

AutoCal 3.5

User Manual

020-100985-03

CHRISTIE®

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Install and Set up AutoCal

This section provides information and procedures for installing and setting up AutoCal.

Hardware recommendations

- Computer:
 - Intel or compatible processor (Intel Core i7-4700 or better recommended)
 - 200 MB of free disk space
 - 2 GB of RAM (Christie recommends 4 GB)
 - A true color (32 bit) display with a minimum resolution of 1024 x 768
 - 1Gbps Ethernet port and network
- Network:
 - 1 network hub
 - 1 Ethernet cable to connect the computer to the network hub
 - 1 Ethernet cable for each projector

Software recommendations

- Computer operating system:
 - Microsoft Windows 7 SP 1
 - Microsoft Windows 8
- Projector software:
 - Christie M series projectors must have Main Software version 2.3.0 or later installed

- Christie StIM WU projectors must have Main Software version 1.4.5 or later installed
 - Christie StIM WQ projectors must have Main Software version 1.2 or later installed
 - Christie J Series projectors must have Main Software version 1.1.0 or later installed
 - Christie D4K series projectors must have Main Software version 1.3 or later installed
- Adobe Reader 11 or later
 - Christie Twist 2.0 Pro or later

Camera recommendations

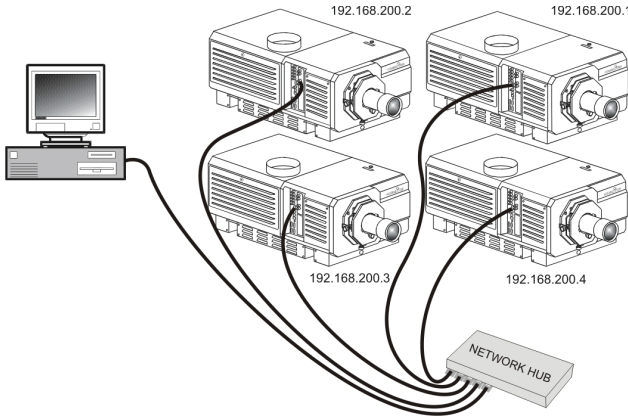
- Point Grey Flea FL3-GE-50S5M-C
- Point Grey Flea FL3-GE-20S4M-C
- Point Grey Chameleon CMLN-13S2M (USB)
- DALSA Genie C1020/DALSA Genie C1600 - These cameras are only supported by AutoCal 3.1 or earlier with a Microsoft Windows 7 (x86 or x64).

Connect projectors to the control computer

To use AutoCal, a minimum of one camera and one AutoCal-enabled projector must be connected to the control computer.

1. Connect a computer to a network hub with an Ethernet cable or use a wireless connection.

2. Connect an Ethernet cable from each projector to the network hub.



Assign a projector ID

1. Press **Menu** on the keypad or the remote.
2. Select **4 Configuration**.
3. Select **7 Communication**.
4. Select **4 Projector Address**.
5. Specify a unique identification number.
6. Press **Menu**.

Add the projector to the network

Alternative network routing options can cause time-outs and interfere with software functionality.

1. Press **Menu** on the keypad or the remote.
2. Select **4 Configuration**.
3. Select **7 Communication**.
4. Select **5 Network Routing**.
5. Select **1 Separate**.
6. Press the **Menu**.

Assign a projector port number

When you add projectors to a configuration, you can search all available ports or specify a specific port. To associate a projector with a specific port, you must know the port number.

1. Press **Menu** on the keypad or the remote.
2. Select **4 Configuration**.
3. Select **7 Communication**.
4. Select **5 Ethernet Settings**.
5. Make sure the correct port number is displayed.
6. Press the **Menu**.

Connect cameras

Cameras are connected to a network hub with an Ethernet connection. The network hub is connected to the control computer.

To use AutoCal, a minimum of one camera and one AutoCal-enabled projector must be connected to the control computer. Every camera connected to the control computer must have a valid IP address and be accessible on the local network.

Tools provided by the camera manufacturer are installed in the AutoCal folder in the Windows **Start** menu. Typically, cameras work correctly with AutoCal without modifying their settings. If you need to modify camera settings, see the documentation provided by the camera manufacturer or visit their website. If a camera is not working correctly, see [Unable to connect a camera](#) on page 38.

Connect a DALSA camera

By default, AutoCal is configured to work with Point Grey Flea3 cameras.

To enable DALSA cameras, click **Start > All Programs > Christie > AutoCal 3.5 > Tools > Enable Dalsa GigE cameras**.

To restore the default settings, click **Start > All Programs > Christie > AutoCal 3.5 > Tools > Enable Point Grey GigE cameras**.

Install AutoCal and camera drivers

Use the AutoCal installation wizard to install AutoCal and the camera drivers. Christie recommends that you only install the drivers for the cameras connected to the control computer. Installing multiple drivers from different manufacturers can cause software conflicts and prevent the cameras from working correctly.

Uninstall previous software versions

Before upgrading to AutoCal 3.5, remove all earlier AutoCal versions and these applications:

- Christie AutoCal
- Dalsa Genie Framework
- Dalsa Sopera LT (listed as Teledyne DALSA Sopera LT Run-time)

1. Click **Start > Control Panel**.
2. Click **Programs and Features**.
3. For each of the listed programs:
 - a. Right-click the program and click **Uninstall**.
 - b. Click **Yes**.

Install AutoCal

If you are using older projectors, you can install AutoCal 3.5 without removing an existing AutoCal 3.1 installation.

If a restart prompt appears during the installation, select **No** and restart the computer when the full AutoCal installation is complete.

1. Insert the installation CD or download the application from the Christie website.

If the installation does not start automatically, click **Start > Computer**. Browse to the CD-ROM drive and double-click the **setup.msi** file that matches your Windows version.

