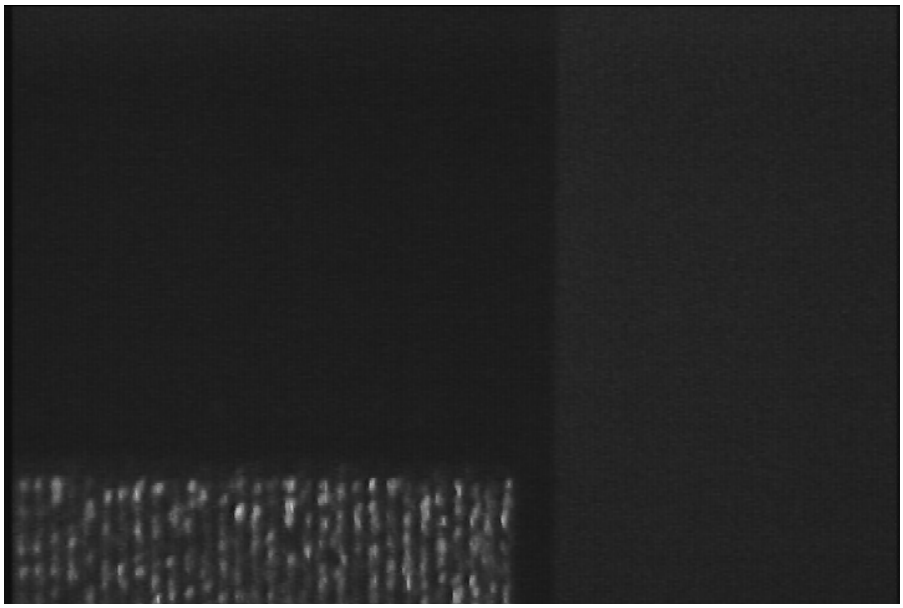


Figure 18: Underexposed (Increase StrobeDuration)

7. CALIBRATING THE EDGE DETECT CAMERA

Camera calibration is needed to set the subscan scale and subscan offset from the focus laser, the mainscan camera position, and the strobe configuration. Calibration must be repeated after removing and replacing the same camera (after cleaning) or after removing and replacing the same head (after cleaning).

Focus laser edge detect must be working reliably as the camera is calibrated with respect to the focus laser.

A service tool inside the Service Shell client application enables you to view live camera images and to browse stored images. The camera images are transferred to the workstation and are stored there as image files. To view the camera images, open the Service Shell client 3.1.x , open the **Tool** bar, and select **EdgeCam**.

Note: Viewing live camera images require the existence of DCAPI server version 2.0.5 and the **option camera-edge-detect** to be enabled in the device firmware.

7.1 Mainscan Calibration

Mainscan calibration is required so that when a requested edge detect point is specified (microns from the leading edge) the camera finds the edge at the correct drum position.

