

GETTING MORE FROM VICON SHOGUN

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After you've become familiar with the topics covered in *Getting started with Vicon Shogun*, you may want to take your use of Shogun further. The following topics in this guide describe some of the ways in which you can do this.

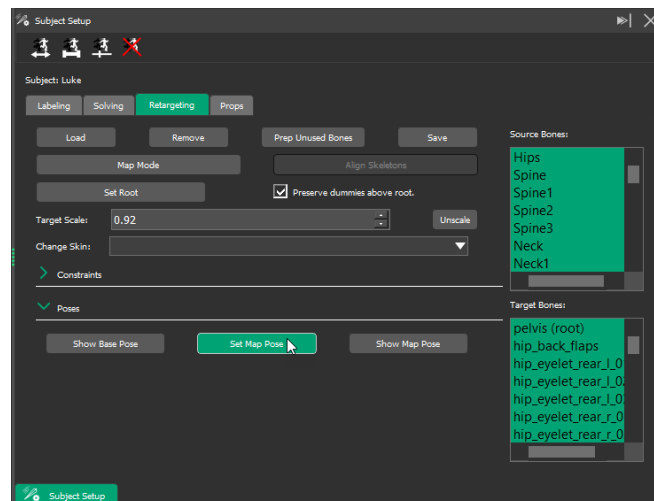
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For information on scripting with Shogun, see *HSL scripting with Vicon Shogun* and for information on retargeting, see *Retarget with Shogun Post* in *Getting started with Vicon Shogun*.

Map pose and best rig practices

Map pose and best rig practices

Map pose is used to constrain the target skeleton to the source skeleton. To get the optimum results from the retarget, the source and target poses need to be as close as possible.



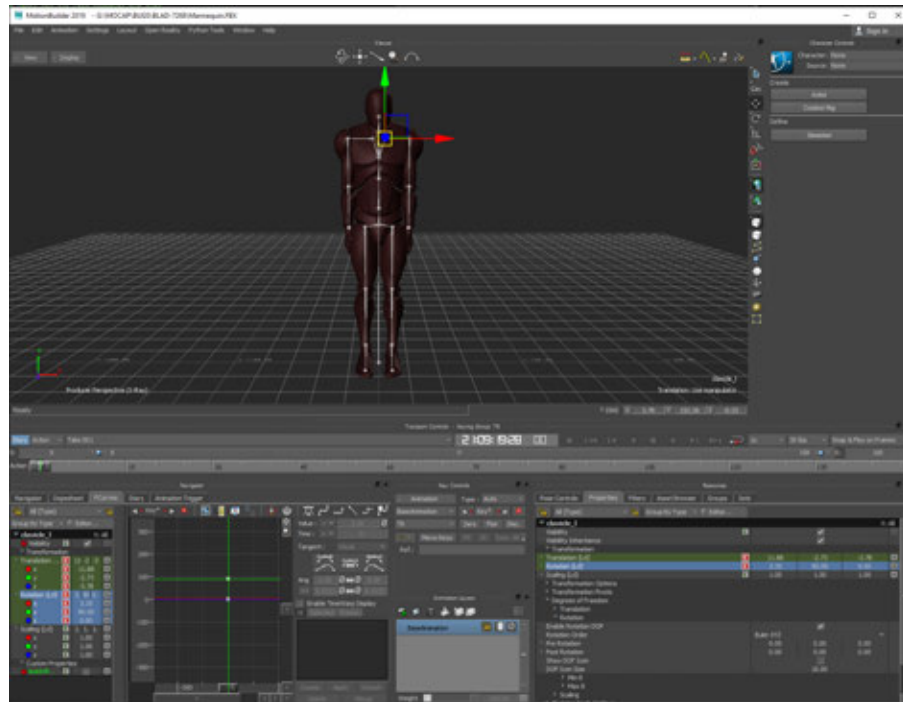
When you click **Set Map Pose**, Shogun Post takes any differences between the two skeletons and stores them as offsets within the VSR file. Any joints with default values or keys are copied onto pre-rotation to match the source Vicon skeleton and stored as the map pose for the solver to use. The original values are maintained in the FBX or USD skeleton, enabling the skeleton to be imported back onto the original rig without any issues.

In addition to supporting the use of skeletons that use pre-rotation to define the base pose (see Retarget with Shogun Post in *Getting started with Vicon Shogun*), Shogun Post also supports the use of skeletons that have zeros for pre-rotation and use keys or default values to achieve this.

For example, Mannequin.FBX is a commonly used target skeleton. It contains joints like the clavicles which, instead of using pre-rotation, use keys to define a base pose, (or more accurately, the appearance of a base pose, as the actual base pose is not a real base pose.)

Map pose and best rig practices

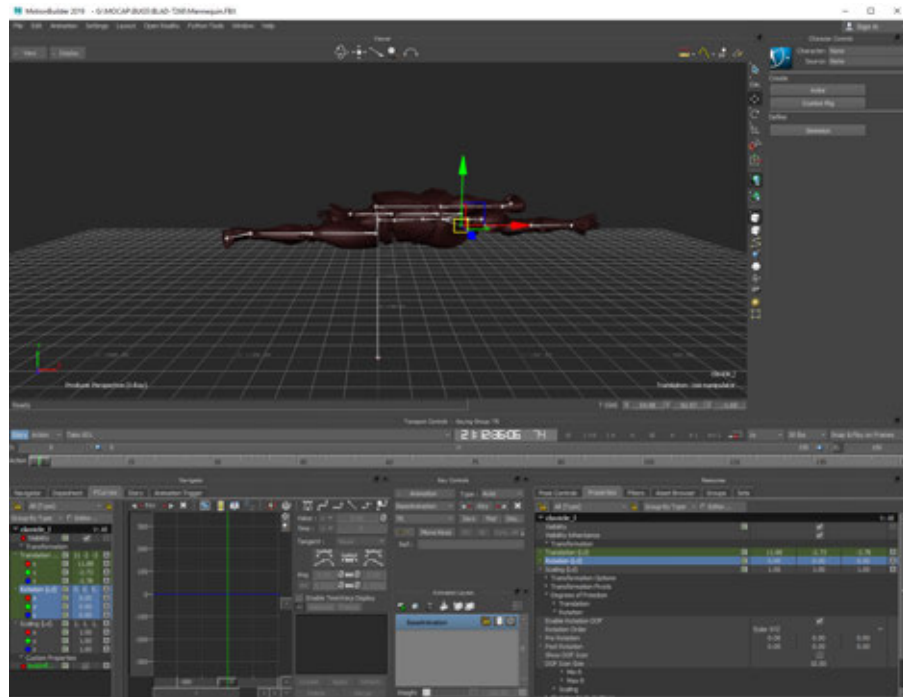
When Mannequin.FBX is loaded into Autodesk® MotionBuilder®, at first glance it appears to be in a base pose:



However, notice that the pose is actually defined by a set of keys on frame 0 and the pre-rotation (as seen in the Properties) is zeros for bones like the clavicle, which have a rotation so the X axis can point to the side even though its parent has the X pointing up.

Map pose and best rig practices

To see the actual base pose, delete the keys and set all the rotation values for all bones to zero:



This demonstrates why it's better to use the pre-rotation to define the base pose. When all keys are removed, and all bone set to zeros, it's preferable to have a base pose that's a clear T- or A-pose instead of the stack of bones shown above. It's also more sensible because the animation you place on a skeleton via mocap or hand-keying is easier to deal with when poses are relative to zero. For example, it's easier to think of a bend of the elbow as X degrees from 0, not X from 90, which is what you'd have if straight was actually 90 because of the current base pose.

Ideally, you would rebuild skeletons like this to use pre-rotation instead, but this is not always possible. When it's not possible, you can still use the skeleton, but you must set the map pose (see Retarget with Shogun Post in *Getting started with Vicon Shogun*).

Benefits of using map pose:

- The pose used during mapping is saved and restored when you go back into map mode or load the VSR into the Retarget app.
- The target skeleton matches the source skeleton's joint orientation more closely, resulting in a better solve.

Work with custom props and meshes

Work with custom props and meshes

You can add custom prop meshes in Shogun Live and manipulate the prop during a shoot. These updates are seen instantaneously in engine, so that you can correctly position props and virtual cameras.

 Watch the Vicon video, [Shogun Live Prop Manipulation](https://youtu.be/o7X0QICz3H0)¹ on YouTube.

 Watch the Vicon video, [Shogun Live Prop Manipulation](https://vimeo.com/275782908)² on Vimeo.

Note

As the videos were recorded using an earlier version of Shogun, you may notice minor differences in the user interface.

For information on using a custom L-frame to set the origin, see *Set the origin with a custom L-frame* in *Getting Started with Vicon Shogun*, Calibrate cameras.

For information on linking a calibrated SDI or Vicon Vue video reference cameras to a rigid tracking object, to enable the video camera to be tracked, see [Link a prop and a video camera](#), page 9.

To create custom props:

1. To make a custom prop mesh available in Shogun, copy the .fbx file into C:\Users\Public\Documents\Vicon\PropMeshes.
(Any skinned FBX object can be a prop, provided the skin bone is called Root.)
You can now select it from the **Mesh** drop down list as described below.
2. In Shogun Live, to make it easy to select the required trajectories, in a 3D Perspective pane, pause the real-time stream (press the space bar).
3. Select the markers in the correct order:
 - a. Root
 - b. Target
 - c. Up vector
 - d. Any other markers

¹ <https://youtu.be/o7X0QICz3H0>

² <https://vimeo.com/275782908>

Work with custom props and meshes

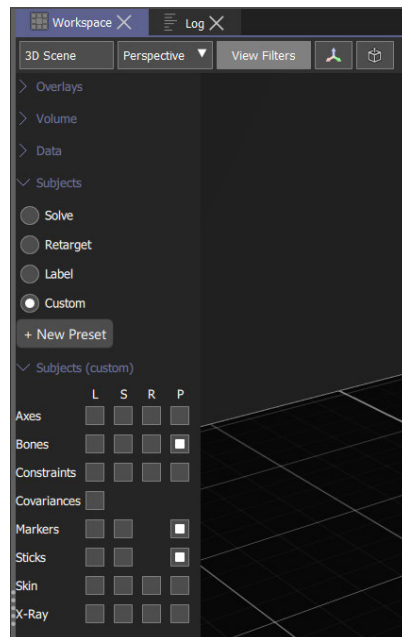
4. In the **Tracking** tab, ensure the **Setup** tab is selected and in the **Prop** field, enter the name of the prop.
5. Click **Create**.
6. On the **Properties** tab, from the **Mesh** dropdown menu, select the **.fbx** that you made available in Step 1.



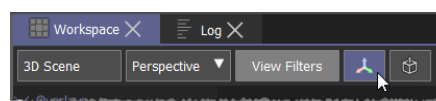
7. Un-pause the real time (press the space bar again) to see the prop and mesh move together.

Work with custom props and meshes

8. To change the view of props independently of subjects, select **View Filters** and then select the **Props** options that you want at the bottom left of the pane.



9. To change the position of your new prop, pause the scene, select the root bone and use the Object Manipulator (select it at the top of the 3D Scene view or press M). Note that you can't currently use the manipulator in the Cameras view.



10. When you have finished manipulating the prop, its constraints are automatically updated and a new version is saved.

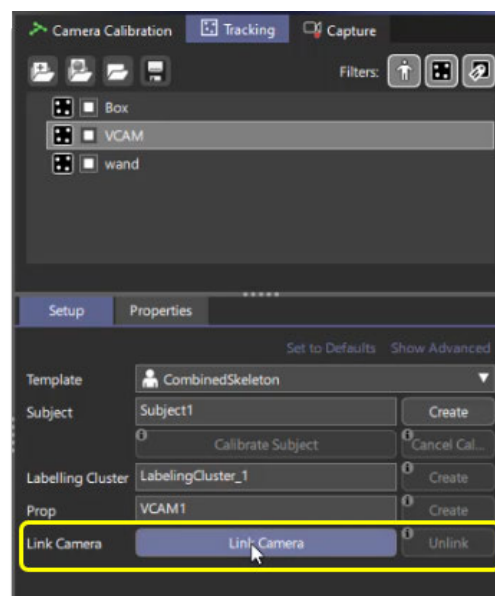
Work with custom props and meshes

Link a prop and a video camera

Shogun Live lets you link a calibrated SDI or Vicon Vue video reference camera to a rigid tracking object. This enables the video camera to be tracked, providing real-time 3D overlay in Shogun Live while the camera is moving and enabling the animation to be captured to the MCP.

To link a calibrated video camera and a rigid tracking object:

1. Create the object (normally a tracking crown or set of markers attached to the camera) in the usual way:
 - a. In the 3D Scene, select the relevant markers.
 - b. In the Tracking panel, with the Setup tab selected, go to the Prop field, enter a name for the object and click Create.
 - c. If you want to use the object tracker (see [Understand object tracking in Shogun Live, page 15](#)), on the Properties tab, ensure Track with ObjectTracker is selected.
2. At the top of the Tracking panel, ensure the object is selected.
3. In either the Workspace view pane or the System tree, Ctrl-click to select a calibrated video camera.
4. In the Tracking panel, on the Setup tab, click Link Camera.



Work with custom props and meshes

The button text changes to display identifying information for the linked camera and the bone for the prop moves to the video camera's optical center, aligned with the video camera's coordinate system.

You can now move the camera while maintaining the 3D overlay, and you can see the camera moving in the 3D Scene and Cameras views.