2. Select the 32-bit or 64-bit installer that matches your Windows version.
3. Click **Next** when the Setup Wizard appears.
4. Select the **I accept the terms in the License Agreement**. Click **Next**.
5. Select one of these options:
 - **Typical** - installs AutoCal and the Point Grey camera drivers in the default installation directory.
 - **Custom** - installs AutoCal and the selected camera drivers in a directory you specify.
6. To select drivers for your cameras, expand the list for your cameras and select **Entire feature will be installed on local hard drive**.

To remove other camera drivers, expand the list for those cameras and select **Entire feature will be unavailable**.
7. If you selected specific camera drivers, complete one of these wizards:
 - Genie Framework for Sopera LT.
 - Sopera Network Imaging Driver.
 - TeleDyne DALSA CamExpert.
8. To specify a different installation directory, click **Browse**.
9. To view how much disk space remains, click **Disk Usage**.
10. Click **Next**.
11. Click **Install**.

Start AutoCal

Click **Start > All Programs > Christie > AutoCal 3.5 > AutoCal 3.5**.

To create a new configuration, click **New**.

To open an existing configuration, click **Open**, browse to the location of the configuration file (*.cal), select it, and click **Open**.

Licensing

A software license key is included with AutoCal. If the software key is lost or altered, AutoCal will not function. Use this procedure to generate a request file and send it to Christie.

Request a license key

1. On the **Help** tab, click the **Request** button.
2. Browse to a location to save the .dat file, and click **Save**.
3. Click **Close**.
4. Open your email application and add the .dat file as an attachment.
5. Send the .dat file to Christie Technical Support.

Register a license key

1. Download and save the .key file provided by Christie to your local computer.
2. On the **Help** tab, click **Register**.
3. Browse to the location to where you stored the .key file, select it, and click **Open**.
4. Click **Close**.

Uninstall AutoCal

1. Click **Start > Control Panel**.
2. Click **Programs and Features**.
3. Right-click **Christie AutoCal 3.5** and select **Uninstall**.
4. Click **Yes**.



Bonjour, Microsoft Visual C++ 2010 and 2012 Redistributables, and Microsoft .NET Framework 4 may be used by other programs and are not uninstalled by the wizard. To uninstall these programs, see [Uninstall previous software versions](#) on page 5.

Technical support

North and South America: +1-800-221-8025 or tech-support@christiedigital.com

Europe, Middle East, and Africa: +44 (0) 1189 778111 or techsupport-emea@christiedigital.com

Asia Pacific: tech-asia@christiedigital.com

Manage Projectors

When you add projectors to your configuration, they appear in the Projector panel. Use the **Projector** panel to view information about connected projectors.

To view the details about a projector expand the **Details** list.

To add a projector, you need the IP address, and the port number. To identify the IP address and port number, press **MENU > 4 CONFIGURATION > 7 COMMUNICATIONS > 5 ETHERNET SETTINGS**.

To reorder the projectors, select a projector and click **Move Up** or **Move Down**.

To remove a projector from the list, select it and click **Remove**.

To rename a channel, double-click the **Name** and enter a new one.

Add a projector to a configuration by searching

1. Start AutoCal. See [Start AutoCal](#) on page 6.
2. Click **New**.
3. Click **Projector** in the left pane.
4. Click **Add** in the lower left pane.
5. Click the **Broadcast** tab.
6. Select **Default** in the **Port Number** area to search for a projector with a default port setting.
or
Select **Custom** and enter the custom port number for the projector.
7. Click **Search**.
8. Select projectors in the **Search Results** list.
9. Click **OK**.

Manually add a projector to a configuration

Use this procedure if your projectors cannot be detected automatically, or are not on the same subnet. To manually add a projector to a configuration, you must provide the projector IP address and port.

1. Start AutoCal. See [Start AutoCal](#) on page 6.
2. Click **New**.
3. Click **Projector** in the left pane.
4. Click **Add** in the lower left pane.
5. Click the **Manual** tab.
6. Complete the **IP Address** and **Password** fields.
7. Click **Search**.
8. Select the projector in the **Search Results** list.
9. Click **OK**.

Manage Cameras

This section provides information and procedures for managing projectors.

Add a camera

Use the **Camera** panel to locate cameras, add them to your configuration, and change exposure and binarization settings.

1. Click **Add**.
2. To select all of the cameras, click **Select All**.

To clear your selection, click **Select None**.

To select individual cameras, press **CTRL** and select the cameras.

If you have recently connected a new camera, click **Refresh** to see it.

3. Click **OK**.

When a camera is added, a snapshot of the camera's image appears in the image preview.

Remove a camera

Select a camera and click **Remove**.

View camera details

Expand the **Details** list in the Camera panel.

The Details area displays information about the camera and network information including the IP address, the subnet mask, and the MAC address. It also shows the name of the camera **Profile**.

Manage camera profiles

Camera profiles must be registered on cameras that originally shipped with AutoCal 2.0. You do not need to register camera profiles for cameras sold with AutoCal 3.5 or later. Camera profiles for cameras shipped with AutoCal 3.5 are stored on the camera.

A camera profile defines the technical characteristics of a camera and its lens. The camera calibration process defines the position and orientation parameters of a camera.

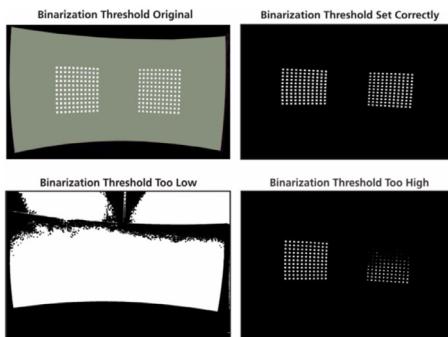
If you attempt to add a camera without a profile, it is unavailable in the Camera panel or the Select Camera dialog.

1. On the **File** tab, click **Manage**.
2. To add a camera profile, click **Add**.
3. In the Open File dialog, browse to the file (.xml) containing the camera profile, select it, and click **Open**.
4. Click **OK**.

Set camera exposure and binarization

You use the Camera panel to set the exposure and binarization of your camera(s).

Binarization defines the threshold of the black (dark) and white (bright) pixels of the captured image. The ideal binarization is when the image's background noise is minimized and all grid points are fully captured.