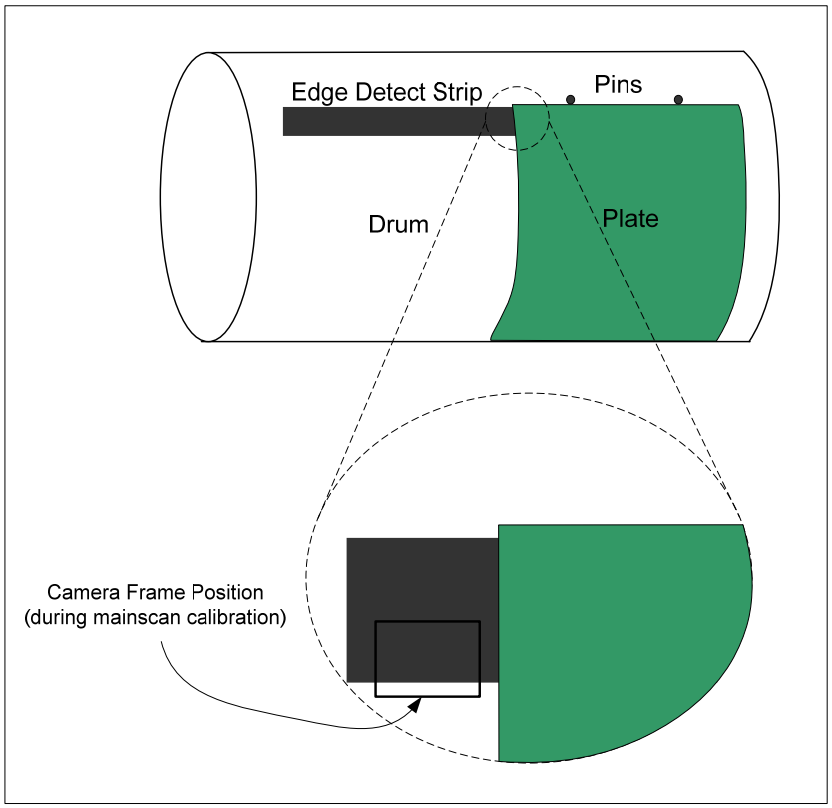


Figure 19: Mainscan calibration diagram

1. Enable the edge detect camera. Type `>>option camera-edge-detect enable.` Reset the device for the option changes to take effect.

2. Load a plate onto the drum.

   a. Type `>>edge test camera` to get the carriage positioned over the plate edge

   b. Type `>>drum move 20` to move the drum to approximately 20 degrees so that the edge detect strip will be visible.

   c. Type `>>video on` – video will now be visible in the EdgeCam Service Shell applet at about 1 frame per second.

   d. Make fine changes to the drum position (`>>drum move x.x`) until the picture looks like the one shown in Figure 20.
   The reference mark should be as close to the boundary between the drum and the blackness of the edge detect strip as possible. The edge of the edge detect strip must be approximately 100 pixels from the bottom of the image.

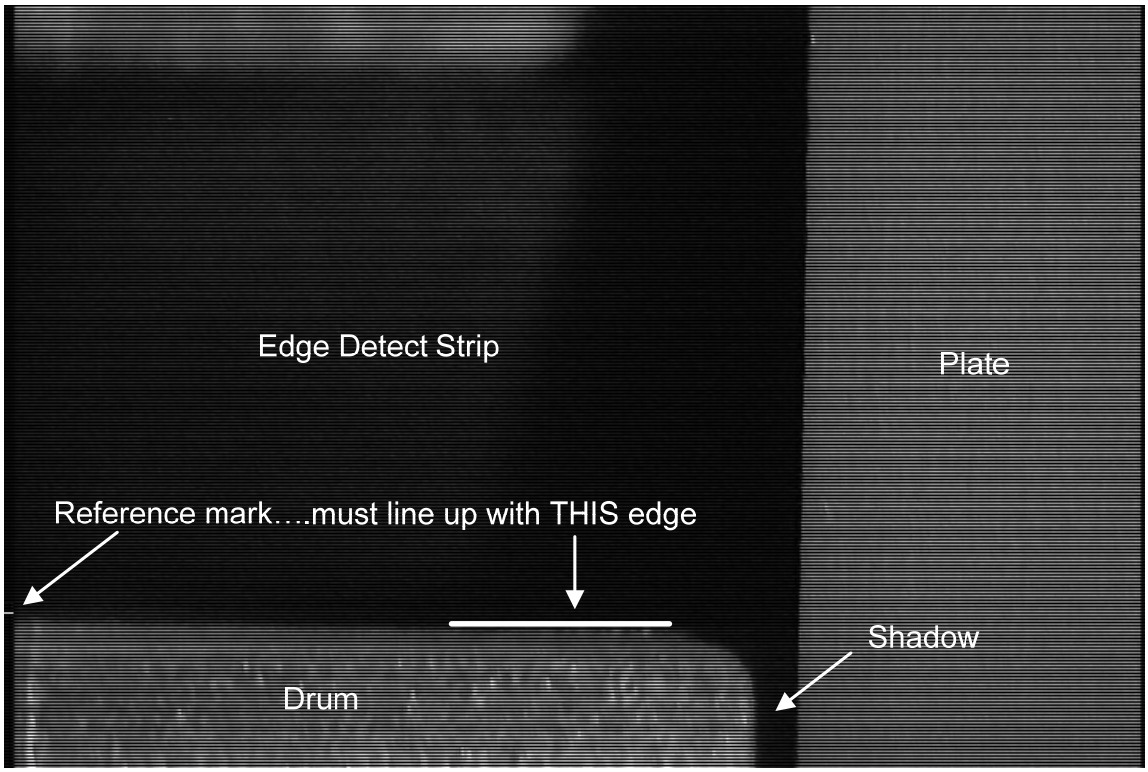


Figure 20: Camera image showing edge detect strip, plate, and drum

   e. Type `>>set edgecam MsOffset` to set the NVS parameter to the drum position.

