ILS User Guide Supplement
Universal Camera Registration (UCR)

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Universal Camera Registration

OVERVIEW

Camera Registration enables the laser system to automate the alignment of a vector path to the material to be processed for improved process control and a finer quality vector cut and vector mark process. Vector patterns are precisely aligned to the material's registration marks by using a camera and pattern recognition software to locate the X/Y coordinates of the material's registration marks. The difference between the X/Y coordinates of the material's registration marks and the X/Y coordinates of the art work's registration marks is calculated to translate, rotate, and stretch the vector pattern before laser processing begins.

NOTE: It is critical that the design file and the artwork on the material used to create the vector pattern are dimensionally matched. A recommended practice is to use three different printing layers in the graphic design file:

- *a common layer for positioning registration marks that will be sent to both the printer for printing on the material and to the laser system*
- *a second layer containing the print artwork to be printed on the material*
- *a third layer to contain the superimposed vector pattern that will be sent to the laser system.*

Your graphics software package must support layering to use this practice.

INSTALLATION

The camera registration software is integrated with the Universal Control Panel (UCP). However, it has a separate installer that must be run after the UCP has been installed on the computer connected to the laser system.

NOTE: Windows XP/Vista/7.0 Users must have .NET Framework 4.0 or higher installed on the system before running this software. The .NET framework can be downloaded and installed from Microsoft's support website: https://www.microsoft.com/net/download

Installation Steps

1. Install the UCP software. Refer to the installation guide for further instructions.

2. Install the camera registration software located on the installation CD included with your laser system. During the installation process you may be asked to install I-Net Stream video camera drivers. Make sure to allow the installation of these drivers.

3. Connect the laser system to the computer via USB cable.

CALIBRATION

In order for the registration process to function correctly, the camera must be calibrated to the lens. During calibration, the system learns the distance between the laser focal spot and the center of the camera's viewable area. Calibration is normally performed at the factory, however recalibration may be necessary if service is performed on the laser system or if a lens has been replaced. The registration system is calibrated at four locations on the field and calibration values are automatically interpolated between these locations for better accuracy.

Steps to Calibrate the UCR

1. Navigate to the System Tab (1) of the UCP and locate the Camera heading. Tap the Calibrate (2) button to launch the calibration window.
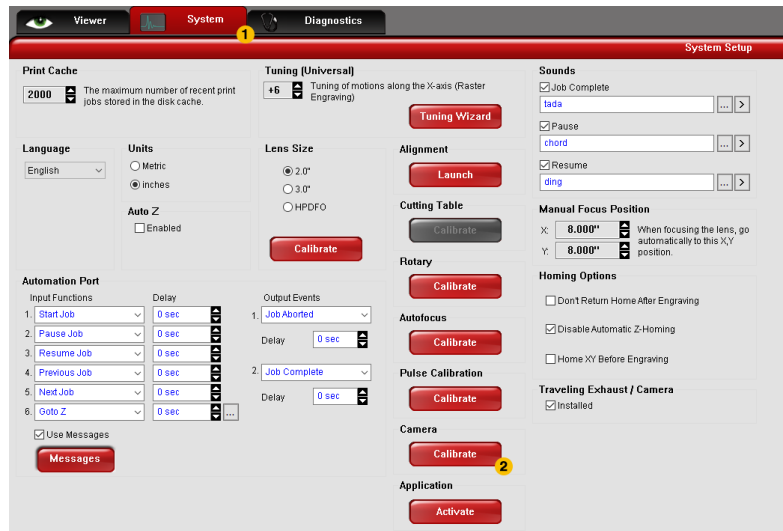
2. Select Goto 1 (1) in the the target location section. The motion system will move to this location.

3. Open the top door of the laser system and place a piece of anodized aluminum under the camera and, using the corresponding focusing tool, make sure the system is focused to the material. Close the top door.

4. Press the Calibrate (2) button. The system will mark a cross-hair on the anodized aluminum, then move the camera over the mark, perform a seek routine to center the camera on the mark, then store the X/Y offset for that location. Press Display Cross-hair (3) to verify the location.