When a binarized image is taken, the projector(s) in the system display a black background with a white grid. (If Camera Markers are selected, the camera visible markers are turned on to select a correct binarization and exposure value to detecting these markers).

When a single camera and projector are activated, you can adjust the binarization threshold and camera exposure of the selected camera.

By default, AutoCal determines exposure and binarization settings automatically. Before making changes to these settings, make sure that:

- the screen is defined
- the required cameras are imported and activated
- the required channels are imported and activated
- channel extents are defined
- all points are mapped

Adjust camera exposure and binarization

1. Make sure at least one camera is connected and one channel is selected.
2. Select a camera on the Camera panel.
3. In the **Markers** list, select one of these options:
 - Grid - displays a grid pattern for the projectors associated with the selected camera.
 - Camera - displays the camera markers specified on the Point Calibration Tab. If visible camera markers are not being used, this option is not available in the list.
4. Select **Automatic** to automatically adjust binarization.

To adjust these settings manually, clear the **Automatic** check box.
5. In the **Marker Type** list, select **Projector** to change the projector grid settings or **Camera** to change the camera calibration marker settings.

6. Drag the **Exposure** slider back and forth or click the **-** and **+** buttons to adjust the amount of time the camera shutter remains open while capturing images.
7. Click the **Thresholding Mode** button and then drag the **Threshold** slider back and forth to adjust the brightness of an image pixel before it appears in the binarized image.



When using multiple cameras, adjust binarization and exposure settings individually for each one.

When making adjustments, make sure that you find a balance between the correct exposure and binarization threshold until all ambient light is filtered out and the image displayed shows only the grid points in their sharpest context. It is essential to avoid losing points when making adjustments.

Manually adjust camera settings

If camera alignment, brightness, or focus are not correct, use this procedure to manually adjust the camera.

1. To change image scale, either enter a value in the **Scale** field, select a predefined value from the list or use the **Zoom In** and **Zoom Out** buttons. Image scale can also be adjusted using the mouse wheel.
2. To increase or decrease image exposure, drag the slider to adjust the camera exposure. Each time a slider is adjusted, a new image is captured and displayed in the image preview window.

Calibrate cameras

Before you calibrate your configuration, you must identify points on the screen so that your camera(s) are calibrated.

The system view is a 3-dimensional representation of the screen. The camera view is 2-dimensional. To calibrate a camera, you map the 3D points in the System View to the 2D points of the camera.

The Calibration panel displays a real-time picture of the camera view. The System View displays a representation of your configuration. To display or hide windows, select one of the buttons in the upper-right corner.

Add 3D Points to the System View

You add 3D points to the system view to define the edges of the screen. To calibrate the camera, you must have a minimum of 4 points.

With a multiple camera installation, Christie recommends that each pair of overlapping cameras share 4 points. Following this recommendation, the number of points required for a 2 camera installation is 8, with 6 seen by each camera.

Add Points Automatically

When you add points automatically, AutoCal removes any existing points and adds a new grid of points.

1. In the Screen Markers window, click the 3D points button.
2. Select the number of horizontal and vertical points. Click **OK**.
3. To adjust the position of a point, select the point and adjust the X, Y, and Z values in the Screen Markers window.

Add Points Manually

1. In the Screen Markers window, click **Add**.
2. Adjust the X, Y, and Z values for the new marker. To avoid multiple overlapped points in the center, define the position for each point as it is added.

Delete Points

Select a point in the System View window or in the **Screen Markers** list and click **Delete**.

Automatic camera calibration

To use an ACT device to control the connected camera's visible markers use the **Automatic Camera Calibration** section of the **Calibration** panel. To show these settings, click the expand button beside Automatic Camera Calibration.

- Select **Enabled** to activate the automatic camera calibration feature

- Select **Prompt** to have receive a prompt to run an automatic camera calibration.
- Click **Add** to add an ACT device to the configuration.
- Select an ACT device and click **Remove** to remove it.
- Click **Test Calibration** to run an automatic camera calibration.

Locate corners

AutoCal can automatically locate the corners of your screen that correspond to the corners defined in the System View. This feature works best for planar rectangular screens.

To locate the corners, follow these recommendations:

- The screen has a well-defined border with a high degree of contrast between the screen area and the border.
- There are no objects between the camera and the screen that would obscure the camera's view.
- The camera's aperture and focus settings are set properly.
- The center of the camera view is in the center of the screen.

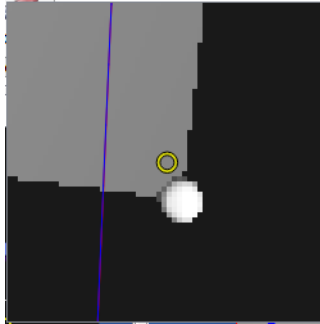
To find corners, on the Home tab, click **Find Corners**.

After AutoCal has searched for corners, it displays blue dots at the corners of your screen in the Camera view window. It also shows blue lines along the edge of the screen. If you selected one of the Cylindrical options, then blue circles appear on the top and bottom of your screen area to show the curved edges of your screen.

In some cases, AutoCal might not be able to find the corners of your screen. If the corners are not where you want them:

1. Move the corners to match your screen by clicking and dragging the blue circles. When you click a dot to select it, it turns yellow. While you are dragging a dot, it appears as a hollow blue circle. Drag all 4 red circles to the desired locations, and then observe the blue box to see if it is where you want it.

- For fine adjustments to corner locations, press and hold the **CTRL** key. A zoom window appears, allowing you to drag a circle by small increments.



Press **CTRL** + the arrow keys to move a selected circle by 10 pixels. To move a circle by 1 pixel, Press **CTRL** + **SHIFT** + the arrow keys. Release the **CTRL** key to close the zoom window.

Add points manually

To add 2D calibration points select the points with your mouse and drag them from the system view to the camera view.

Map points

Complete the following steps for each camera in the system.