7.2 Subscan Calibration

7.2.1 Background Information on Calibrating the Subscan Scale

The firmware has a built-in procedure for finding the edge at multiple points across the field of view. The carriage moves in small increments and the plate edge is found at each position the result is a linear relationship between carriage position and edge position (camera pixels). The slope of this line gives the scale [microns per camera pixel].

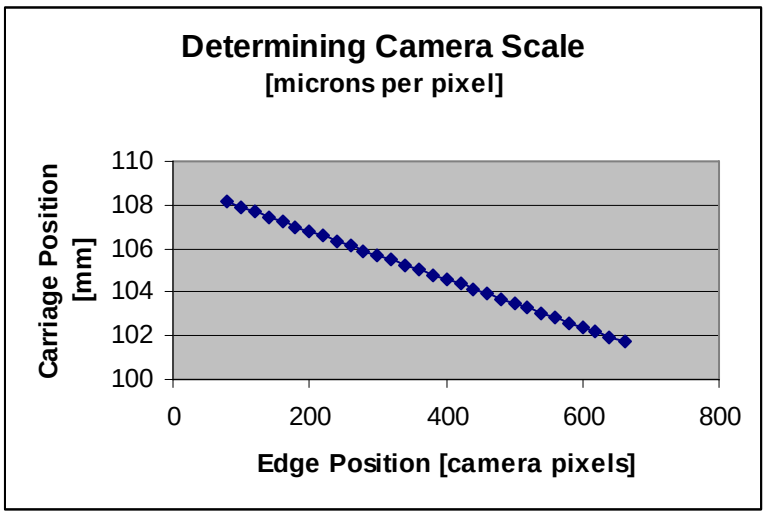


Figure 21: Determining camera scale

Notes:

- During calibration the carriage moves in one direction only to eliminate errors due to backlash
- 30 points gives a good tradeoff between accuracy and speed
- Very small errors in scale would lead to significant errors when multiplied across the field of view. For example an error of 0.04 um/pixel gives an error of 14 microns when multiplied across half the field of view (360 pixels).

7.2.2 Calibrating Scale and Subscan Offset

Scale is a measure of camera magnification and depends on the plate thickness, the precise camera to plate distance and varies with manufacturing tolerances.

Subscan offset is the physical distance between the camera and the focus laser. This could change if the camera or head is removed, cleaned and then replaced. The camera is typically not mounted perfectly perpendicular to the drum and therefore the subscan offset will vary depending on the plate thickness.

The offset is taken from the center of the camera field of view to the focus laser.

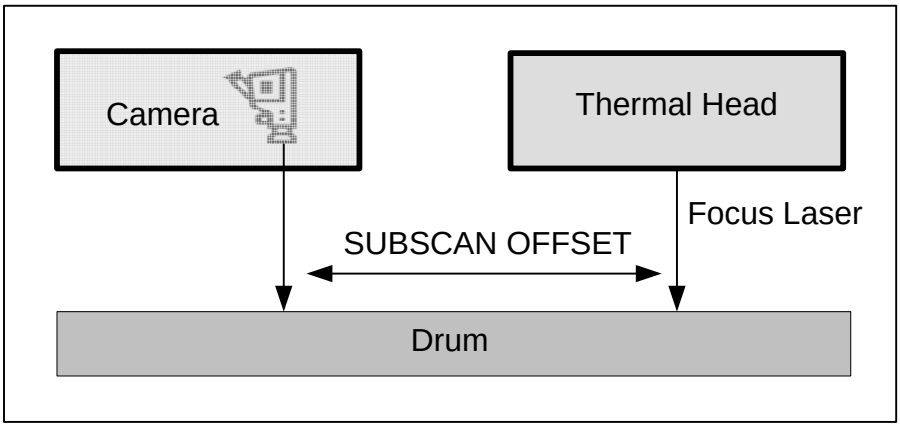


Figure 22: Calibrating subscan offset

Note: During head production the offset between focus and write laser is calibrated.