5. Repeat steps 3 and 4 for each location in numerical order. Tap Save Camera Calibration (4). If a value was previously set, an overwrite window will display asking to overwrite the settings. Click YES. The window closes automatically.
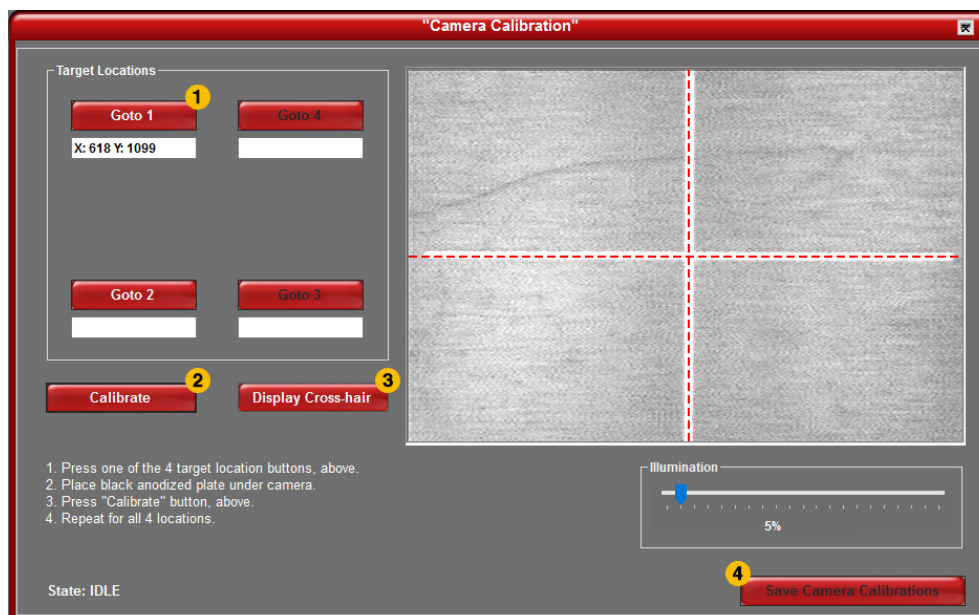
PREPARING THE ARTWORK WITH REGISTRATION MARKS

The UCR software automatically searches for registration marks in artwork being printed or imported into the UCP by looking for a certain shape in a designated color. The pre-defined registration mark shape is shown here.

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Registration Mark Setup

Color - Registration marks are identified by the default color, magenta. It is recommended that the color of the registrations marks, magenta or otherwise, should not be used in the artwork cut pattern or for any raster or vector objects.

Size & Shape - Registration marks should measure 0.25 in (6 mm) and are preferably a cross-hair shape. A teach mode will allow the camera to recognize other sizes and shapes of registration marks with a maximum size of 0.45 in (11 mm) and a minimum size of 0.05 in (1.3 mm). Registration marks must be set as hairline vectors (0.001 pt) in the graphics software package to be recognized when printed or imported.

Spacing - Registration marks should be at least 0.59 in (15 mm) from any other feature to prevent misidentification of a registration mark and a portion of a vector pattern.

Distance - For the best accuracy, position registration marks as far apart from each other as possible. For best results, place registration marks at the furthest edges or "corners" of the artwork being registered.

NOTE: *Registration marks cannot be placed in the left most 1.5 in (38.10 mm) area of the laser processing field. The camera is mounted to the right side of the focusing carriage, restricting camera visibility. However, the vector artwork itself can extend into this area.*

Contrast - Registration marks should stand out from their surroundings. To ensure easy identification, there should be sufficient contrast between the mark and the background.

NOTE: *If processing transparent materials, a material of a contrasting color to the registration marks can be placed under the material to improve visibility.*

PRINTING/IMPORTING TO THE UNIVERSAL CONTROL PANEL (UCP)