- Click a 3D point in the System View to select it. The point turns yellow.
- To move the selected 3D point, change the values in the coordinate fields.
- To change the coordinate system, select one of these options in the **Coordinates** list:

Option	Description
Cylindrical	The position of screen markers based upon Radius (the distance between the screen marker and the Z-axis), Yaw (the angle of the screen marker about the Z-axis), and Z (the height of the screen marker above the XY plane)

Option	Description
Spherical	The position of screen markers based upon Radius (distance between the screen marker and the origin), Yaw (the angle of the screen marker about the Z-axis), and Pitch (the angle of the screen marker from the horizontal plane).

By default, the coordinates are Cartesian: X, Y, and Z.

4. To move the corresponding 2D point in the Camera View, select the camera in the **Camera View** list.
5. Drag the 2D point or change its values in the marker table.
6. Repeat for each point that requires mapping.
7. Click **Save** to save the settings.

Confirm layout

After adding and adjusting points, verify that the calibration is set up correctly.

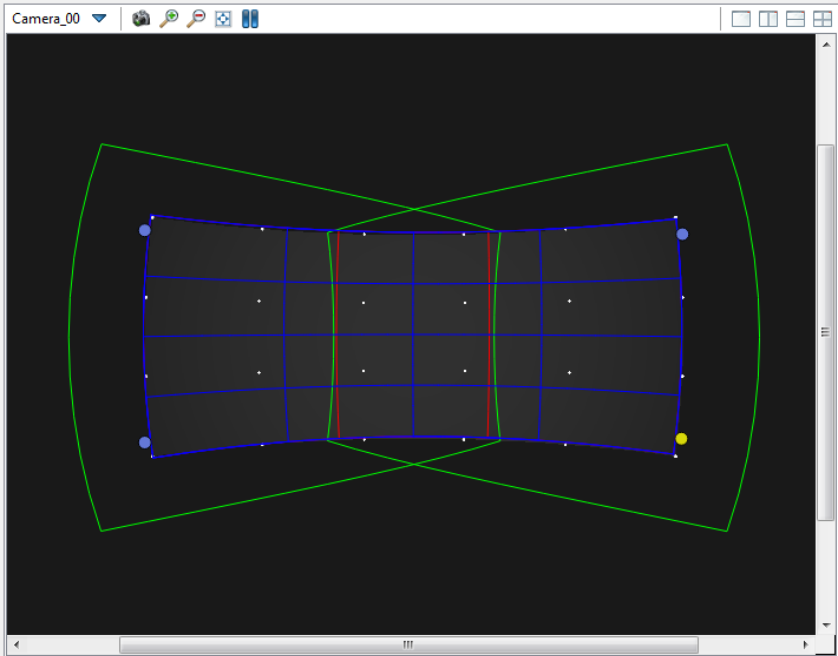
On the Home tab, AutoCal superimposes the boundary of the screen section and channels that the camera sees.

1. On the **Home** tab, click **Confirm Layout**. AutoCal switches to Camera view. Warping/blending is turned off, a white test pattern is displayed on all screens and a red bounding box is superimposed for each channel in the image. A blue bounding box represents the defined screen.
2. Confirm that the blue lines trace the outline of your screen and the red lines outline where you want your channels to be.
 - If the red bounding box is not within the white test pattern, then image will not be displayed within the target position.
 - If the blue outline does not match the layout of the physical screen, then you should re-calibrate the camera, adjust the horizontal and vertical overlaps, or adjust the physical/target screen parameters.

Analyze layout

Analyze your configuration to create a mapping between the camera and projector coordinate systems.

Click the **Home** tab and click **Analyze**.



The display area for the projectors (green), the screen area (blue), and the overlapped areas (red) is displayed.

Run calibration

Before beginning a calibration, make sure that these conditions are true:

- The screen is defined.
- The required cameras are imported, activated, and calibrated (with green calibration numbers).
- The required projectors are imported and activated.
- Channel extents are defined.
- All points are mapped.

- Camera images are focused
- Manual exposure and threshold values are correct.
- Images are not over exposed.

To begin a calibration:

1. On the **File** tab, click **Save** to save the current configuration.
2. Click **Run** to begin a full calibration.

To access other run options, select one of these options:

Option	Description
Run using analyze results	If you have already analyzed your setup (by clicking Analyze on the Home tab) or performed a full calibration (by clicking Run on the Home tab), then the mappings between the camera and projector coordinate systems may already exist. Select this option to use these mappings instead of generating them again. Only use this option if you have not moved any cameras or projectors since the last analysis was done.
Run without iterations	Select this option to run a faster calibration by disabling iterations for camera-to-projector coordinate mapping. If you disable iterations, AutoCal will only perform the calibration calculation once, which could lead to poor results. To configure iteration options, see the Options panel.
Run without automatic camera calibration	Select this option to run a faster system calibration using the existing camera calibration. To configure automatic camera calibration settings, see the Calibration panel.

Manage the Image Position and Layout

This section provides information and procedures for manipulating the displayed image.

Set up screen definitions

This section outlines procedures for setting up the geometry definitions that define the characteristics of the physical projection screen.

Use the Screen panel to change these settings.

When you select a screen shape, a default system view appears. Do the following to change the size, position, and orientation of the system view:

- To rotate the image but leave the point of view stationary, click the left mouse button and drag.
- To move the point of view, click the right mouse button and drag.
- To zoom in/out, use the mouse wheel.
- To return to the default orientation, click the Reset button.

Flat screen

1. Select **Flat** in the **Shape** list.
2. Select the unit of measurement in the **Units** list.
3. Specify the **Width** and **Height**.

Spherical screen

1. Select **Sphere** in the **Shape** list.
2. Select a unit of measurement in the **Units** list.
3. Specify the **Radius** of the screen.

4. Complete these fields:

- **Min. H. Angle:** The minimum horizontal angle measured from the center of the screen to the left side.
- **Max. H. Angle:** The maximum horizontal angle measured from the center of the screen to the right side.

5. Complete these fields:

- **Min. V. Angle:** The minimum vertical angle measured from the center of the screen to the bottom.
- **Max. V. Angle:** The maximum vertical angle measured from the center of the screen to the top.