Choosing calibration media thicknesses

Calibration must be repeated for two different media thicknesses to allow the firmware to extrapolate the **Scale** and **SsOffset** parameters to any other plate thickness.

- If a site uses only a single media thickness then calibration can be done for that thickness only. However if a different thickness is used the edge detect will fail edge detect with the error “Camera has not been calibrated for this media thickness”.
- Choosing the two extreme media thicknesses gives the best extrapolation. For example, if a site uses 200, 350, and 400 um plates, use the 200 um and 400 um plates during calibration.
- Due to variations in actual media thickness from the nominal value, the edge detect accuracy will be best for the media thicknesses calibrated.

7.2.3 Initial Setup Procedure

1. If it is not already done, do the mainscan calibration.
2. If this is a new camera installation, give the camera some rough estimates to work with. Type:

```
>>set edgecam calibmediathick 1 <plate thickness in microns>

>>set edgecam calibmediathick 2 <plate thickness in microns>

>>set edgecam scale 1 10

>>set edgecam scale 2 10

>>set edgecam ssoffset 1 0

>>set edgecam ssoffset 2 0

>>option camera-edge-detect enable
```

3. Obtain a more accurate estimate for the **SsOffset**. This is needed so that the calibration can accurately position the camera with respect to the plate edge.

   a. Load a plate.

   b. Type `>>edge test` to find the edge with the focus laser.

   c. Type `>>edge test camera` to find the edge with the camera.

   d. Subtract: SsOffset = Focus_Edge – Camera_Edge (may be negative). Set the SsOffset parameters for both media thicknesses to this value.

Repeat the steps below for two plate thicknesses and seven plates of each thickness.

4. Load a plate, and find the edge with the focus laser. Type:
   `>>edge test`

5. Type `>>edgecam calib ss <focus laser edge in mm>` to trigger calibration. For example, if the focus laser found the edge at 70.123 mm, enter `>>edgecam calib ss 70.123`.

6. Type `>>edge test camera`. The firmware will now find the edge multiple times across the field of view and calculate the calibration values.

7. After the sequence completes, type `>>edgecam calib` to show the calculated **Scale** and **SsOffset**. Record the **Scale** and **Ssoffset** values for later use.

7.2.4 Set the NVS Parameters

Average the 7 Scale and 7 SsOffset together for each media thicknesses.

Set the CalibMediaThick, Scale and SsOffset NVS parameters for both media thicknesses.

Note: After calibration, the camera edge detect and focus laser edge detect should find the plate edge in the same place, within a tolerance of ± 25 microns.

7.3 Field blank Zone

The BlankZoneBefore and BlankZoneAfter parameters should remain at the default values of 250000.

Background Info: The size of the blank zone influences the duration when the camera is sensitive to light, and hence is capable of detecting the very short LED strobe. When a strobe falls within the “blank zone” the captured image will be black. Xilinx detects this situation so that the image can be captured on the next drum revolution. Increasing the blank zone will cause Xilinx to reject more images (hence slowing throughput).

The field blank zone applies to the new camera (500-05190A) only.

8. PRINT CONSOLE CONFIGURATION

Print Console 4.5

The three registration modes supported in Print Console 4.5 are:

1. Leading Edge
2. Configurable Leading Edge
3. Configurable Side Edge

Note: Options 2 and 3 are controlled via licensing.

Note: If the camera is disabled, only leading edge and side edge registration modes will be available.

The configurable leading edge registration point must be set in Print Console to align the registration position with the pusher for the punch.