To detach a video camera and rigid tracking object:

1. At the top of the **Tracking** panel, select the prop that you want to unlink from the video camera.
2. On the **Setup** tab, to the right of the Link Camera button, click **Unlink**.
The prop and camera are unlinked, and no longer move together. The prop origin remains at the video camera optical center, and the video camera remains in its last position.

If you recalibrate the linked video camera, for example, following a zoom lens or tracking crown location change, the linked prop is also automatically updated so that the correct calibrated nodal point is maintained.

After you have captured a scene with linked video cameras, you can load the MCP into Shogun Post. The linked video cameras display the same animation in Post, with a key per frame for translation and rotation.

Work with objects in Shogun Post

Work with objects in Shogun Post

For information, see:

- [Create multiple objects, page 12](#)
- [Work with FBX objects, page 13](#)

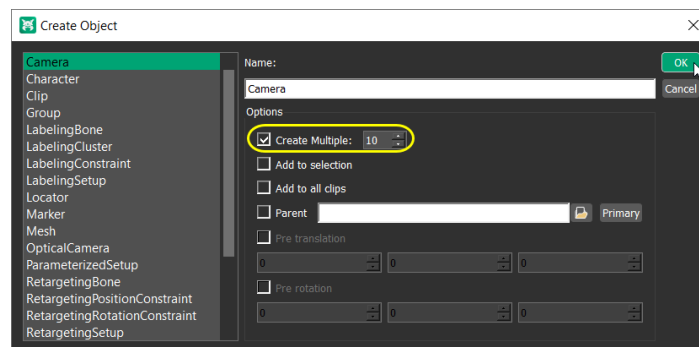
Work with objects in Shogun Post

Create multiple objects


To make it quicker and easier to create multiple instances of an object in Shogun Post (for example, if you want to create a number of cameras to help you to visualize a new capture space), you can specify the number of objects to create when you create an object.

To create multiple objects:

1. On the **Objects** menu, point to **Create objects**, then click **Create Object**.
2. On the left of the Create Object dialog box, click the type of object you want to create (in this example, Camera).
3. On the right of the dialog box:
 - a. Enter a name for the object you're creating.
 - b. In the **Options** select **Create Multiple** and if necessary, change the value to the required number of objects.
 - c. Click OK.



4. To check that your new objects are displayed, open a **Selection** panel.
5. With the Object Manipulator, move the objects to their required positions.

 For tips on creating multiple objects and using the Selection panel, see [Vicon Shogun 1.3 Post Tutorial - Object Creation and Selection List](https://youtu.be/x2W3tsnm8gg)³ on YouTube.


³ <https://youtu.be/x2W3tsnm8gg>

Work with objects in Shogun Post

Work with FBX objects

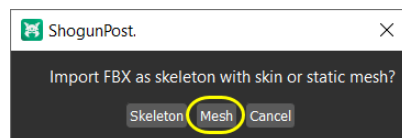
To help you visualize your scene, you can import FBX files to use as objects in your scene in Shogun Post. You can also create Mesh objects, to which you can attach FBX files, and manipulate them within your Shogun scene.

This might be useful when you want to visualize your existing 3D environment within Shogun to enable you to position the characters accurately, or to help with camera placement.

 For more information, see the following steps and watch [Vicon Shogun 1.3 Post Tutorial - Static FBX Meshes⁴](https://youtu.be/fq9Iz9HEsDM) on YouTube.

To import an FBX file as a static object:

1. Drag the FBX file into the Shogun Post view pane.
2. When you are prompted, choose **Mesh**.

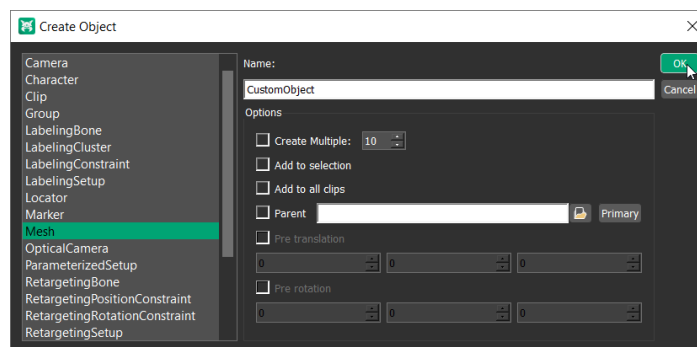


⁴ <https://youtu.be/fq9Iz9HEsDM>

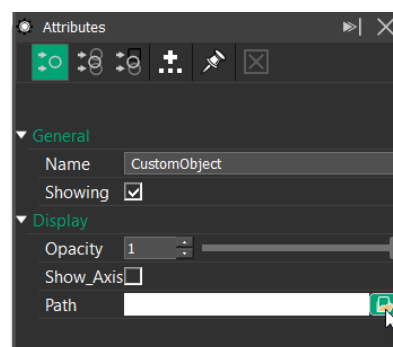
Work with objects in Shogun Post

To create a static FBX object:

1. On the **Objects** menu, point to **Create objects**, then click **Create Object**.
2. On the left of the Create Object dialog box, click **Mesh**, enter a name for the new object on the right and then click OK.



3. In the Attributes panel, enter or browse to the FBX file of the required mesh.



When you have created or imported the object, you can then move the object to the required position as normal.

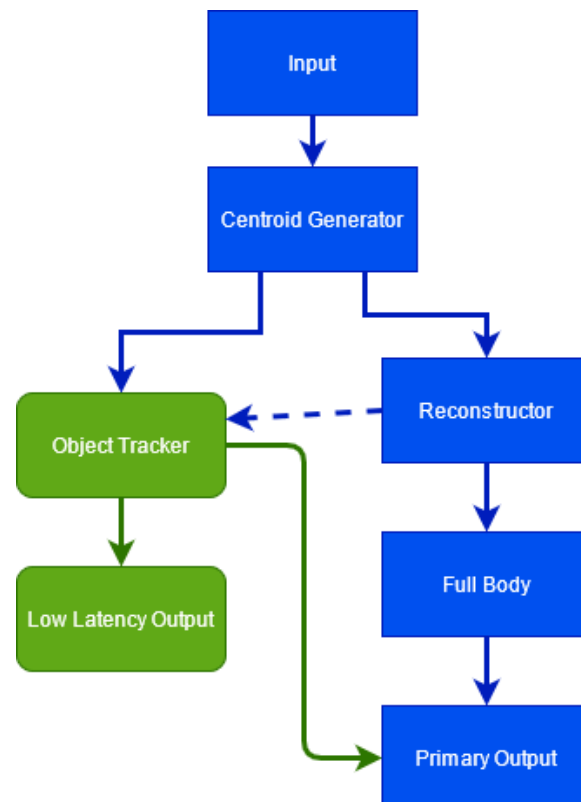
Understand object tracking in Shogun Live

Understand object tracking in Shogun Live

With Shogun 1.6 and later, you can specify that a selected rigid object is tracked using a custom object tracker.

Conventional object tracking requires at least three cameras with an unoccluded view of a marker to be able to reconstruct it in 3D. The object tracker is an alternative set of algorithms that are based on computing the 6DoF pose of the object directly, using 2D centroid data.

The advantage of this approach is that Shogun produces tracking that is robust to occlusion and can track the object into parts of the volume where it may not be possible to form enough reconstructions for the conventional approach (Full Body) to apply. Latency is also minimized as it is not necessary to wait for reconstruction, labeling and solving to complete before an object pose is obtained.

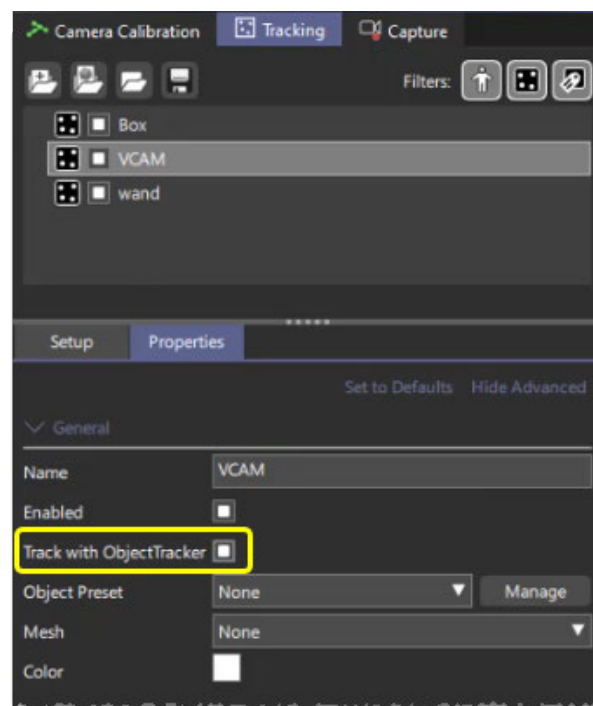


Understand object tracking in Shogun Live

The reconstructions generated by the reconstructor are used by the object tracker to boot a solution but are not needed on every frame, allowing the object tracker to generate results even in situations where the Full Body solution drops frames.

To use the object tracker:

1. Create the object in the usual way:
 - a. In the 3D Scene, select the relevant markers.
 - b. In the **Tracking** panel, with the **Setup** tab selected, go to the **Prop** field, enter a name for the object and click **Create**.
2. On the **Properties** tab, ensure **Track with ObjectTracker** is selected.



Understand object tracking in Shogun Live

Specify settings for optimal object tracking

If you can't see these parameters, at the top of the relevant panel, click **Show Advanced**.

- [System panel settings, page 17](#)
- [Processing panel settings, page 21](#)
- [Tracking panel parameters, page 23](#)

System panel settings

Towards the top of the **System** tab, the following Advanced global parameters that relate to object tracking are displayed:

Setting	Description
Force Lowest Latency	<p>Some models of Vicon cameras can be forced into a mode to provide the lowest possible latency at the cost of reducing grayscale and centroid throughput. Generally, select this setting only when using low-latency object tracking.</p> <p>However, note that for some large systems with a high number of cameras, this may cause network problems that manifest as cameras appearing to drop out. For more information, see Use the Force Lowest Latency option, page 18.</p> <p>Default: Cleared</p>
Object Tracking Level	<p>Set the camera and processing parameters to the required level of object tracking:</p> <ul style="list-style-type: none"> • Standard: Basic level involving no camera changes • Use Grayscale: Enables object pose jitter reduction using grayscale data. Note that this requires camera to send only grayscale data, which for large camera counts may cause network issues. • Object Tracking Only: As for Use Grayscale and enables lower quality centroid data to further reduce jitter. <p>Default: Standard See also Handling jitter, page 20.</p>

Understand object tracking in Shogun Live

Use the Force Lowest Latency option

To enable you to achieve lowest latency possible for object tracking, so that external devices driven by object pose (such as an LED wall virtual camera driven by a Vicon-tracked hero camera) are as close to real time as possible, you can control whether any attached Vicon cameras have their DSPs (Digital Signal Processors) enabled or not. You do this by selecting or clearing the Force Lowest Latency option. Selecting this option provides the lowest possible latency at the cost of reducing grayscale and centroid throughput. However, it is normally only useful if you are using low-latency object tracking (see [Use the object tracker, page 16](#)).

Note that this feature is not available for Vicon cameras that do not have a DSP.

Caution

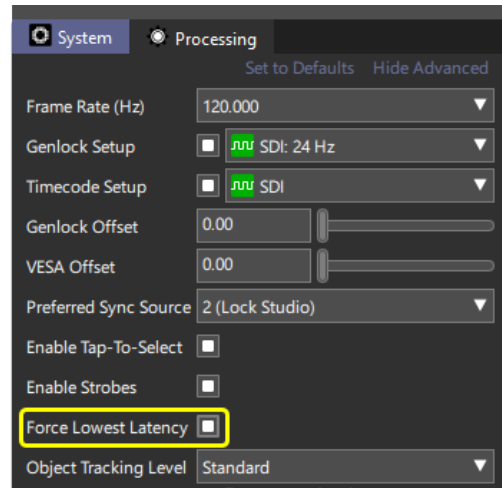
- If you are tracking only a single object or a few rigid objects, you may want to reduce the camera delivery latency and instead allow Shogun, rather than the camera, to fit grayscale blobs. In this case, you can select Force Lowest Latency.
- However, we advise you not to select Force Lowest Latency if the system contains a significant number of Vantage cameras and/or a lot of markers, as this can overload the network with grayscale data.

To use the Force Lowest Latency option:

1. Connect Shogun Live to a system containing Vicon optical cameras that have a DSP, such as Vantage and/or ViperX, with a number of markers scattered throughout the volume.
2. On the **System** panel, ensure the Advanced options are displayed. If not, at the top right of the **Systems** panel, click **Show Advanced**.

Understand object tracking in Shogun Live

3. Select Force Lowest Latency.



This ensures that any attached cameras with DSPs do not use them.

If you select Force Lowest Latency in a system with a large number of cameras and/or markers, the cameras may overload the network with grayscale data, which can result in HAL error messages in the Log, and cameras appearing to drop out or show as not transmitting data (ie, in the System panel, their icons are gray or flicker to gray). To minimize this effect:

- If possible, use 10 GB networking, rather than 1 GB networking.
- On the System panel, check the Object Tracking Level. If possible, set it to Standard, rather than Use Grayscale or Object Tracking Only, which forces the cameras to send grayscale data.
- For all cameras, check that their Grayscale Mode (found in the Optical Setup section of the System panel) is NOT set to Only.

Note that the Force Lowest Latency setting is not available if no cameras with DSPs are attached to the system.

Understand object tracking in Shogun Live

Handling jitter

Jitter is mainly caused by these issues:

- Changing sets of centroid-label correspondences (rays) contribute to the object, interacting with small inaccuracies in the camera calibration so that flickering contributions cause the optimum pose to jump about.
- Noise on the centroids cause the optimum pose to change.