Cylindrical screen

1. Select **Cylinder** in the **Shape** list.
2. Select a unit of measurement in the **Units** list.
3. Specify the screen **Radius**.
4. Specify the **Height** of the screen.
5. Define the minimum and maximum horizontal angle of the screen:
 - **Min. Angle:** The minimum horizontal angle measured from the center of the screen to the left side.
 - **Max. Angle:** The maximum horizontal angle measured from the center of the screen to the right side.

Custom screen

Use the custom option to create a custom screen shape. It requires a valid .wrl file (vrml97) produced in photogrammetry or CAD software.

To use this option with a planar layout, the screen must be parametrized with UV texture mapping coordinates.

1. Select **Custom** in the **Shape** list.
2. Click the file button.
3. Navigate to the .wrl file, select it, and click **Open**.

Define layout

A layout defines the location of each channel. A layout must match the parameters of the content or image generator. Warps are automatically generated so the projected image matches the specified layout.

There are the 4 different methods to define the channel extents for a system: Planar, Planar (Advanced), Spherical, and Spherical Collimated.

Planar data (basic)

Select Planar Data when displaying a view with a single viewport, such as a multi-headed windows desktop. Channel layouts are defined by the overlaps between adjacent channels. The projected area of all channels will fill the entire screen.

1. Expand **Layout** and select **Planar** in the **Type** list.
2. On the **Setup** list, select a grid layout.

The number of projectors installed determines what options are available. For example, when 2 projectors are active, the drop-down contains the selections **1x2** and **2x1**, and **1x1 (stacked)**. When four projectors are selected, the list includes **1x1 (stacked)**, **1x2 (stacked)**, **2x1 (stacked)**, and **2x2**.

3. Enter the horizontal or vertical overlap percentages.
4. To further inset the projected image inward, specify insert percentage values (percentage in screen space). A positive inset value will create a black border around the final full image.

Planar data (advanced)

Select Advanced Planar when displaying a view with a single viewport, but when you want to control the area covered by each projector. The projected area of all channels can exceed the screen area resulting in loss of some pixels off the screen.

1. Expand **Layout** and select **Advanced Planar** in the **Type** list.

2. Enter the channel extents for each channel (specified in screen relative percentages). For example, setting up a 1x2 might have the following advanced planar information:

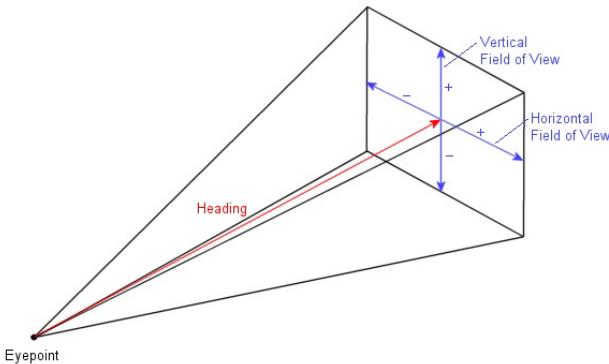
- both channels have a starting Y of 0%, ending Y of 100%
- channel (1,1) has a starting X of 0%, ending X of 55%
- channel (1,2) has a starting X of 45%, ending X of 100%

Y:	
0%	Top edge of screen
100%	Bottom edge of screen
X:	
0%	Left edge of screen
100%	Right edge of screen

Percentages below 0% and above 100% are valid, and will result in projector pixels being lost outside the defined screen.

Spherical data

When **Spherical** is selected, you must specify the angular extents of each channel (by Heading and Field of View). A non-zero **Eyepoint** can also be specified.



1. Expand **Layout** and select **Spherical** in the **Type** list.
2. In the **Eye Point** table, enter the offset from the default center eye point.

For planar screens, the default eye point is in the middle of the screen. For cylindrical or spherical screens, the default eye point is in the center of curvature.

3. For each channel in the **Spherical Channel Extents** table, adjust these settings:

Setting	Description
Yaw	The angle of rotation about the Z-axis, describing the left-to-right direction of the channel's heading. Forward headings have a yaw of 0, headings to the right are positive, and headings to the left are negative.
Pitch	The angle of rotation up towards the Z-axis, describing the up-to-down direction of the channel's heading. Horizontal headings have a pitch of 0, heading up towards the Z-axis are positive, and downward headings are negative.
Roll	The angle of rotation of the channel about the heading direction (specified by yaw and pitch). A channel with no rotation about the heading has a roll of 0, channels with clockwise rotation have positive roll, and channels with counter-clockwise rotations are negative.
Left FOV (Field of View)	The angle at the eyepoint from the channel heading to the channel's left edge. Angles toward the left are negative
Right FOV	The angle at the eyepoint from the channel heading to the channel's right edge. Angles toward the right are negative
Top FOV	The angle at the eyepoint from the channel heading to the channel's top edge. Upward angles are positive.
Bottom FOV	The angle at the eyepoint from the channel heading to the channel's bottom edge. Downward angles are negative.

4. To change the settings in the **Spherical Channel Extents** table by copying them to a spreadsheet application, modifying them, and then pasting them back into the table:
 - a. Use the cursor keys or drag the mouse to select several cells.

- b. To copy the cells to the Windows clipboard, click the **Copy** button. Paste the cells into your spreadsheet application.
- c. Change the values as required.
- d. Copy the cells from the spreadsheet into the Windows clipboard.
- e. Click the upper-left corner of the cell grid you want to paste in AutoCal, and click the **Paste** button.

Collimated spherical data

Collimated spherical projection is the projection of spherical data onto a mirror which the viewer then sees. In addition to the settings required for spherical data, you must also specify other parameters for collimated projection, such as the position of the mirror relative to the screen, the radius of the mirror, and so on.