4. In the **Media Tool** window, select the following:
   - Registration mode – Configurable Leading Edge
   - Edge to pin offset – 177 mm

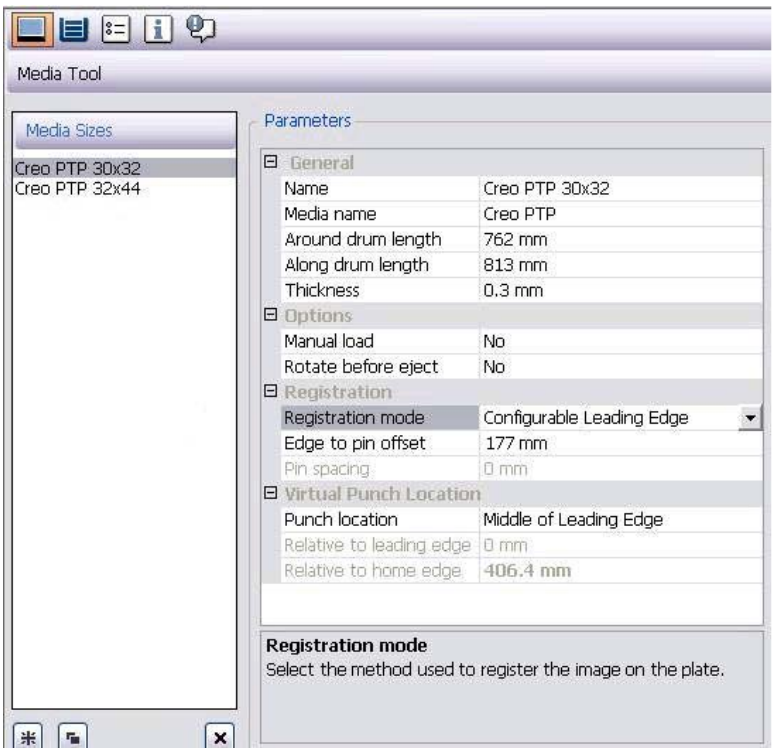


Figure 23: Print Console 4.5 settings

5. Click **Apply**.

Note: The edge to pin offset value of 177 mm matches the side registration pin on the Kodak punch. When registering to 3rd party equipment, this value should be configured to match the actual side registration location.

Print Console 4.6

Registration can be done on either the home side or the away side of the plate. The screenshot below shows the registration modes available.

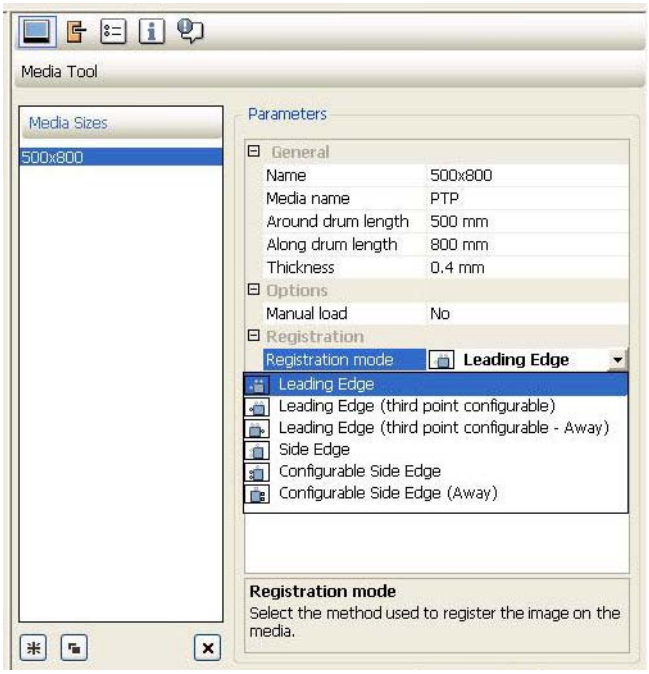


Figure 24: Registration modes

The three registration modes for home edge detection are:

1. Leading Edge
2. Leading Edge (third point configurable)
3. Configurable Side Edge

Note: Options 2 and 3 are controlled via licensing.

The Leading Edge (third point configurable) value must be set in Print Console to align the registration position with the pusher for the punch.