If you experience large levels of jitter and/or you know that it's caused by the first issue, first try increasing the **Object Tracking Level** (the lowest level is Standard, the highest is Object Tracking Only).

If it's caused by the second issue, try selecting [Enable Motion Model](#), [page 21](#).

Understand object tracking in Shogun Live

Processing panel settings

On the Processing tab, in the Object Tracking section, the following Advanced parameters that relate to object tracking are displayed:

Setting	Descriptions
Thread Count	Number of threads to use. If set to zero (the default setting), the thread count is calculated automatically. Default: 0
Reprojection Threshold	Maximum allowable distance (in pixels) between a centroid and the projection of a marker into the same camera. Applies only to markers that are tracked using the Object Tracker. If you need to increase the Environmental Drift Tolerance, also increase this value.
Entrance Threshold	Minimum proportion of markers that must be displayed before an object is booted. If the proportion of markers that are displayed is less than this value, the object is not booted. You can override this value for selected objects by using object presets. Default: 1.00. See also Create and apply object presets , page 22.
Minimum Object Marker Separation	Minimum allowable separation distance between objects (in mm) to enable the objects to be tracked separately, based on the smallest distance between a marker on each object. Default: 10
Enable Motion Model	When selected, ensures stationary objects don't have a pose jitter arising from image noise. Select this setting to eliminate jitter that occurs when a scene is viewed through a stationary tracked camera. This setting may cause issues with very slow moving cameras. Default: Cleared. See also Handling jitter , page 20.

Understand object tracking in Shogun Live

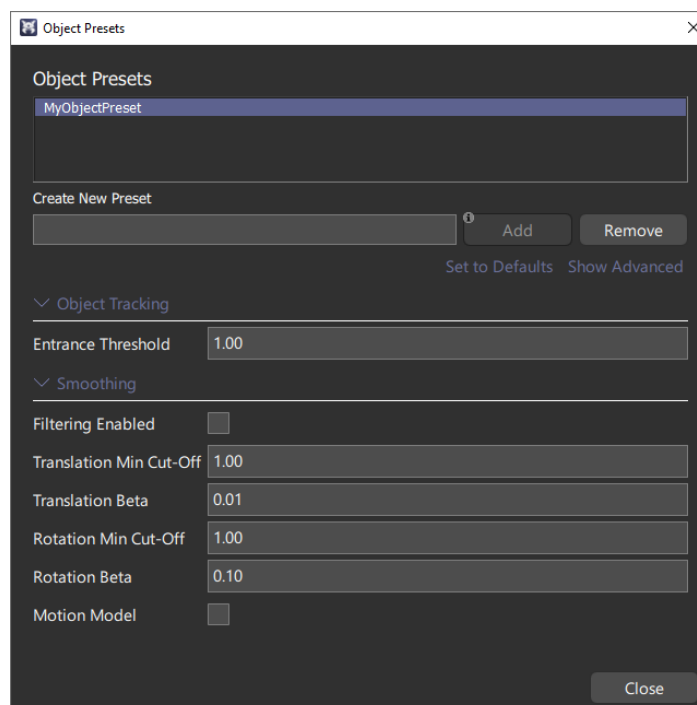
Create and apply object presets

Object presets enable you to specify the object tracking and smoothing (filtering) properties for selected objects. (Note that these properties override the overall object tracking properties that you can set in the **Processing** panel.)

By experimenting with different values for the filtering properties and applying them to an object using a saved object preset, you can evaluate filter performance to ensure the smoothest possible tracking for selected objects.

To create an object preset:

1. In the **Tracking** panel, ensure the object whose tracking and/or filtering properties that you want to refine is selected.
2. On the **Properties** tab below, ensure the Advanced properties are displayed and in the **General** section, on the right of the **Object Preset** field, click **Manage**.
3. In the **Object Presets** dialog box, enter a name for the new preset, click **Add** and ensure the new preset is selected.



Understand object tracking in Shogun Live

4. Specify the required settings and close the dialog box.
Object presets are saved in the *Subjects.mcp* file (found in C:
\\Users\\Public\\Documents\\Vicon\\ShogunLive1.7\\LastRun\\UserName), or in any
exported tracking configuration.

To apply an object preset:

1. In the **Tracking** panel, ensure that the object to which you want to apply the preset is selected and that Advanced properties are displayed.
2. On the **Properties** tab below, ensure the Advanced properties are displayed and in the **General** section, from the **Object Preset** list, select the required preset.
The tracking and/or filtering properties specified in the preset are applied to the object.

Tracking panel parameters

On the **Tracking** tab, with the required object (prop) selected, on the **Properties** tab, the following Advanced setting is displayed:

Setting	Description
Track With ObjectTracker	When selected, objects are tracked using the object tracker. Default: Cleared

Use Auto-Skeleton

Auto-Skeleton (AS) is an alternative to live solving subject calibration, providing you with a way to generate an optimized, controllable, second-solve skeleton.

Live calibration produces reliable results for accurate labeling and can produce a high quality solve ready for direct real-time previsualization or retargeting. Auto-Skeleton enables you to intervene and have greater control over the solving subject as a post-processed alternative to the Live calibrated solve. You can re-import the solving subject into Shogun Live so that you can use this for real time and also for the capture of processed data.

The way in which you use Auto-Skeleton depends on whether you have already created a VSS (Vicon Solving Setup file) and how much of it you want to keep:

- [If you have no VSS calibration, page 25](#)
- [If you have a VSS and want to use its bone lengths, but calculate new constraint offsets, page 26](#)
- [If you have a VSS but want to replace it entirely, page 28](#)

When using Auto-Skeleton, note these points:

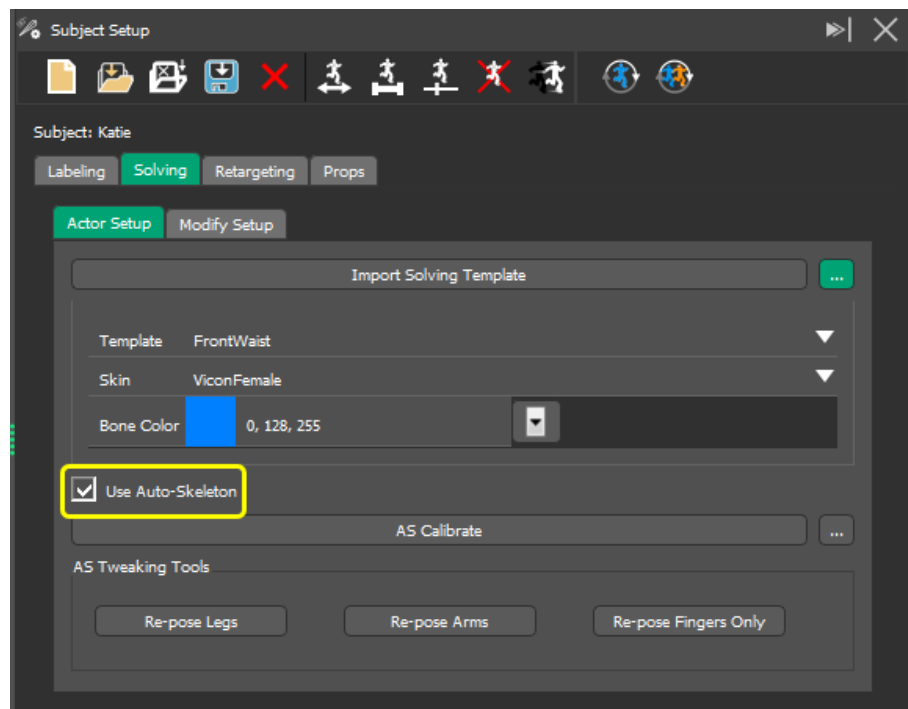
- In these sections, the marker set used is assumed to be one of the standard marker sets that are supplied by Vicon.
- Auto-Skeleton is compatible with VRA (Vicon Remarkable Actions) and does not affect it.
- Auto-Skeleton removes all solving parameterization because it's not used by Auto-Skeleton. It sets bone lengths and constraint offsets directly.
- You can run Auto-Skeleton on an existing setup, for example, one previously calibrated in Live. However, with files earlier than Shogun 1.5, before you use Auto-Skeleton, you may need to replace the existing template by loading the equivalent template from 1.5 or later, if available.

For further hints and tips, see [Get the best results from Auto-Skeleton, page 33](#).

Use Auto-Skeleton

If you have no VSS calibration


1. In Shogun Post, load a ROM or at least a labeled T- or A-pose.
2. In the **Subject Setup** panel, click the **Solving** tab, and then the **Actor Setup** tab.
3. Set the current frame to a good T- or A-pose.
4. Choose a template VSS and skin. If no templates are displayed, ensure the path to the templates is added in the **Preferences** dialog box.
5. Ensure **Use Auto-Skeleton** is selected.

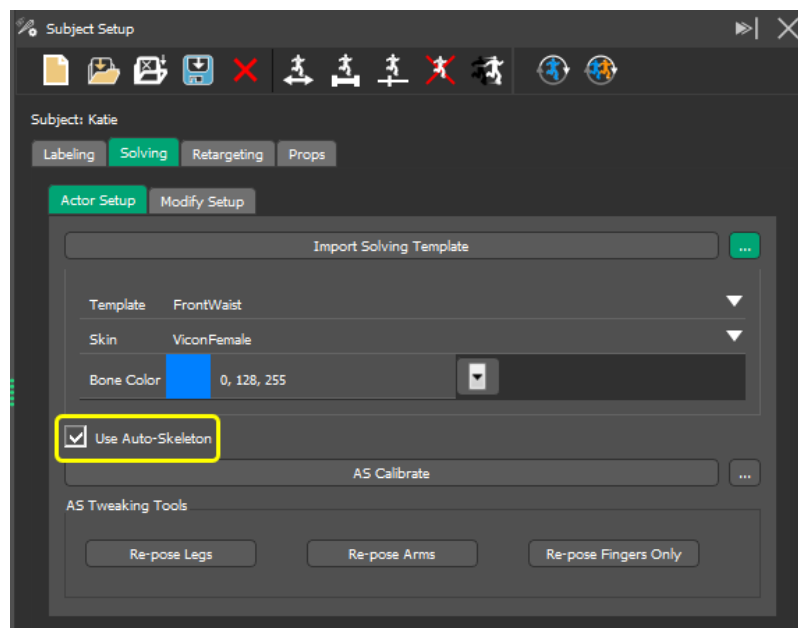


6. Click the **AS Calibrate** button.
The skeleton is scaled and posed,
7. If necessary, adjust any settings that require refinement (see [Adjust Auto-Skeleton results, page 30](#)).
8. Solve and review the motion.
9. When you're happy with the result, export the VSS.

Use Auto-Skeleton

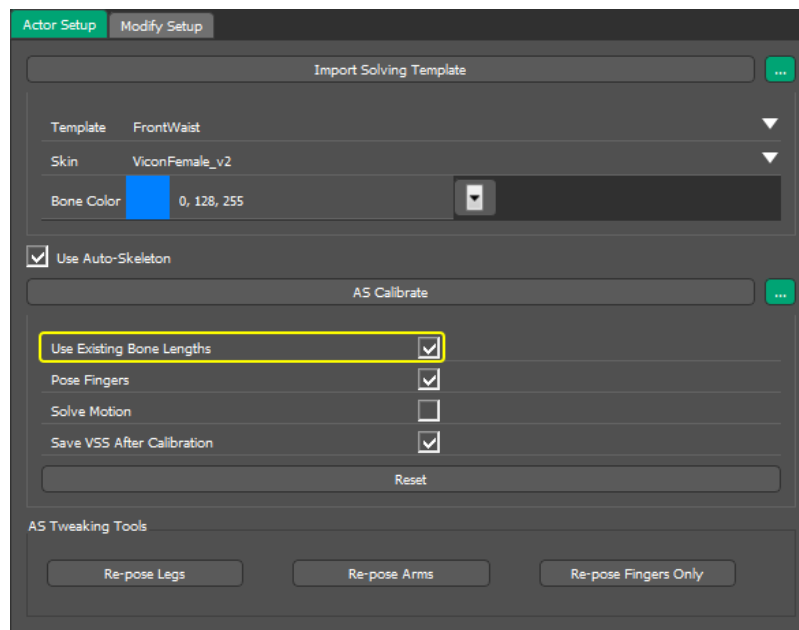
If you have a VSS and want to use its bone lengths, but calculate new constraint offsets

1. In Shogun Post, load a ROM or at least a labeled T- or A-pose.
2. In the **Subject Setup** panel, click the **Solving** tab, and then the **Actor Setup** tab.
3. Set the current frame to a good T- or A-pose.
4. In the Subject Setup panel toolbar, click the Import Solving Setup button  and load your VSS.
5. Ensure **Use Auto-Skeleton** is selected.



Use Auto-Skeleton


- To the right of the **AS Calibrate** button, click the **Show options ellipsis (...)** and select **Use Existing Bone Lengths**.



- Click the **AS Calibrate** button.
In the 3D Scene, the skeleton is posed.
- Make any adjustments necessary (see [Adjust Auto-Skeleton results, page 30](#)).
- Solve and review motion.
- When you're happy with the result, export the VSS.

Use Auto-Skeleton

If you have a VSS but want to replace it entirely

1. In Shogun Post, load a ROM or at least a labeled T- or A-pose.
2. In the **Subject Setup** panel, click the **Solving** tab, and then the **Actor Setup** tab.
3. In the **Subject Setup** panel toolbar, click the **Remove Solving Setup** button  to remove the existing setup.
4. Follow steps 3–9 in [If you have no VSS calibration, page 25](#).