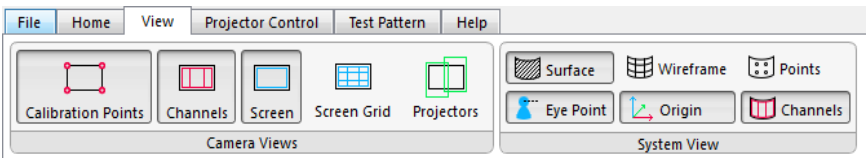
1. Expand **Layout** and select **Spherical Collimated** in the **Type** list.
2. Specify the other spherical settings. See [Spherical data](#) on page 24.
3. Specify the **Mirror Location** settings, the radius, the yaw, pitch, and roll.
4. Specify the eyepoint offset from the mirror.

Use AutoCal

Read this chapter to learn about AutoCal features, how to use controls, and more.

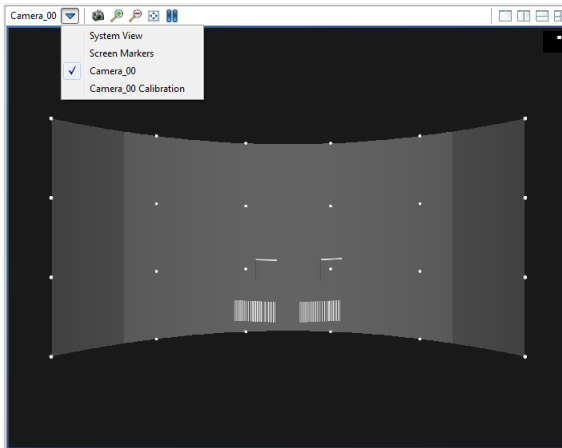
View ribbon

Use the View ribbon to customize what the projectors display on screen and what is visible in the AutoCal application window.



Two configuration views are available; Camera View and System View.

Camera view



The Camera view shows what is currently visible in your cameras. Use the buttons beside the **View** list and your mouse to adjust the camera view:

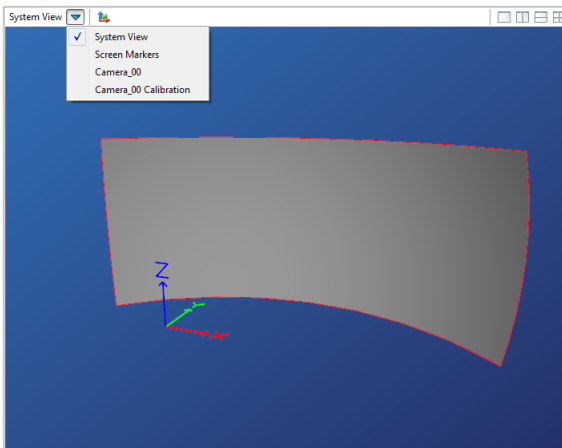
- To change the position of the image, click the left mouse button and drag.

- To zoom in or out, use the wheel button on your mouse or click the zoom in and zoom out buttons.
- Click the capture button to capture an image from the camera.
- Click the fit button to fit the current image to the camera view window.
- Click the pause button to pause the real-time view from the camera.

The **Camera Views** area includes these buttons:

Button	Description
Calibration Points	Shows or hides calibration points around the edge of the screen.
Channels	Shows or hides the projector display area on the screen with the current configuration.
Screen	Shows or hides the screen outline.
Screen Grid	Shows or hides a grid displayed across the screen that shows the screen's interior shape (red grid).
Projectors	Shows or hides the areas that the projectors can display.

System View



The System View is a representation of your configuration, including the shape of your screen and the 3D axes of the eyepoint.

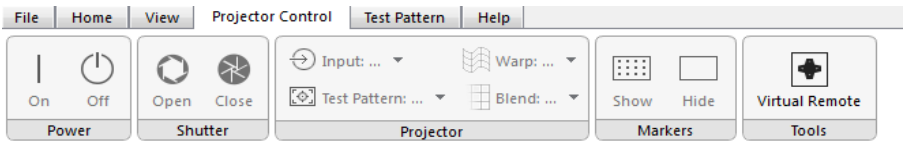
- To rotate the image, click the left mouse button and drag.
- To change the position of the image, click the right mouse button and drag.
- To zoom in or out, use the wheel button on your mouse.
- To return to the default axis positions, press the reset button beside the View list.

The **System View** area includes these buttons:

Button	Description
Surface	Show or hide the screen surface.
Wireframe	Show or hide a wireframe of the screen surface.
Points	Show or hide the screen surface vertices.
Eye Point	Show or hide the eyepoint location for the configuration.
Origin	Show or hide the X, Y, and Z axes at the origin’s location.
Channels	Show or hide the areas that each projector can reach on the screen with the configuration.

Projector control ribbon

Use the Projector Control ribbon to send commands to the projector.



Button	Description
Power	Turns the projector power on or off.
Shutter	Opens or closes the projector shutter.
Input	Selects the input source for the projector.
Test Pattern	Displays or removes a test pattern.
Warp	Applies or removes a standard or user-defined warp.

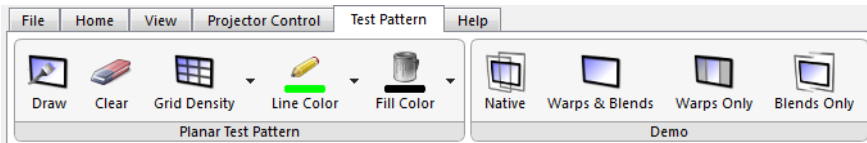
Button	Description
Blend	Applies or removes a standard or user-defined blend.
Show/Hide Markers	Displays or hides markers.
Virtual Remote	Displays the virtual remote application.

Test pattern ribbons

Use the Test Pattern ribbon to display test patterns and troubleshoot calibration issues. You cannot display test patterns with an Advanced Planar layout.

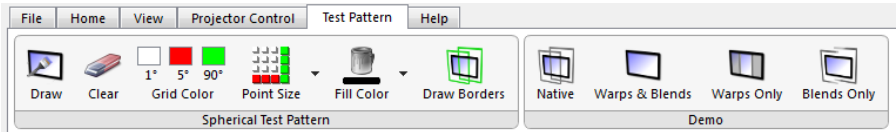
Two Test Pattern ribbons are available; Planar and Spherical.