Artwork containing registration marks and vector patterns that follow the Registration Mark Setup rules can be printed to the UCP using the ULS print driver or can be exported to DXF or PDF format and then imported into the UCP. *Please see the Direct Import section of the ILS User Guide for additional information on this optional laser processing support module.*
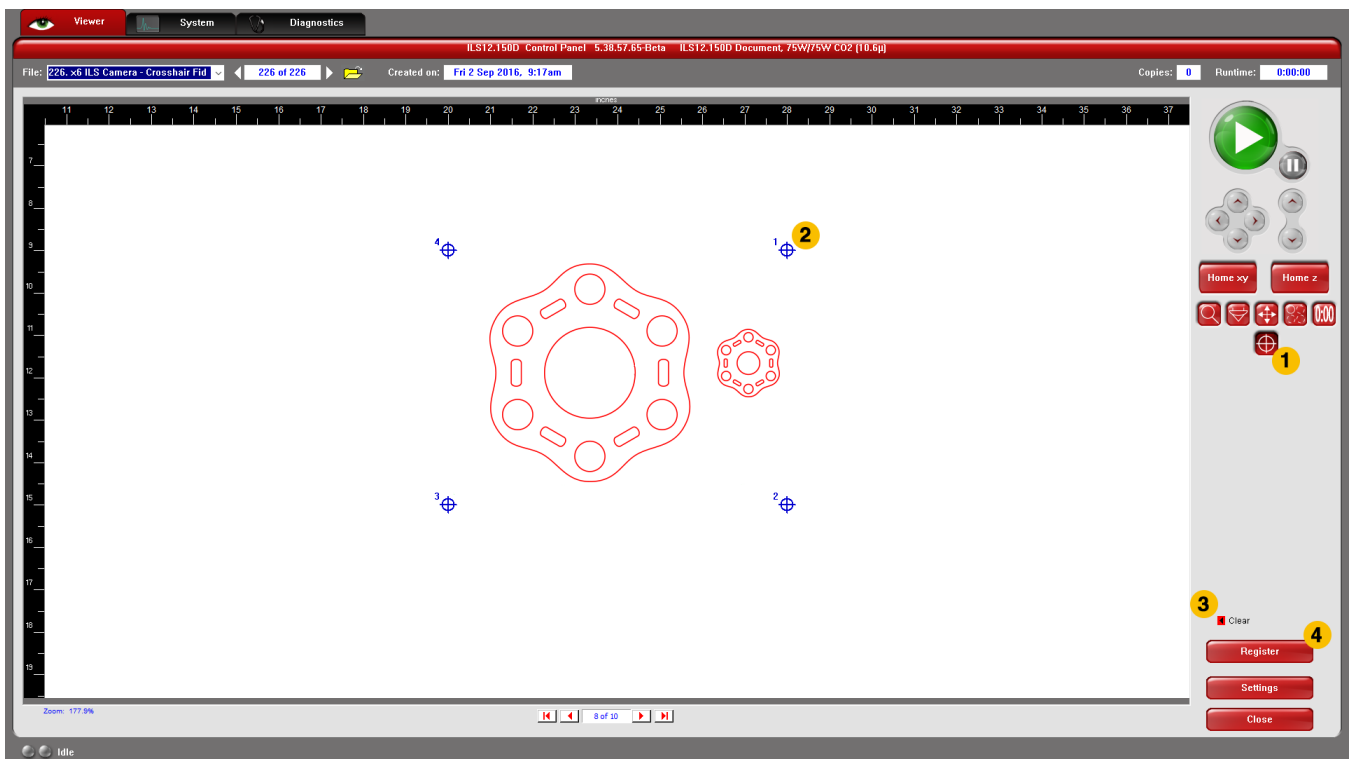
ENTERING THE REGISTRATION PROCESS

When the camera registration software is properly installed, the Registration View button will appear in the View tab of the UCP. This button enables the user to enter the camera registration process.

1. Select a laser processing file containing registration marks previously printed or imported into the UCP.

2. Select the Registration View button (1). All registration marks in the artwork will become highlighted. A greyed out Register button will appear for the user to launch the registration process once registration marks have been chosen.

3. Select at least two and no more than four registration marks from those registration marks present in the artwork. To select registration marks, use the mouse pointer to click on each one in the order you would like the system to seek each registration mark. A number will appear (2) next to each mark illustrating the selected order. Once registration marks are selected, the registration button will become accessible. A Clear button (3) is provided above the Register button to clear the seek order if the user wants to change the seek order.

> **NOTE:** *If more than four registration marks are present in the design file, the system will highlight all registration marks but will not allow you to select more than four.*