4. In the **Media Tool** window, select the following:
    - Registration mode – Leading Edge (third point configurable)
    - Distance to the third point – 177 mm

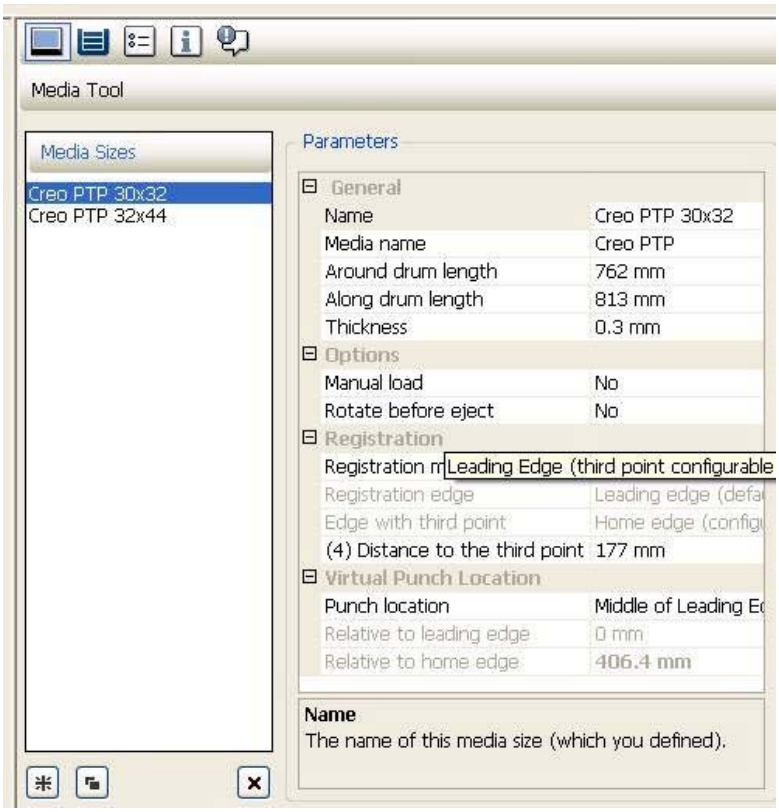


Figure 25: Print Console 4.6 settings for Home registration

5. Click Apply.

Note: The value of 177 mm matches the side registration pin (third point) on the Kodak punch. When registering to 3rd party equipment, this value should be configured to match the actual side registration location.

The two registration modes for away edge detection are:

- Leading Edge (third point configurable - Away)
- Configurable Side Edge (Away)

Note: Both options are controlled via licensing.

To perform away edge detection, select one of the two away edge registration modes and specify the registration point(s) on the away edge.

For Leading Edge (third point configurable – Away), specify one point on the away edge.

1. In the **Media Tool** window, select the following:
   - Registration mode – Leading Edge (third point configurable - Away)
   - Distance to the third point – 10 mm

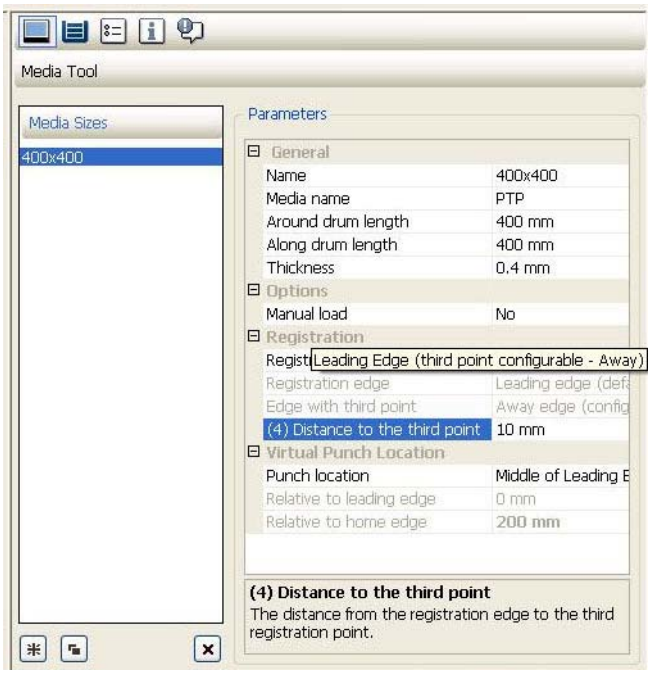


Figure 26: Print Console 4.6 settings for Away registration

2. Click Apply.

Note: The value of 10 mm matches the side registration pin (third point) on the Kodak punch. When registering to 3rd party equipment, this value should be configured to match the actual side registration location.

For Configurable Side Edge (Away), specify two points on the away edge.