Planar test pattern ribbon



Button	Description
Draw	Displays a test pattern on the screen.
Clear	Removes a test pattern from the screen.
Grid Density	Increases or decreases the line spacing of the grid pattern. These are the available options: <ul style="list-style-type: none"> • Fine • Medium • Coarse
Line Color	Changes the color of the grid test pattern.
Fill Color	Applies a fill color to the grid test pattern.
Native	Displays the projector image without warps or blends.
Warps & Blends	Displays the configured warps and blends.
Warps Only	Displays the configured warps.
Blends Only	Displays the configured blends.

Spherical test pattern ribbon



Button	Description
Draw	Displays a test pattern on the screen.
Clear	Removes a test pattern from the screen.
Grid Color	Changes the color of grid points at 1°, 5°, and 90° increments.
Point Size	Changes the point size. These are the available options: <ul style="list-style-type: none"> • Small • Medium • Large
Fill Color	Applies a fill color to the grid test pattern.
Draw Borders	Adds borders to the test pattern.
Native	Displays the projector image without warps or blends.
Warps & Blends	Displays the configured warps and blends.
Warps Only	Displays the configured warps.
Blends Only	Displays the configured blends.

View network details

Click the  icon in the lower-left corner of the Select Projectors dialog.

Set AutoCal Options

The Options panel allows you to specify warp and blend settings, grid resolution, and projector orientation. The information for both warps and blends is stored under one name. You specify whether or not you want to include blend calculations.

Set units of measurement

To set the units of measurement used by AutoCal, select one in the **Units** list.

Warping and blending

1. In the Warping & Blending area, in the **Name** field, enter the warp/blend name to be sent and saved to the projector.
2. In the **Mem Location** list, select the memory location of the warp/blend.
3. To include blend calculations, select the **Enable Blending** check box. If you clear this check box, blend calculations are not done and no blending information is sent to the projectors.
4. If MotoBlend Blinders are being used, select the **MotoBlend** check box. If Blinders are used, AutoCal needs to move the blinders out of the way when doing a calibration.

Access a saved warp

To apply a saved warp to the projector, select the projector in the Projector panel, and then select the warp in the **Warp** list on the **Projector Control** tab.

1. Press the **Menu** button on the projector keypad or the remote. Use the up and down arrow keys on the project keypad to make selections.
2. Select **4 Configuration**.
3. Select **8 Geometry and Color**.
4. Select **2 Keystone and Warping**.
5. Select **1 Warp Select** to access a list containing all saved warp locations. Each projector can store up to 10 custom warp definitions. Users can select any number from 1 to 10.
6. Press **Menu**.

Access a saved blend

To apply a saved blend to the projector, select the projector in the Projector panel, and then select the blend in the **Blend** list on the **Projector Control** tab.

1. Press the **Menu** button on the projector keypad or the remote. Use the up and down arrow keys on the project keypad to make selections.
2. Select **4 Configuration**.
3. Select **8 Geometry and Color**.
4. Select **4 Edge Blending**.
5. Select **1 Blending Select** to access a drop-down menu containing all saved blend locations. Each projector can store up to 5 custom blend definitions. Users can select any number from 1 to 5.
6. Press **Menu**.

Set calibration options


Use these settings to specify calibration options:

- **Do Iterations:** Performs calibration calculations repeatedly to refine the calibration. Clear this option to have AutoCal use initial calculations only.
- **# of Iterations:** Specify the maximum number of iterations AutoCal will perform. The default value is 50. Specify a value between 10 and 50. Calibration automatically stops when convergence is detected. Lower the iteration number to stop calibration sooner.
- **Do Tiling:** Select to have the projectors tile the image so that each one shows only its portion of a shared input. This option is not supported on all projectors.
- **Masking:** Select the method used to obtain the mask definition to mask projectors to the screen:
 - **No Masking:** No mask is applied. Note that, if you are using a Twist file with a previously applied mask, that mask is erased if you select this option.

- **Mask to Screen:** Masking is applied to the shape of the screen geometry.
- **From Twist File:** Brightness uniformity and masking settings are taken from the Twist file specified in the Twist area of the Options panel. Using this setting, you could customize masking settings in Christie Twist and then use these settings in AutoCal.
- **Fit Order:** Select the order of magnitude used to adjust the mathematical model to fit the collected data. Higher values should only be used for more complex situations. Change this option only if you have an advanced understanding of AutoCal.
- **Fit Solver:** Select the method used to generate a mathematical model of fit the collected data: **RANSAC** or **Least Squares**. In most cases, the RANSAC (Random Sample Consensus) method is preferred. Change this option only if you have an advanced understanding of AutoCal.

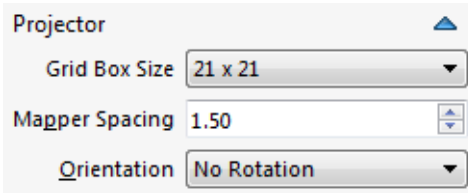
Twist

Use these settings to specify Twist-related options. To show these settings, on the **Options** panel, click the expand button beside **Twist**.

- **Twist Filename:** Specify the name of the Twist (.twistx) file that you want to use. Click the browse button  to select a folder. By default, the folder where you save calibration (.cal) files is selected. Also, by default, AutoCal updates the name of the Twist file to match the name of the AutoCal file.
- **Grid Size:** Specify the number of grid points to be drawn by the projector during calibration (the warp resolution sent down to the projector). If you specify a grid size greater than 9, your Twist file will only be able to be opened by Twist Pro.
- **Output Format:** Saves the Twist file in a format that can be used by Twist.

Projector

Use these settings to specify projector-related options. To show these settings, on the **Options** panel, click the expand button beside **Projector**.