4. Click the Register button (4) to launch the Universal Camera Registration window.

FUNCTIONS OF THE UNIVERSAL CAMERA REGISTRATION (UCR) WINDOW

The UCR window consists of three sections enabling full control and visibility of the registration process.
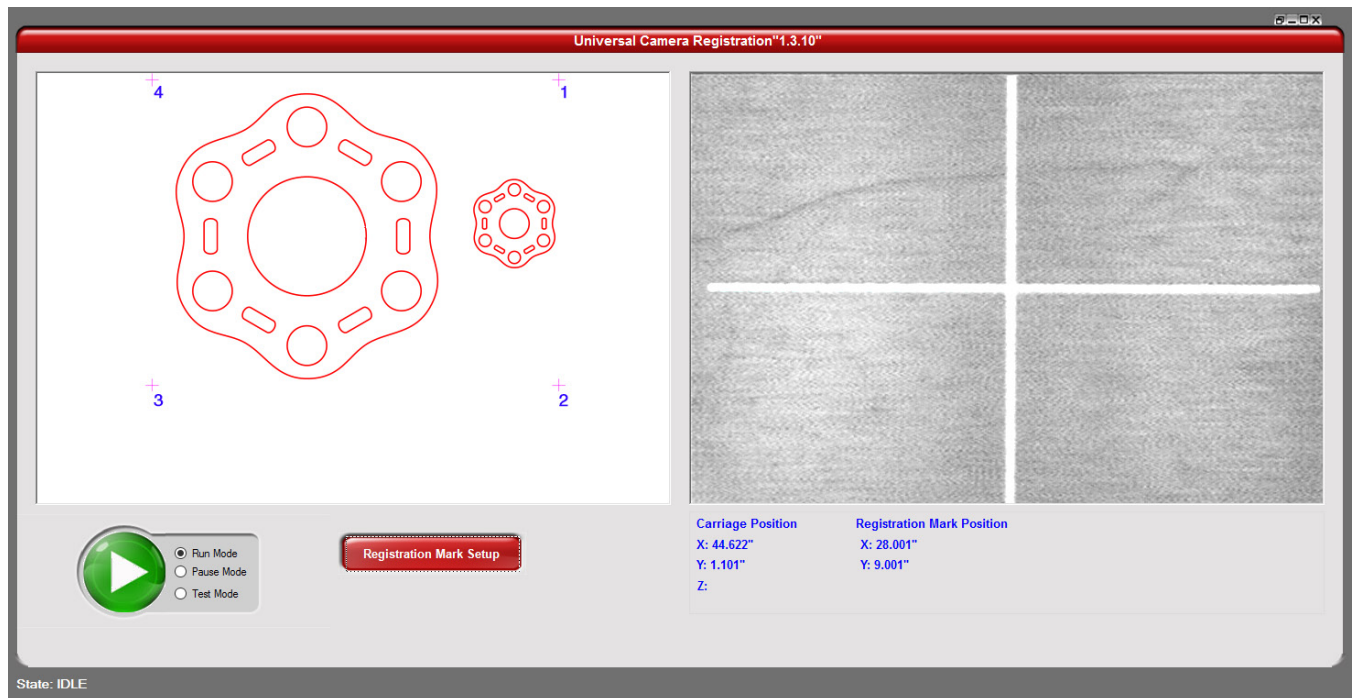
Artwork Preview

Enables the user to see the artwork, identify selected registration marks, and view which registration mark is currently being sought.

Camera View

The Camera View enables the user to view the camera seek process, identify the camera's current coordinates, and view the registration marks position.

UCR Controls

The UCR controls enable the user to begin laser processing, perform dry runs, troubleshoot, and adjust registration mark settings.

Play

Press Play to begin the selected radio mode.

Run Mode Radio Button

Initiates the seek process. The camera locates each registration mark, after which the laser will cut or scribe the material.

Pause Mode Radio Button

Forces the seek process to pause after centering on each registration mark. This mode is useful for checking the accuracy of each registration mark before moving on to the next registration mark. After locating the registration mark, the cross hairs overlaid on the Camera View should be centered on the registration mark. Any error in centering will translate into an error in the alignment of the vector pattern with the material. If the alignment is good, press Play to move to the next registration mark. This mode is useful for troubleshooting.

Test Mode Radio Button

Forces the seek process to pause after all the registration marks are located just before cutting or scribing the material. This mode is useful for troubleshooting.