Use Auto-Skeleton

Use a VSS created with Auto-Skeleton in Shogun Live

Auto-Skeleton is just an alternative way to create a VSS for an actor. After running Auto-Skeleton, you can export the resulting VSS and use it in Live.

Because Auto-Skeleton removes parameterization, you can't recalibrate the VSS in Shogun Live. If you want to do this, go back to Shogun Post and re-run Auto-Skeleton on a T-pose containing the new marker positions and ensure that the **Use Existing Bone Lengths** option is selected.

- Auto-Skeleton is compatible with VRA (Vicon Remarkable Actions) and does not interfere with it.
- Because solving parameterization is not used by Auto-Skeleton and it sets bone length and constraint offsets directly, Auto-Skeleton removes all solving parameterization.
- You can run Auto-Skeleton on an existing setup, for example, a setup previously calibrated in Live. However, with files earlier than Shogun 1.5, before you use Auto-Skeleton, you may need to replace the existing template by loading the equivalent template from 1.5 or later, if available.

Use Auto-Skeleton

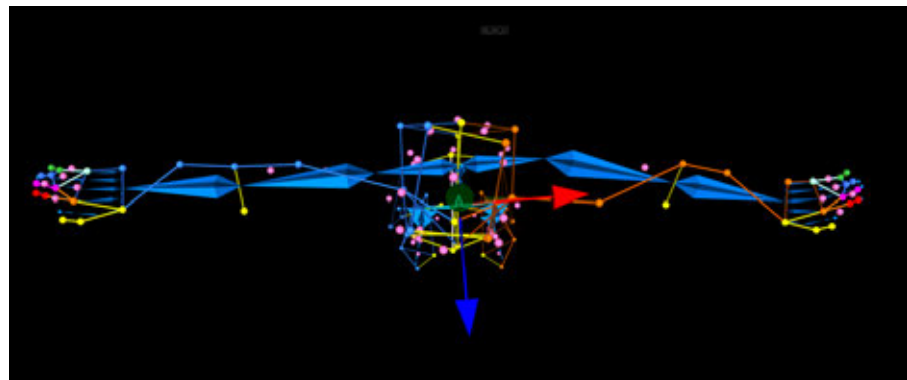
Adjust Auto-Skeleton results

Applying Auto-Skeleton generally produces good results. However, sometimes, due to marker placement or the actor's stance being less than ideal, you need to make some adjustments, for example, altering the pose or length of a few bones. Sometimes the adjustments themselves are small, like rotating the root a few degrees to face the right way, but this then requires the limbs be re-posed, which is time consuming and challenging to do manually.

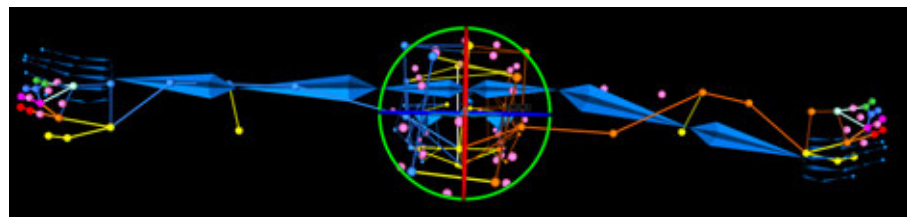
Auto-Skeleton re-posing provides a solution for this. It enables you to re-pose only the arms, or only the legs, leaving the rest of the body as is. Re-posing changes only the pose. It does not adjust scale. The tools for re-posing the results of Auto-Skeleton are found in the same place as the Auto-Skeleton option: in the **Subject Setup** panel, on the **Solving** tab, click the **Actor Setup** tab.

Correct a misalignment of the root

In the following example, based on a T-pose, the root has ended up facing slightly to the actor's left side, instead of straight ahead. This can be clearly seen by the direction of the Z (blue) axis of the manipulator when the root is selected.



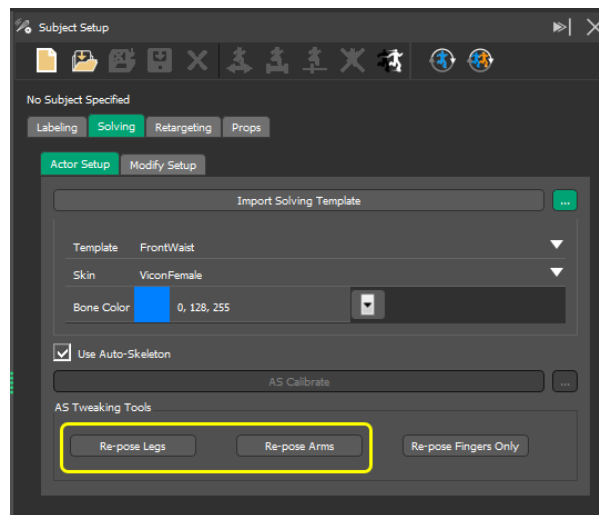
1. To correct the issue, rotate the root about its up axis to be correctly posed.



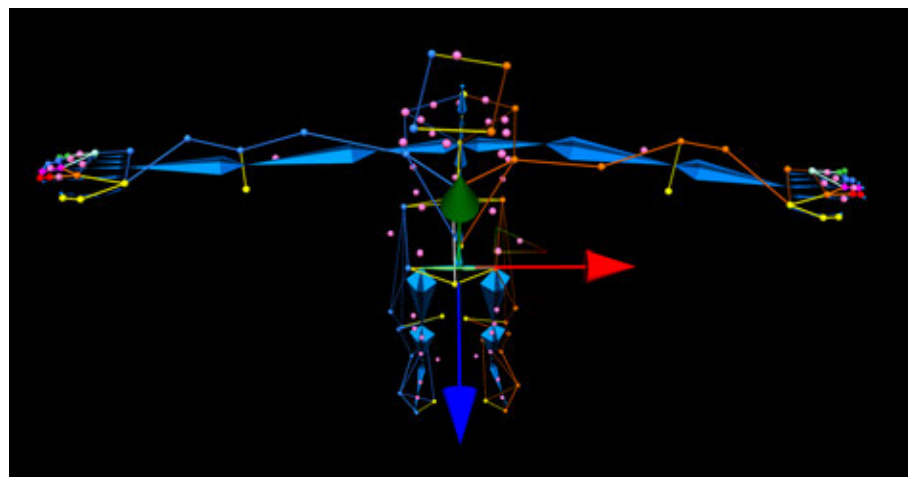
This leaves the arms and legs needing to be re-posed.

Use Auto-Skeleton

2. Click the Re-pose Arms and Re-pose Leg buttons (the order does not matter in this case).



The arms and legs are re-pose and all constraint offsets of the entire body are updated based on the resulting pose.

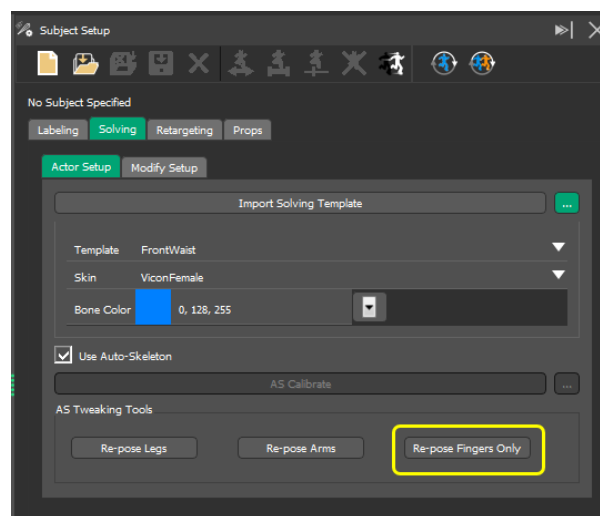


Use Auto-Skeleton

Re-pose fingers

In cases where you manually tweaked the arm and then need to repose the fingers, use the **Re-pose Fingers Only** button.

Note that you need to update the constraint offsets for the arm after your tweaks and before you click **Re-pose Fingers Only**.



Use Auto-Skeleton

Get the best results from Auto-Skeleton

The following suggestions produce best results for Auto-Skeleton and are generally useful, regardless of how you set up the solve.

- [Actor stance, page 33](#)
- [Marker placement, page 34](#)
- [A- vs T-pose, page 35](#)
- [Single frame vs ROM, page 35](#)

Actor stance

- At the time Auto-Skeleton is run, the actor must be in a T- or A-pose.
- Legs must be in a natural, neutral stance:
 - Feet must be about shoulder width apart.
 - Feet must point forward (slightly out is OK, symmetry matters most).
 - Feet must be in the same position forward and backward.
 - Legs must be straight.
- Waist to head must be relaxed, natural, and straight.
 - Feet, waist, chest, and head must all point forward. Prevent actors from standing with a slight twist if they're looking off to the side watching how to perform the ROM. Auto-Skeleton cannot tell if the head is not pointing straight ahead as opposed to the markers being placed inaccurately, so it assumes the head is straight.
 - The root is assumed to be over the mid-foot, probably a little in front of the ankle. This is usually how people stand when relaxed. Prevent actors from standing too stiff and straight and leaning back, or putting too much effort into just standing and leaning forward.
- Arms must be straight.
- Fingers must be straight.

Use Auto-Skeleton

Marker placement

- Mid-segment markers (thigh, shin, bicep, and forearm) are ignored.
- Root position front-to-back and to some extent side-to-side works best when the waist markers are symmetric.
- Aim for the waist markers to be close to all the same height. Often back is higher than front, which is OK, but avoid extremes.
- Waist marker height overall is mostly ignored by Auto-Skeleton. Try to place waist markers well, but be aware that Auto-Skeleton assumes that waist marker height is not a reliable way to determine anything.
- Place the outer knee marker so that it's on the side of the knee joint and symmetric in placement for both legs (same height and middle of knee front-to-back on both left and right).
- Inner knee marker is ignored.
- Upper knee marker in the Production marker set is ignored.
- Place ankle markers as closely as possible to the ankle joint center, but note that Auto-Skeleton ignores their height.
- Ideally, MT markers should be at the same height and their midpoint defines where the toe joint ends up, as well as the height of the foot.
- Toe and heel should be centered and ideally at similar height.
- Place CLAV, STRN, C7 and T10 in the center of the body. Auto-Skeleton ignores their height, but partially uses them for actor-facing direction.
- Ensure that the front and back shoulder markers are symmetric left-to-right and front-to-back, and that a line from front-to-back is close to intersecting the shoulder joint center.
- Place the outer elbow markers on the sides of the joints.
- If present, place inner elbow markers on the side of the joint, symmetrically to the outer.
- Place wrist markers so that their midpoint defines the wrist joint center. Auto-Skeleton assumes this for both arm scale and arm posing, and correct wrist joint calibration is essential for the fingers to solve well.
- Head markers are ignored by Auto-Skeleton. It assumes that the actor is standing straight, with the head looking forward.

Use Auto-Skeleton

A- vs T-pose

Auto-Skeleton works with an A- or T-pose. The T-pose may give slightly better results because it assumes the clavicles are straight, whereas with an A-pose, it estimates the appropriate bend downward.

Single frame vs ROM

Auto-Skeleton looks only at the marker positions at the current frame. You need only a T- or A-pose to run it, but having a ROM present is useful to check whether the resulting calibration solves well.

Create a subject calibration hotspot

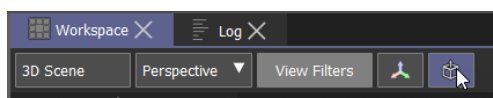
Create a subject calibration hotspot

To avoid having to clear the volume whenever you need to calibrate or re-calibrate a subject, you can use visualize the reconstruction volume and set aside a part of the volume (known as a hotspot) specifically for subjects to perform their calibration ROMs, leaving the rest of the volume free.

Before you begin, ensure you have completed the usual setup steps, including camera calibration, as described in *Getting started with Vicon Shogun*.

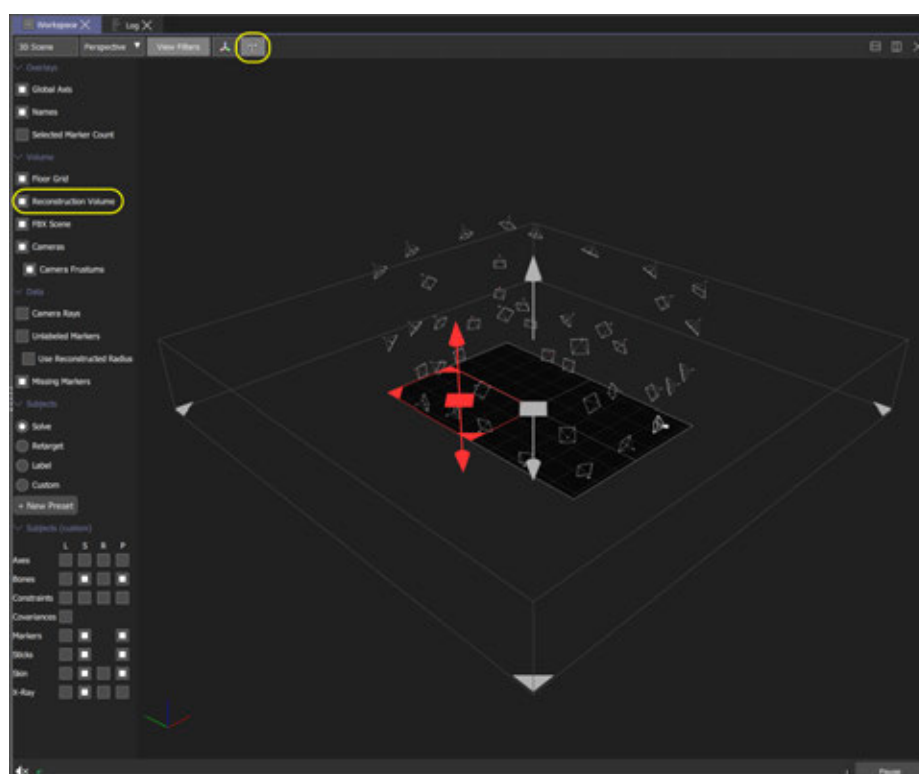
To view the default reconstruction volume and subject calibration hotspot:

1. In Shogun Live, in a **3D Scene** view, display the **View Filters** and ensure that **Reconstruction Volume** is selected, as well as any other options you want.
2. At the top of the view pane, click the **Reconstruction Volume Manipulator** button.