Projector

Grid Box Size 21 x 21

Mapper Spacing 1.50

Orientation No Rotation

- **Grid Box Size:** Sets the size (in pixels) of grid points that AutoCal draws during calibration.
- **Mapper Spacing:** Sets the spacing of the grid points used by AutoCal during calibration. The value specified is a multiplier of the grid box size.
- **Orientation:** Sets the orientation of the projectors: **No Rotation**, **Portrait (CCW)** (counter-clockwise), or **Portrait (CW)** (clockwise). Use this setting if your projectors are physically rotated and you want AutoCal to adjust their images to the correct orientation. For spherical layouts, select **No Rotation** and use the roll component of the channel definition instead.

Troubleshooting

This section provides information and procedures for resolving common AutoCal issues. If you cannot resolve a projector issue, contact Christie Technical Support. For contact information see on page 1.

View and export diagnostics

When you are troubleshooting AutoCal issues, Christie Technical Support may ask you to view diagnostics files, such as log files or images, or send those files to Christie for further analysis.

AutoCal creates a new folder for diagnostics files each time you run the software.

View diagnostic files

Click **Help** > **Diagnostics** > **View** and select one of these files:

- Crash
- Data
- Images
- Logs

Export diagnostic files

1. On the **Help** tab, click the **Export** button.
2. Select an AutoCal session and click **Export**.
3. Browse to the location where you want to save the zip archive file, and click **Save**.
4. Locate the file on your computer.

The file name begins with "ACDiags_" and includes the calibration file name (if you have saved your calibration) and the session folder name, which includes the date and time when AutoCal was launched.

5. Send the archive zip file to Christie Technical Support.

Unable to locate cameras or projectors

- Ensure computer network connectivity.
- Check cable connections (computer, camera, projectors, etc.).
- Make sure that the computer is on the same subnet as the camera/projector.
- Attempt to access the projector's Web interface. If you can reach it, then enter the IP address of the projector on the **Manual** tab of the **Select Projectors** dialog.
- Check the Ethernet firmware version on the projector.
- Make sure that no other Christie software application is running.

Unable to connect a camera

Make sure the camera is connected to a dedicated router with DHCP enabled. The camera should be assigned an IP address automatically.

If the Point Grey Flea3 camera cannot be detected on the network, use this procedure.

1. Disable all wireless network connections.
2. Connect one end of an Ethernet cable to the camera.
3. Connect the other end of the Ethernet cable into the network port of the computer running the AutoCal application.
4. Click **Start > Programs > Christie > AutoCal 3.5 > Point Grey Utilities > GigE Configurator**.
5. Select your camera in the left pane.
6. Click **Automatically Force IP**.
7. If your cameras use static IP addresses:
 - Enter the network settings for the camera.
 - Select **LLA & Persistent IP**.
 - Click **Set IP Address/Subnet**.

If your cameras use dynamic IP addresses:

- Select **LLA & Persistent IP**.
 - Select **DHCP**.
 - Click **Set IP Address/Subnet**
8. Click **Test Camera Connection**.
 9. Reconnect the camera to the network.
 10. Click **Test Camera Connection**.

If the camera is not recognized, see the documentation provided by the camera manufacturer for diagnostic information.

Projector unresponsive

- Check power.
- Check cable connections.
- Check ability to search for projectors.

Invalid calibration file loaded

A .cal file is valid when all of the following conditions have been met:

- The selected camera is currently on the network.
- The screen has been defined.
- Each projector within the configuration is currently on the network.
- Each camera has the minimum number of calibration points (4 for flat screen / 6 for non-flat screen).

High dx, dy during camera calibration

1. If the dx, dy values are greater than 1.0, adjust the 2D calibration points via the image preview until a lower tolerance is achieved.

2. If the tolerance remains greater than 1.0 after adjusting the 2D calibration points:
 - ensure screen dimensions are correct.
 - ensure 3D calibration points are defined accurately.

Poor calibration results

Make sure that you have adequate camera coverage on the screen.

Make sure you have calibrated your camera successfully.

Review your exposure and binarization settings. If you used automatic exposure and binarization, select manual and adjust the values yourself.

Point Grey Flea3 status

This table shows the statuses that correspond to each LED state for the Point Grey Flea3 camera.

Camera Status	
Off	Not receiving power
Steady green, high intensity (~5 seconds)	Camera powers up
Green flashing quickly, low intensity	Camera is attempting to establish an IP connection.
One green blink Two green blinks Three green blinks Three red blinks	1) An IP address, if enabled and available; 2) a DHCP address, if enabled and available; 3) a link-local address (LLA). 4) Failure to establish connection
Steady green, high intensity	Camera is streaming images
Red/Green flashing quickly	Firmware update in progress
Red flashing slowly	General error.

DALSA Genie camera status

This table shows the statuses that correspond to each LED state for the DALSA Genie camera.

Genie Camera Status	
Blue/Solid	IP addressee assigned
Blue/Slow	Waiting for IP address
Blue/Fast	Ethernet cable connected
Green/Solid	Application linked to camera
Green/Slow	Trigger acquisition in progress
Green/Fast	Acquisition in progress
Red/Slow	Camera initialization problem
Red/Fast	Camera overheating

Location of generated images and log files

AutoCal generates images and log files which may be useful when troubleshooting.

View

To view the log and image files, on the Help tab, click **Diagnostics > View**.

Export

To export log and image files, on the Help tab, click **Export**.

Problems with device communication

- Check that Network Routing is set to Separate. See [Add the projector to the network](#) on page 3.
- Confirm that the network settings for the camera are correct.
 - If you are using Point Grey cameras, click **Start > All Programs > Christie > AutoCal 3.5 > Point Grey Utilities > GigEConfigurator**.
 - If you are using Dalsa cameras, click **Start > All Programs > DALSA > Spera Network Imaging Package > DALSA Network Configuration Tool**.
- Confirm that the camera and computer are connected properly. Click **Start > All Programs > Christie > AutoCal 3.5 > Point Grey Utilities > FlyCap2**.

Slow camera performance

For optimal results, you should have a minimum of a 1.0 Gigabits per second (Gbps) network connection. To confirm the speed of your network connection, click **Start > Control Panel > Network and Sharing Center**. Click your network connection and view its settings.

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