Registration Mark Setup

Changes the registration mark type, inverts colors, and modifies LED illumination.
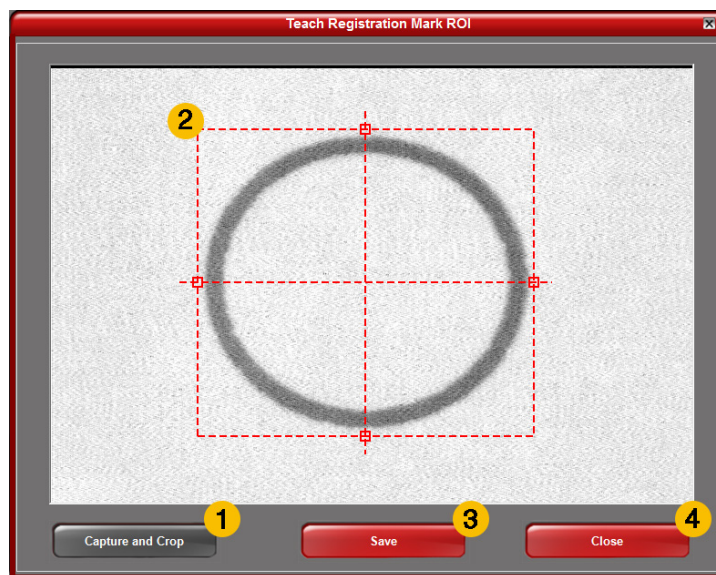
Select Registration Mark

Click the radio button to select the registration mark you will be using. If you are using the default registration mark, no click is needed. If you which to use a different registration mark, press the Teach Custom radio button and the Teach Registration Mark window will appear.
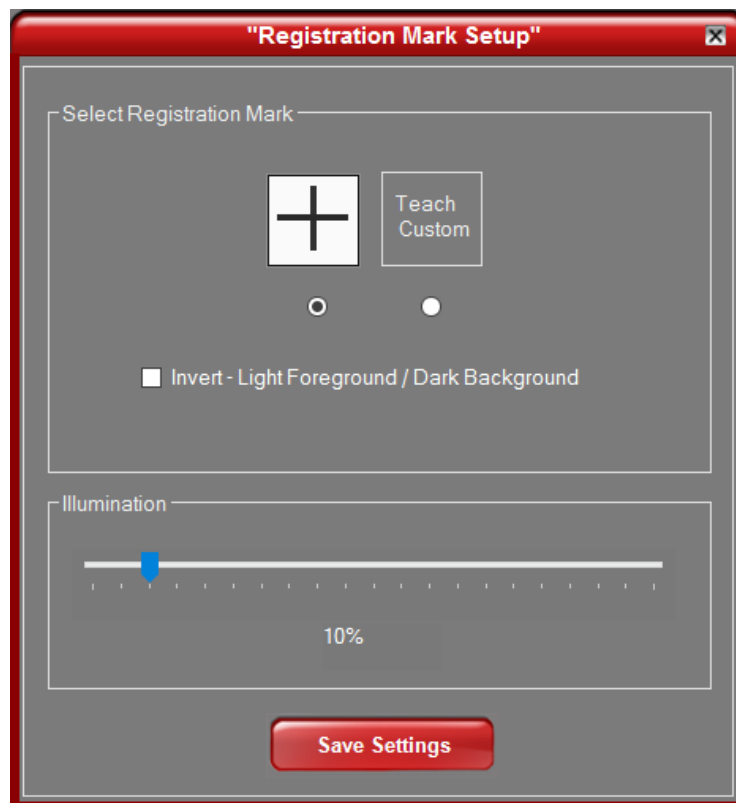
Teach Registration Mark Window

To use a registration mark other than the default cross-hair mark, use the following steps to teach the UCR a new registration mark.

1. With the Teach Registration Mark window open, position the camera over the registration mark using the motion controls in the UCP.

2. Press the Capture and Crop button (1) to freeze the camera's view. A crop box will appear in the window.

3. Move and size the crop box (2) to fully encompass the registration mark. The more accurate the crop is, the more accurately the system will locate the registration mark.

4. With the crop outline set, press Save (3).

5. Close the window by pressing Close (4).

Invert

Check this box if you are processing on a dark background material, such as black, and have a light registration mark, such as white.

Illumination

Adds additional light to an otherwise dark enclosure. Slide the bar to increase or decrease illumination in increments of 5%. This feature is most often used when the light within the enclosure of the ILS is lower than normal, preventing the camera from locating registration marks.