Create a subject calibration hotspot

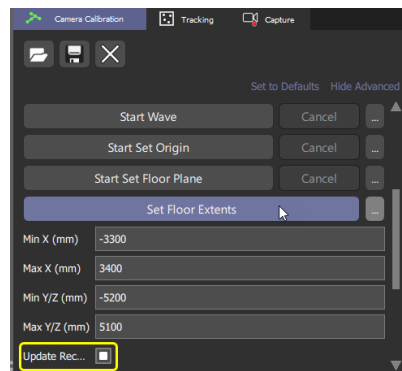
3. The boundaries of the reconstruction volume (gray) and subject calibration hotspot (red) are displayed in the 3D Scene view.



Create a subject calibration hotspot

To modify the reconstruction volume:

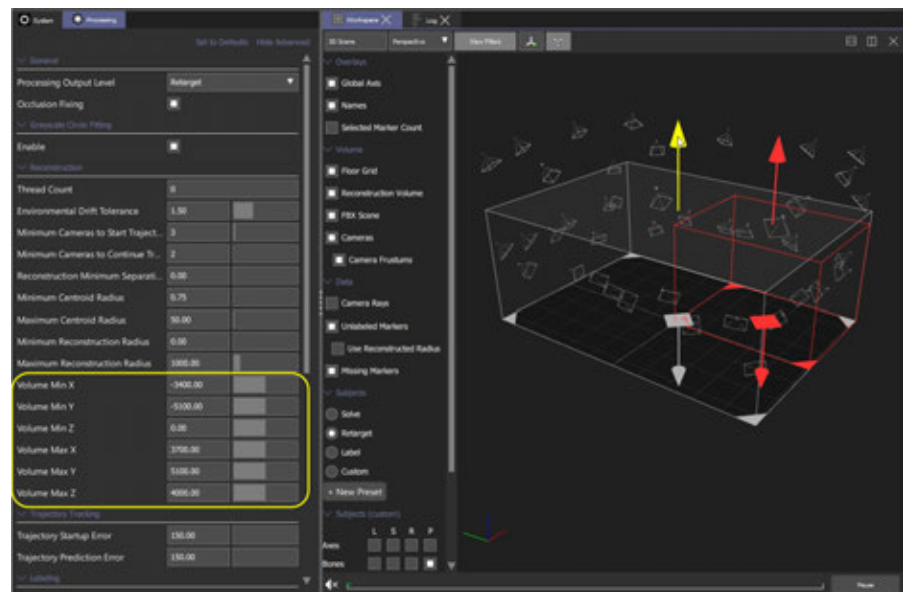
1. If you want the reconstruction volume to match the current floor extents, in the **Camera Calibration** panel, display the Advanced properties, ensure the **Update Reconstruction Volume** checkbox is selected (click the ellipsis (...) next to Set Floor Extents to check) and then click **Set Floor Extents**.



Create a subject calibration hotspot

2. Specify the size of the reconstruction volume (gray) in either of these ways:

- Drag the gray arrows, which turn yellow on selection, to change the boundaries.
To move the position of the whole reconstruction volume, drag the gray diamond shape from the origin.
Or
- On the **Processing** tab, ensure the **Advanced** properties are displayed and in the **Reconstruction** section, change the values of **Volume Min X, Y, and Z** and of **Volume Max X, Y and Z** to reflect the required volume size and position.

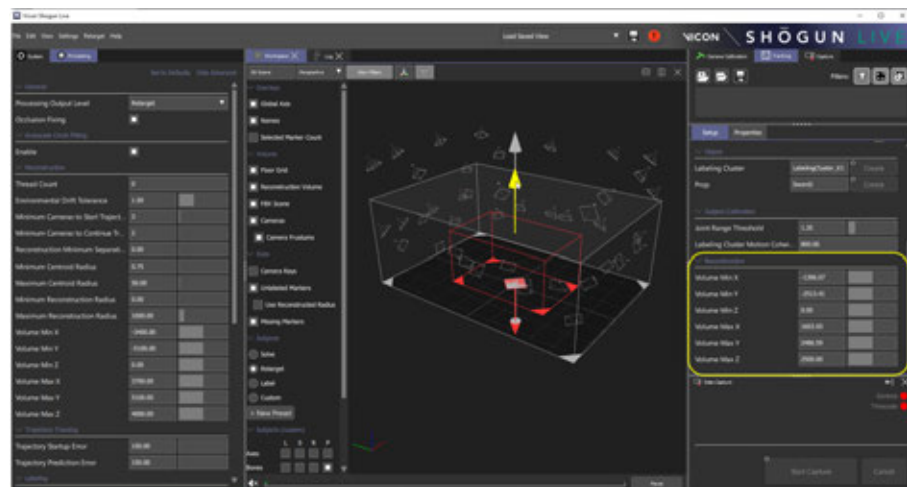


Create a subject calibration hotspot

To modify the subject calibration hotspot:

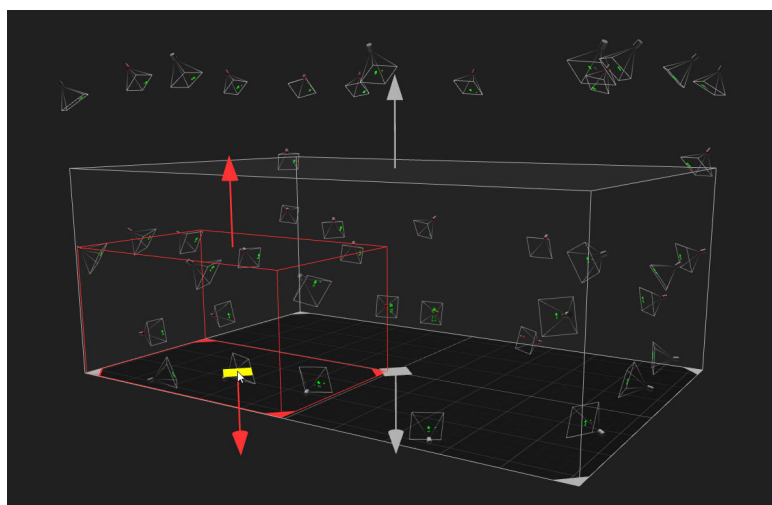
In a similar way as the reconstruction volume, you can specify a subject calibration hotspot (red).

1. Specify the size of the hotspot in either of these ways:
 - Drag the red arrows (which turn yellow on selection) to change the boundaries. To move the position of the whole hotspot area, drag the red diamond shape from the origin.
Or
 - In the Tracking panel, on the **Setup** tab, ensure the **Advanced** properties are displayed and at the bottom, in the **Reconstruction** section, change the values of **Volume Min X, Y and Z**, and **Volume Max X, Y and Z** to reflect the required subject calibration hotspot size and position.
2. The results of your changes are displayed in the 3D Scene.



Create a subject calibration hotspot

3. If required, move the subject calibration hotspot to a different part of the volume either by dragging the red diamond shape or by amending the Volume Min X, Y, and Z and of Volume Max X, Y and Z values in the Calibration Processing Parameters of the Tracking panel.



Run Shogun processing on multiple machines

Run Shogun processing on multiple machines

Shogun Live's multi-machine capability enables you to reduce dropped frames by running a standalone agent on one or more other machines on the same network.

- [Requirements for multi-machine processing, page 43](#)
- [Set up multi-machine processing, page 44](#)

See also:

 [Vicon Shogun 1.3 Live Tutorial - Multi-machine Workflow⁵](#) on YouTube.

⁵ <https://youtu.be/41bv18ULhAQ>

Run Shogun processing on multiple machines

Requirements for multi-machine processing

- Agent machines with high clock speeds
- Agent(s) and main machine running on the same network
- Network adapters on the network set within the range 192.168.128.###

If required, for example, if 192 is already used for other clients or processes, you can manually set the subnet to be used for Shogun multi-machine processing. For details, see [Specify the subnet for multi-machine processing, page 46](#).



Port numbers

Normally, you will not need to change the default port number, 37415.

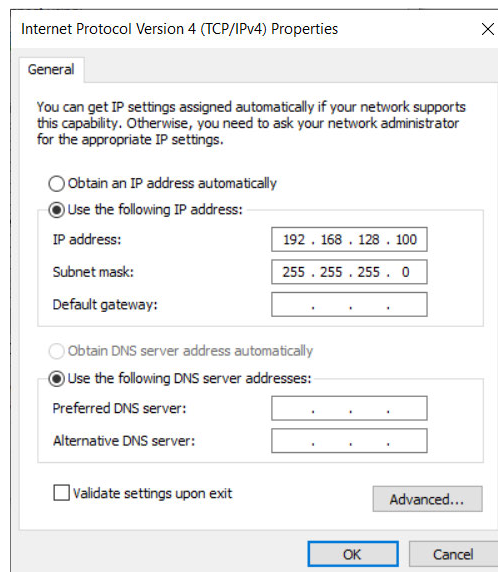
If this clashes with another application:

1. Run `ShogunAgent --port=<port number>`
2. Set the matching number in the **Add Agent** dialog box.

Run Shogun processing on multiple machines

Set up multi-machine processing

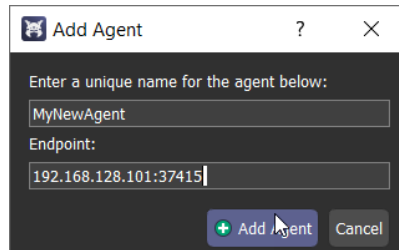
1. On the main machine, note or set the IP address. In the following example, the address is 192.168.128.100.



2. On the agent (secondary) machine, note or set the IP address. In this example, it is set to 192.168.128.101.
3. Open up CMD/PowerShell and ping each machine to make sure there is a connection.
4. On the agent machine, install the agent installer (the *ShogunAgentInstaller* file, found in the Shogun installer) and run it.
5. Install the same version of Shogun on the main machine and run it.
6. On the main machine, in Shogun Live, on the **View** menu, select **Agents**.

Run Shogun processing on multiple machines

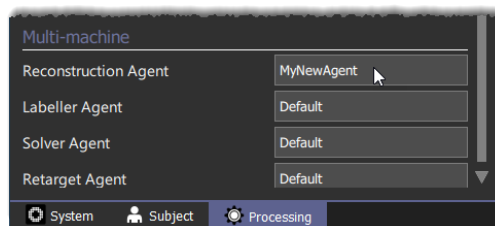
7. In the Agents dialog box, click **Add Agent**
 - a. In the first field, enter a unique name.
 - b. In the **Endpoint** field, enter the agent's IP address, for example, 192.168.128.101:



- c. Click **Add Agent**.
At the bottom of the **Agents** dialog box, **Contributing** is displayed.



8. In Shogun Live, on the **Processing** panel, ensure the Advanced properties are displayed, scroll to the **Multi-machine** section and enter the name you specified (see Step 7a) of the agent(s) that you want to use for reconstruction, labeling, solving and/or retargeting.



Run Shogun processing on multiple machines

Specify the subnet for multi-machine processing

If required, you can manually set the subnet to be used for Shogun multi-machine processing.

To specify the subnet:

1. On the main PC, add this flag:

```
ShogunLive.exe --agent-host-ip=HOST_IP
```

2. On the agent machine, add this flag:

```
ShogunAgent.exe --agent-host-ip=HOST_IP
```

Where HOST_IP is the IP address of the machine.

For example:

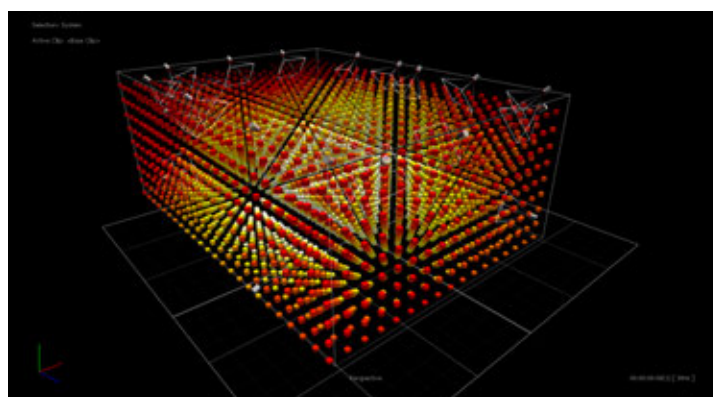
```
ShogunLive.exe --agent-host-ip=192.168.1.100
```

When you add an agent in Shogun Live, you can then use your local IP range.


Visualize camera coverage

Visualize camera coverage

At any point during your use of Shogun Post, you can use the Volume Visualizer to visualize camera coverage of real or virtual volumes based on the cameras in the scene.