PROCESSING MATERIAL USING UNIVERSAL CAMERA REGISTRATION
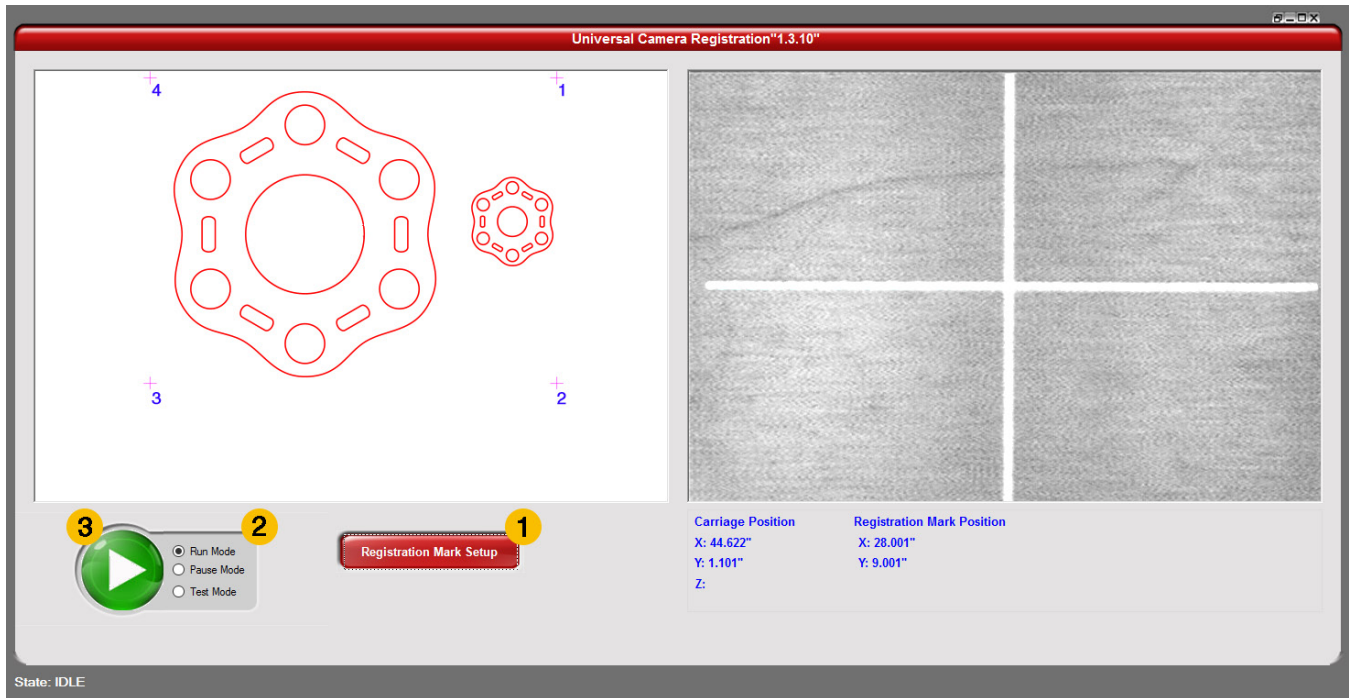
1. Set up the registration mark information in the Registration Mark Setup Dialog (1). Select the registration mark type or teach non-standard registration marks. The type selected must match the type present in the artwork. Select an illumination percentage when registration marks are in areas of the field that are not well lit, like the corners of the engraving field (optional). Once the registration mark information is selected, click Save Settings and the system will use the stored information during its run.

2. Insert material with the printed artwork and registration marks into the laser system for laser processing. For efficiency, a rough alignment guide such as a template or a fixture can be used to ensure that the registration marks are within +/-0.25 in. (6 mm) of the nominal positions in the artwork. It is also possible to use the Focus View in the UCP by moving the Carriage to the first registration mark coordinates, placing the artwork on the stage, and aligning the first registration mark with the red dot from the Red Laser Pointer. This will ensure that the registration mark on the material falls within the 0.5 in.(12 mm) window of the camera's view at each seek location. If the registration marks do not fall within the camera's view, the system will begin to seek the registration mark by moving one camera view width to the right continuing around the nominal location counterclockwise until it finds the registration mark. This will add extra time to the overall completion time.

3. Select the mode you wish to run. Run Mode will process the material where as the Pause Mode or the Test Mode buttons will perform a dry run of the registration process (this will not initiate laser processing).

4. Press Play to begin the registration process. The motion system will automatically move to the nominal position of each registration mark in the artwork in the order specified and the camera will recognize and center on the registration mark at these locations. If a dry run was selected in step 3, the system will return home after the seek routine has completed, otherwise the system will proceed to laser process the material.

5. Remove material when the job has completed.

6. Repeat steps 2-5 to process additional material.