The tool draws voxels for each theoretical ray intersection of cameras in the scene. This means that, within a box encompassing all cameras, every X distance from one corner to the opposite corner a box is drawn if cameras can see that position in space. You can configure the number of cameras that need to see that position and change other options to customize the visualization to more accurately represent your setup.

 For more information, see the following steps or watch [Vicon Shogun 1.3 Post Tutorial - Volume Visualizer](https://youtu.be/TqEL34lF-ng)⁶ on YouTube.

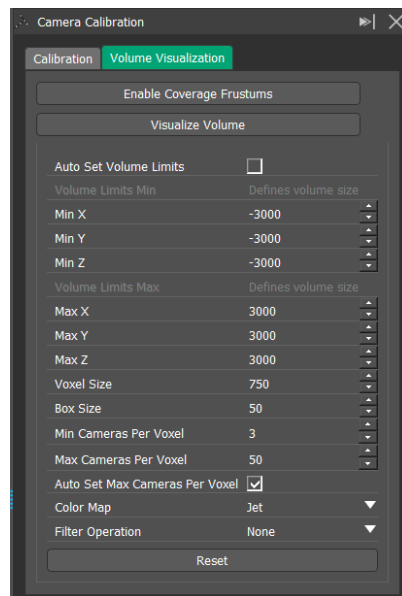
To use the Volume Visualizer:

1. Either load a camera calibration file (.xcp), or create cameras (on the **Objects** ribbon, click **Create Object**) or a create camera objects via a script.

⁶ <https://youtu.be/TqEL34lF-ng>

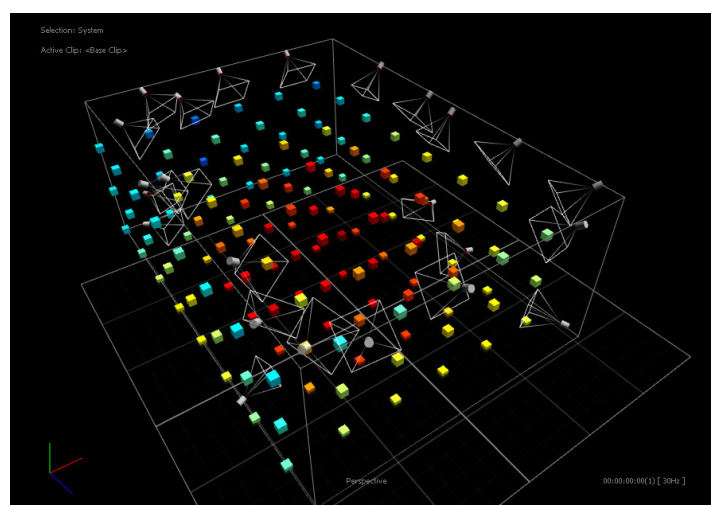
Visualize camera coverage

- On the ribbon, click **Camera Calibration** and in the Camera Calibration panel, click the **Volume Visualization** tab.



- Select whether to show camera frustums and set the other options as required (see [Volume Visualizer settings, page 50](#)) and then click **Visualize Volume**.

The volume, with colored voxels representing the area seen by the selected camera(s), is displayed.



Each box shows a position where cameras intersect. With the default (Jet)

Visualize camera coverage

color map selected, the lighter boxes are where three cameras (the default Min Cameras Per Voxel setting) intersect, and as the boxes become red, more cameras are intersecting. By rotating around this view, you can see which areas of the volume have the best coverage, whether there are dead spots, where you get the most height, etc.

4. If necessary, adjust the settings to enable you to visualize the volume as required (see [Volume Visualizer settings, page 50](#)).
 You can use the Manipulator tool in the 3D Scene view to move and rotate cameras and observe the effect on the volume coverage. Note that increasing the voxel size can improve performance.
 You can also add cameras (on the **Objects** ribbon, click **Create Object**), delete cameras, or change the type of a camera (from the Attributes editor), etc. This enables you to visualize not just existing calibrated camera configurations but also virtual camera arrangements, so you can try out new camera configurations.

Visualize camera coverage

Volume Visualizer settings

The following options are provided for volume visualization:

Option	Description
Enable Coverage Frustums	<p>Displays or hides the Draw_Frustum attribute of all the cameras. The Visualize Volume tool uses this attribute to determine how far each camera can theoretically see.</p> <p>You can display a camera's frustum in Shogun Post without using Visualize Volume. To do this, select one or more cameras and in the Attributes editor, display the Advanced options (⚙️) and in the Display section, select the Draw_Frustum attribute. It's drawn as a transparent pyramid extending from the camera. This is another way of visualizing the space a camera can see and can be useful on its own or with the Visualize Volume tool.</p>
Auto Set Volume Limits	If selected, the box containing the voxels automatically includes all the cameras in the scene and clamps it to the floor.
Min X, Min Y and Min Z	Defines the volume size (mm)
Voxel Size	Modifies the spacing between boxes. A lower value draws more voxels, but may take longer to draw (default is 750).
Box Size	The size of the box that is drawn at each voxel (1-1000, default is 50 mm)
Min Cameras Per Voxel	The minimum number of cameras that must see a voxel for it to be drawn. Usually, set this value to the fewest ray intersections acceptable to reconstruct a marker as a starting point.
Max Cameras Per Voxel	The maximum number of cameras that must see a voxel for it to be drawn. Usually, set this value to the number of cameras in the scene.
Auto Set Max Cameras Per Voxel	If selected, automatically sets the maximum number of cameras per voxel to the number of optical cameras in the scene.
Color Map	Lists the color schemes available to show the number of cameras that see each voxel.

Visualize camera coverage

Option	Description
Filter Operation	<p>By default the tool works on all cameras, but this setting lets you display voxels based on the selected cameras.</p> <p>None Shows all the voxels seen by all cameras, regardless of which cameras are selected.</p> <p>All Selected Shows only the voxels seen by all the selected cameras.</p> <p>Any Selected Shows voxels seen by any of the selected cameras.</p> <p>None Selected Shows voxels that are not seen by the selected cameras.</p>

Set up SDI video cameras

Set up SDI video cameras

In Shogun Live 1.5 and later, you can include up to four SDI video cameras (including sound) in your Vicon Shogun system.




When you have calibrated the SDI video cameras, you can overlay the motion capture data and check the solve against the video. You can also export the calibrated cameras with the image sequence directly into Autodesk® Maya® software as an FBX file.

Set up SDI video cameras

The following sections describe how to set up SDI video with a single Blackmagic URSA Mini 4K camera and an Evertz 5601MSC timecode generator, but the same principles apply to other supported hardware.

- [Recommended SDI video hardware, page 54](#)
- [Set up a capture card for SDI video in Shogun Live, page 64](#)
- [Set up a timecode generator for SDI video in Shogun Live, page 72](#)
- [Set up cameras for SDI video in Shogun Live, page 85](#)
- [Check and connect the SDI video system components, page 103](#)
- [Choose shutter duration, video standard and system frame rate, page 106](#)
- [Calibrate the SDI video system, page 111](#)

 For details about this procedure, watch the Vicon video, [Shogun Live SDI Video](#)⁷, available on YouTube.

 The Vicon video, [Shogun Live SDI Video](#)⁸, is also available on Vimeo.

Note

As the videos were recorded using an earlier version of Shogun, you may notice minor differences in the user interface.

Shogun Live lets you link a calibrated SDI or Vicon Vue video reference camera to a rigid tracking object. This enables the video camera to be tracked, providing real-time 3D overlay in Shogun Live while the camera is moving and enabling the animation to be captured to the MCP. For more information, see [Link a prop and a video camera, page 9](#).

⁷ <https://youtu.be/X-GiJ9bHAvY>

⁸ <https://vimeo.com/275782939>

Set up SDI video cameras

Recommended SDI video hardware

In Vicon Shogun Live 1.2 and later, you can display and capture video from SDI video cameras. This enables you to use a huge range of third-party, professional-quality video cameras to overlay and capture calibrated reference video.

The following recommendations are based on what the software supports for calibration and what has been tested with this version of the software. They are provided to help you to choose the most suitable SDI hardware.

- [Recommended cameras for calibrated video, page 55](#)
- [Suitable cameras for uncalibrated reference video, page 57](#)
- [Recommended capture cards, page 58](#)
- [Recommended timecode embedder, page 60](#)
- [Recommended master clock/SPG/timecode generators, page 61](#)
- [Recommended cabling, page 63](#)

Set up SDI video cameras

Recommended cameras for calibrated video

For a camera to work well with Vicon Shogun it must:

- Have a global shutter sensor.
- Be able to output progressive video (eg, 720p, 1080p). Interlaced video (eg, 625i/PAL, 525i/NTSC, 1080i) is not supported.
- Support a genlock/reference/sync input.
- Have a timecode input and support embedding timecode in the video, or else you will need a separate timecode embedder.
- Produce output that is compatible with a Blackmagic DeckLink capture card.

Set up SDI video cameras

Following testing, Vicon recommends these cameras for calibrated reference video:

Camera	SDI outputs	Global shutter	Genlock/Reference sync	Timecode input	Timecode embedded in output	Highest supported video standard
RED Komodo 6K ¹	1 x 12G	✓	✓	✓	✓	2160p/60
Blackmagic URSA Mini 4K (discontinued) ²	1 x 12G 1 x 3G	✓	✓	✓	✓	2160p/60
ARRI Alexa Mini LF	1 x 6G	✗ ⁴	✓	✓	✓	2160p/30
IO Systems Flare 2KMSDI-B ³	2 x 3G	✓	✓	✗	✗	1080p/30

¹. For timecode and genlock, the [Komodo Expander Module](#)⁹ is required.

². Only LTC timecode is supported. When LTC timecode is used, only the SDI reference signal can be used (ie, not tri-sync).

Set **Reference Input** on camera to **Program** and check for REF and EXT on screen overlay.

³. This is a grayscale sensor. A timecode embedder is required.

⁴. Rolling shutter, but tested and found to be fast enough in most cases.



Blackmagic URSA Mini 4.6K

The Blackmagic URSA Mini 4.6K uses a different sensor that is not global shutter, so is not recommended.

⁹ <https://www.red.com/komodo-expander-module>

Set up SDI video cameras

Suitable cameras for uncalibrated reference video

The following camera has been used for capturing reference video in Shogun Live, but because it has a rolling shutter sensor, it can't be used for calibration:

Camera	SDI outputs	Global shutter	Genlock/Ref. sync	Timecode input	Timecode embedded in output
Blackmagic Micro Studio 4K (discontinued) 1	1 x 6G	✗	✓	✗	✗

¹. SDI reference is supported. A timecode embedder is required.

Set up SDI video cameras




Recommended capture cards

Shogun Live supports capturing from Blackmagic DeckLink cards using the DeckLink API, thus any DeckLink card should work with it. In addition, Shogun Live 1.6 and later includes support for the two Bluefish444 SDI video capture cards listed at the bottom of the following table.

Vicon has tested Shogun Live with the following cards:

Manufacturer	Model	No. of inputs	Notes
Blackmagic Design	Decklink 8K Pro	4 x 12G	Recommended for 12G and multi-camera captures. The host PC must be powerful enough to support multi-camera capture. In particular, it must have enough fast drives.
	Decklink Mini Recorder 4K	1 x 6G	Recommended as a cost effective option for setups where 12G is not required.
	Decklink 4K Pro	1 x 12G	
	Decklink 4K Extreme 12G	1 x 12G	
	DeckLink SDI 4K	1 x 6G	

Set up SDI video cameras

Manufacturer	Model	No. of inputs	Notes
	DeckLink 4K Extreme	1 x 6G	
			
Bluefish444	Kronos K8	8 x 3G	Supported as either 8 independent 3G inputs or 4 x 3G inputs for quad-link video. 8 x small-size BNC ports.
			
	Epoch 4K Neutron	3 x 3G	Supported as 3 x 3G inputs. An optional LTC expansion module is available.
			

Set up SDI video cameras

Recommended timecode embedder

We have tested the following timecode embedder:

Timecode embedder	Number of channels	Notes
Blackmagic Teranex Mini Audio to SDI	1 x 12G	Use right XLR audio input to insert LTC timecode, and select Timecode mode in control software.

Set up SDI video cameras

Recommended master clock/SPG/timecode generators

We have tested the following timecode generators:

Timecode generator	Notes
Evertz 5601	<p>If the camera requires SDI sync (eg. Blackmagic URSA) then the Evertz 5601 must have a suitable HD or 3G SDI TG (Test Generator) option. The options are known as +HDTG and 3GTG. The presence of the options is not apparent from the number of connectors (ie, the connectors can be present even if the option is not included). To determine which options are enabled, go to the Status tab in VistaLink. In the Options group, ensure that the TG option is present, ie, it displays HD Present or 3G Present rather than Not Valid.</p> <p>Typically the following connections are required:</p> <ul style="list-style-type: none"> • LTC 1, 2 (XLR): Provide LTC for SDI camera or timecode inserter. • TG 1, 2 (BNC): Provide SDI sync if SDI camera accepts this, or • Sync 1, 2, 3, 4, 5, 6 (BNC): Provide Tri-Sync or Blackburst if camera accepts this. • Sync 1, 2, 3, 4, 5, 6 (BNC): Can be configured to supply PAL/NTSC sync with VITC to Lock/Lock+, or • TG 1, 2 (BNC): Provide SDI sync to Lock Studio.
Courtyard CY440	<ul style="list-style-type: none"> • LTC/Wordclock: May be configured to provide LTC output. • SDI 1, 2 (BNC): Provide SDI sync to camera, or • Tri/Black 2, 3, 4: Provide tri-sync to camera • Composite (BNC): Provides PAL/NTSC sync with VITC to Lock/Lock+, or • SDI 1, 2 (BNC): Provide SDI sync to Lock Studio

Set up SDI video cameras

Timecode generator	Notes
Courtyard CY460	<p>Typically the following connections are required:</p> <ul style="list-style-type: none"> • Balanced Audio/AES/LTC (Molex): May be configured to provide LTC output. Custom cable required. • SDI 1, 2 (BNC): Provide SDI sync to camera, or • Tri/Black 2, 3, 4: Provide Tri-sync to camera • Composite (BNC): Provides PAL/NTSC sync with VITC to Lock/Lock+, or • SDI 1, 2 (BNC): Provide SDI sync to Lock Studio

Set up SDI video cameras

Recommended cabling

SDI video uses co-ax cable with 75Ω characteristic impedance. Cables labeled RG-59U will be 75Ω, but may not be of sufficient quality for 3G video. Good quality cables with low return-loss are very important, and become even more crucial over longer distances and at higher standards, such as 6G and 12G. SDI sync also requires good quality video cable because it is also an SDI video signal. Analog blackburst, tri-sync and LTC signals are likely to be more forgiving.

We have tested the following cable types:

Cable	Notes
Belden 1694A	This is sometimes said to be industry-standard video cable. This was used for testing up to a range of 30 m for 3G and 20 m for 6G.
Van Damme 278-175-000 LSZH	20 m lengths of this were used for 3G and 6G.

Set up SDI video cameras

Set up a capture card for SDI video in Shogun Live

These cards are supported for SDI video in Shogun Live 1.6 and later:

- [Set up a Blackmagic DeckLink card, page 65](#)
- [Set up a Bluefish444 card, page 67](#)

Set up SDI video cameras

Set up a Blackmagic DeckLink card

1. Install the capture card in your computer. Remember to connect its extra power connector if it has one.
2. Download and run the Blackmagic Desktop Video Installer, which includes the drivers.

Note

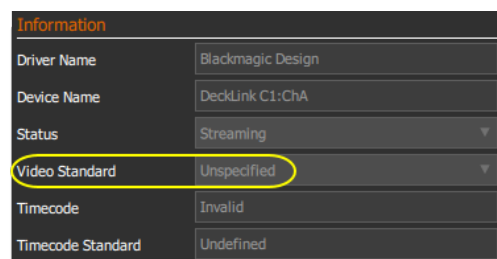
We recommend that you use version 12.1 or later of the Blackmagic Desktop Video Installer. Earlier versions may not work with Shogun Live.

3. Open Shogun Live and ensure that in the **System** panel, the card is listed under **Video Inputs**.



If the device isn't listed, the capture card could be incorrectly installed, the correct driver could be missing, or another instance of Shogun Live could be running and using it.

4. Ensure that the card is selected and in the **Information** section of the Properties, note that **Video Standard** is set to **Unspecified**. This indicates that the cable is not connected or there's no signal on it.



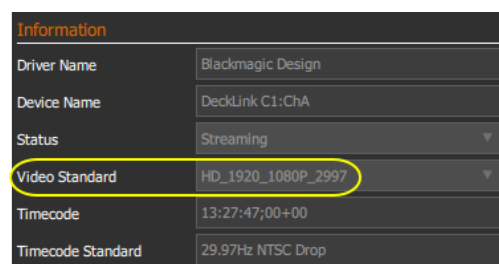
5. Identify which BNC connector is the video input. Some cards have multiple inputs that are not labeled, so you may need to refer to the Blackmagic documentation.

Set up SDI video cameras

6. Connect this input to the SDI output from the camera.
In the Properties, the icon changes in the **Video Inputs** section.



In the Information section, the **Video Standard** is now displayed.



If the video standard is not shown, the standard may not be supported by the capture card, or there may be a problem with the camera or the cabling.

Set up SDI video cameras

Set up a Bluefish444 card

For supported cards, see [Recommended capture cards](#), page 58.

1. Install the card following the instructions in the manual.
2. Note that Shogun Live requires version 6.3.3.1 or later of the drivers.
Download the Bluefish444 driver installer from the [Bluefish444 website](#)¹⁰.
3. Run the installer in administrator mode, ensuring that utilities and drivers are selected.
4. To configure card for inputs, press the Windows key and enter BlueFirmwareUpdater. Follow the instructions to configure the card for inputs (eg, 3 inputs for the Epoch 4K Neutron or 8 inputs for the Kronos K8).



Important

Ensure that you completely power down the computer after a firmware update. It is not sufficient to just reboot.

5. Power down the computer.
6. Start Shogun Live.
7. Check that the card has been detected on start-up. If it is detected, a message similar to this is displayed in the log:

```
2021.01.11 15:55:55.787    Info    VBluefish444Driver    Successfully loaded Bluefish444 driver
```

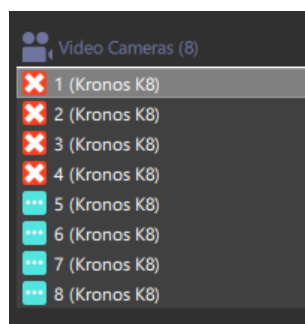
If a warning like the following appears in the log instead, it probably means that the driver is not properly installed:

```
2021.01.11 18:21:58.998    Warn    VBluefish444Driver    Could not load Bluefish444 driver. Driver may not be installed.
```

¹⁰ <https://bluefish444.com/support/downloads/details/1/bluefish444-windows-installer.html>

Set up SDI video cameras

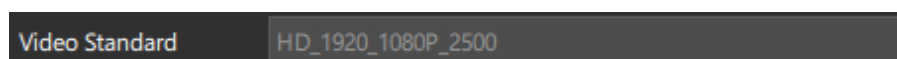
In the the **System** panel, go to the **Video Cameras** section of and check that a separate entry is displayed for each camera:



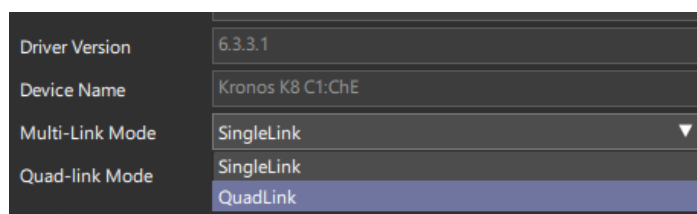
Configure for quad-link

If you want to use quad-link mode on the Kronos K8:

1. Connect four 1.5G or four 3G signals to inputs A, B, C and D, or inputs E, F, G, and H.
2. Confirm that you can see four separate video streams in the Shogun Live workspace. Note that each one is receiving a 1.5 G or 3 G standard.

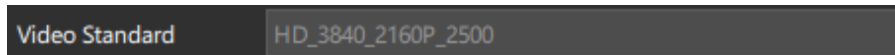


3. In the **System** panel in Shogun Live, in the properties pane, click **Show Advanced** to display the advanced parameters.
4. Change input A or E from **SingleLink** to **QuadLink** mode. (Inputs B,C, D, and F, G, H will not have this option.)



Set up SDI video cameras

After you have changed the relevant input to QuadLink, inputs B, C and D; or F, G, and H disappear, and input A or E now reports receiving a 2160p stream.



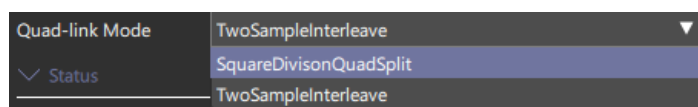
About quad-link mode

Quad link Mode provides these options:

- In **Square Division Quad Split** mode, the image is divided into quarters and each is transmitted on a single 3G link.
- In **Two Sample Interleave** mode, alternate pixels are divided between image, so each stream has a full image effectively subsampled.

Both modes enable the full original image to be reconstructed without loss of data.

Shogun Live cannot determine which type of quad-link mode is in use, so you must select the correct mode.



Set up SDI video cameras

The selected option takes effect immediately. If you choose the wrong option, the video will appear obviously wrong:

Original image



When Two Sample Interleave is incorrectly treated as Square Division Quad Split, it will appear as four copies of the video tiled together.



When Square Division Quad Split is incorrectly treated as Two Sample Interleave, all four quarters of the video appear to have been superimposed on top of each other.



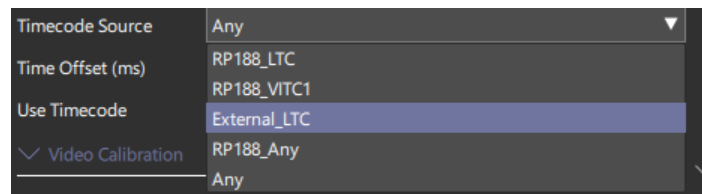
Note

In Two Sample Interleave mode, Luminance8, BGRA, RGBA, and U10Y10V10Y10 pixel formats are not supported. We recommend using U8Y8V8Y8 mode instead.

Set up SDI video cameras

Use External LTC extension

If you have an LTC extension board, you can make available the timecode that this provides by setting the Timecode Source to External LTC.



Known Limitations

- 3G Level-B Dual link mode is not supported on either card.
- 4:4:4 RGB mode is not supported on either card.
- Both Quad Division and Two Sample Interleave mode are supported, but in Two Sample Interleave mode, not all pixel formats are supported.

Set up SDI video cameras

Set up a timecode generator for SDI video in Shogun Live

These timecode generators (SPGs) are supported for SDI video in Shogun Live 1.6 and later.

- [Set up a Courtyard CY440 timecode generator, page 73](#)
- [Set up an Evertz 5601MSC timecode generator, page 81](#)

Set up SDI video cameras

Set up a Courtyard CY440 timecode generator

You can set up the Courtyard CY440 to provide reference and timecode to both the SDI camera and the Vicon system. Most SDI cameras require two cables to provide both timecode and sync. In the case of SDI and Composite, Vicon Lock units can accept one cable that carries both reference sync and timecode. However, when tri-level sync is used, LTC timecode is also required.

Consequently, either three or four ports on the timecode generator are used: two to the camera, and either one or two to the Lock unit. If multiple cameras are used, then you may need to add distribution amplifiers for LTC, and for either tri-sync or SDI.

The software used to set up the Courtyard timecode generator is [ROSS DashBoard](#)¹¹. It can be freely downloaded and installed on Windows.

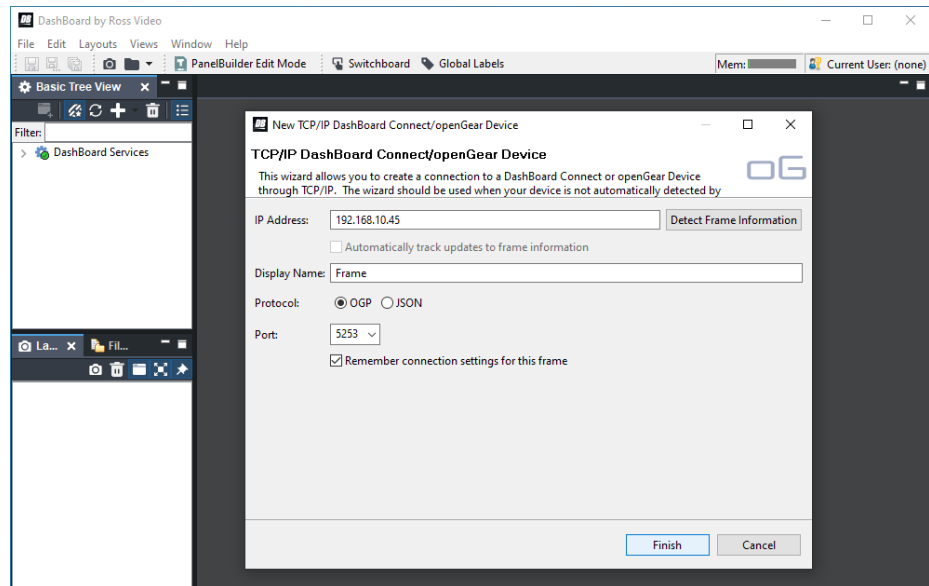
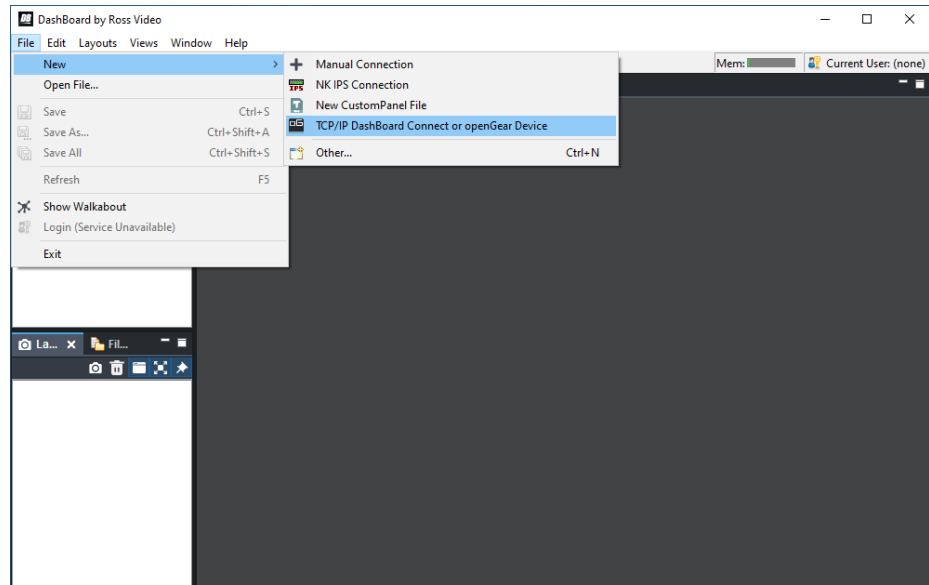
To set up the timecode generator:

1. If the SDI feature is required to sync the camera or the Lock unit, check that it is enabled.
2. On the front panel, select **System Setup > Option Enable**.
If SDI is present, **HD** and **3G** are listed, together with an option code for each. The SDI feature is required for cameras that require SDI sync, such as the Blackmagic URSA Mini 4K, and if you want to use the SDI input on a Vicon Lock Studio.
3. Find the IP address of the device using the front panel, or set an IP address. The IP address is shown on the front panel of the device when the menu is not in use.
If you need to change any network settings, go to **System Setup > Network**.

¹¹ <https://www.rossvideo.com/support/software-downloads/dashboard/>

Set up SDI video cameras

4. Use the Ross Dashboard software to add a connection to the device.

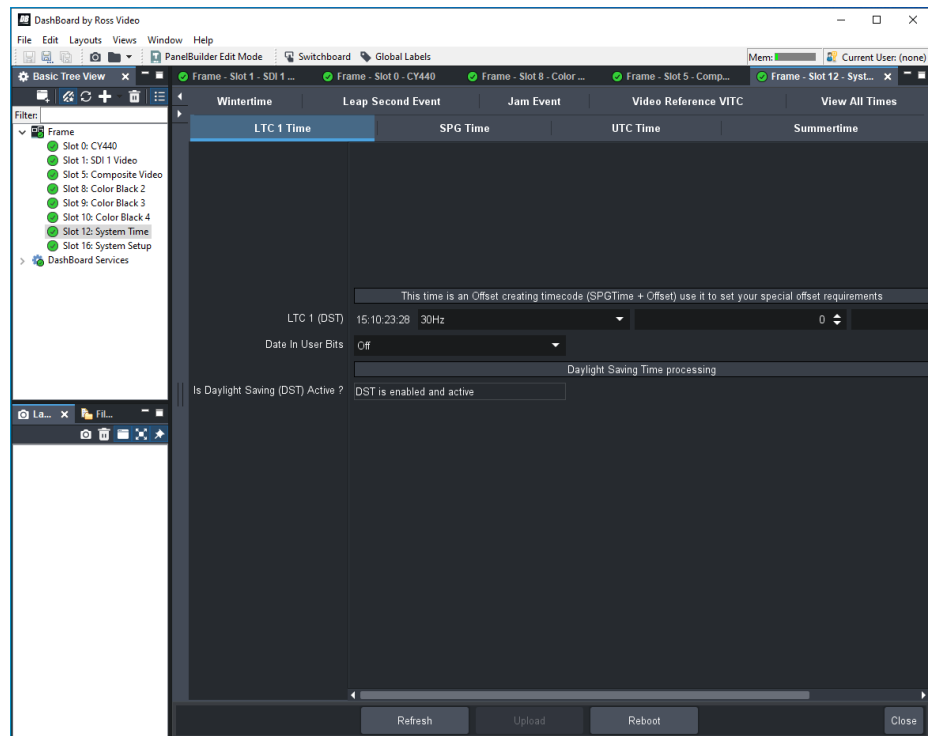


If the connection succeeds, the new display is added to the tree view in green, with sub-menus below it.
If it is not found, it is added to tree in gray, with no sub-menus under it.

5. On the **System Time** menu, set the frame rate for the LTC signal to the video camera, and a Lock is required.

Set up SDI video cameras

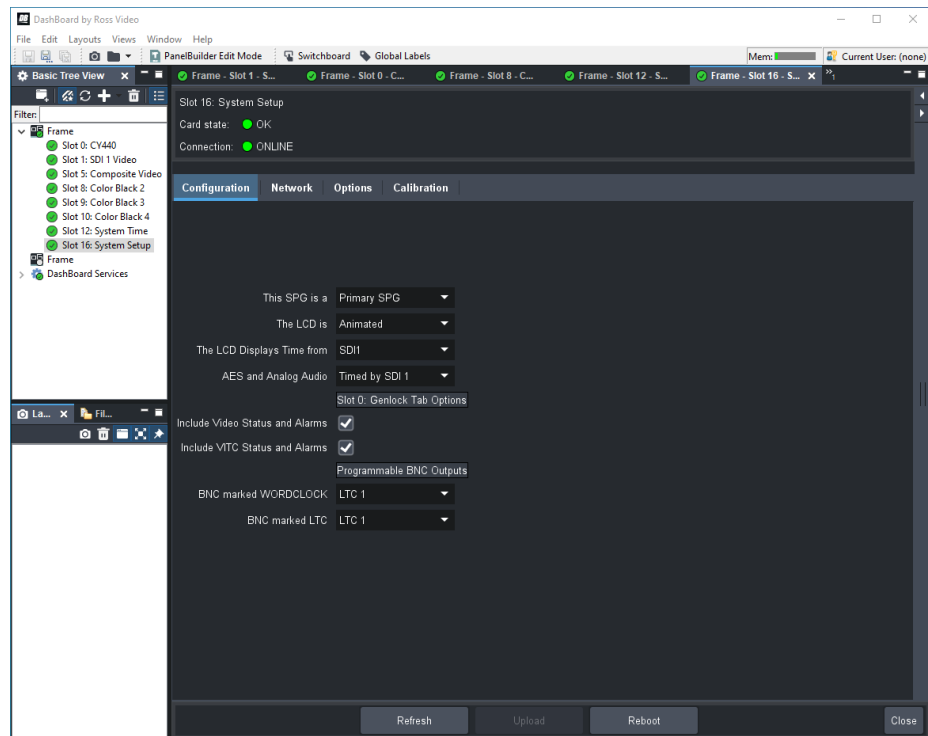
You must set the frame rate to the base rate associated with the desired video standard on the camera. For example, for 60 Hz video standards, the timecode frame rate is 30 Hz.



The CY440 has only one LTC generator, to provide timecode to the SDI camera and the Vicon system. Two outputs on the CY440 can be used for LTC. We recommend that you set them both to LTC1.

Set up SDI video cameras

This gives two timecode outputs: one for the camera and one for the Vicon Lock unit (if required, as the Lock can also get timecode from Composite, or SDI in the case of a Lock Studio.)

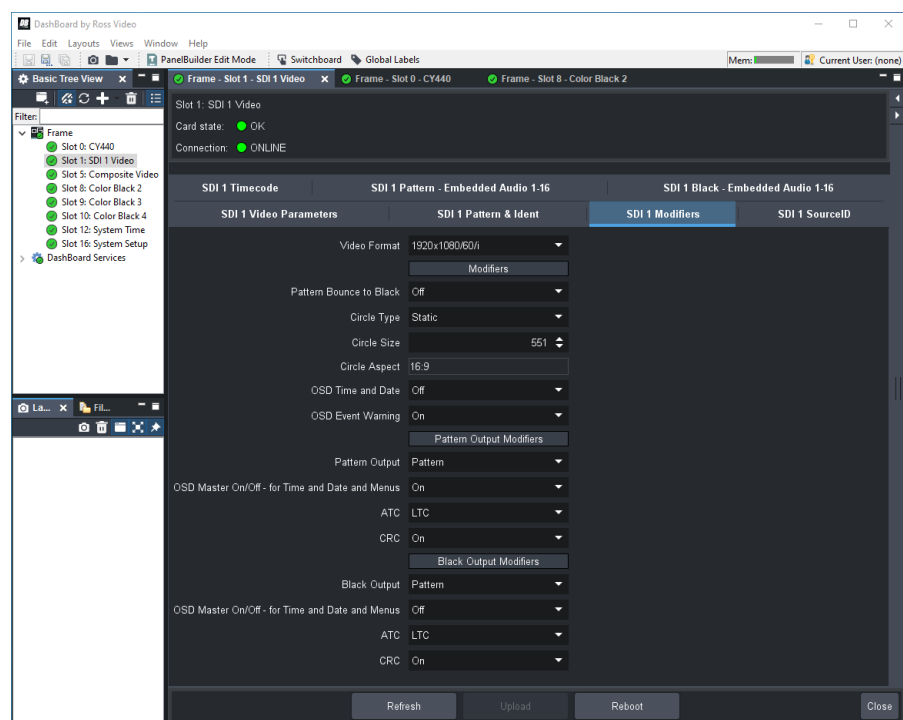


The outputs on the CY440 that can be configured for LTC are labeled LTC and Wordclock.

Connect one of the LTC outputs to the video camera and one to the Lock unit, if the Lock is using tri-sync and LTC. (If a Lock Studio is getting an SDI signal, or any type of Lock is getting a composite signal for sync, then the embedded timecode in the signal can be used and a separate LTC connection is not required.)

Set up SDI video cameras

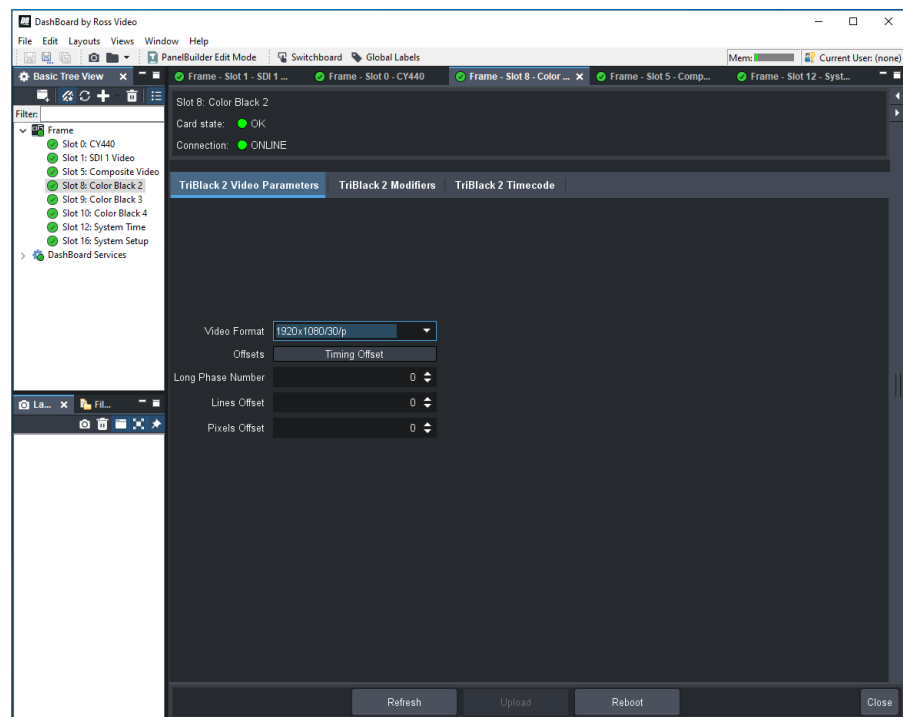
6. Set up the reference signal for the camera. This must be the same as the video standard that is selected on the camera.
 - For cameras that take SDI reference, such as the [Blackmagic URSA Mini 4K](#), [page 92](#), use Slot 1: SDI 1 Video.



Then connect the output labeled SDI1 to the camera's SDI IN port.

Set up SDI video cameras

- For cameras that take tri-sync reference, such as the [ARRI Alexa Mini LF](#), [page 95](#), use Slot 8: Color Black 2.

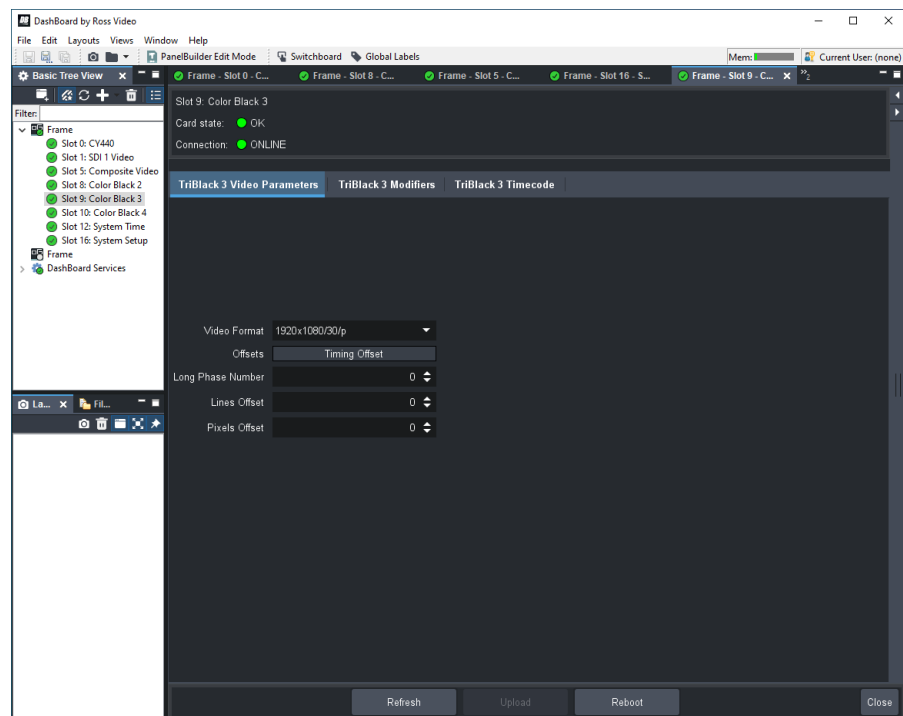


Connect the output labeled Tri Black 2 to the cameras SYNC IN port.

Set up SDI video cameras

7. Set up the timecode and sync for the Vicon Lock unit.
 - Vicon Lock or Lock+

Use Slot 9: Color Black 3 and set the video format as required.



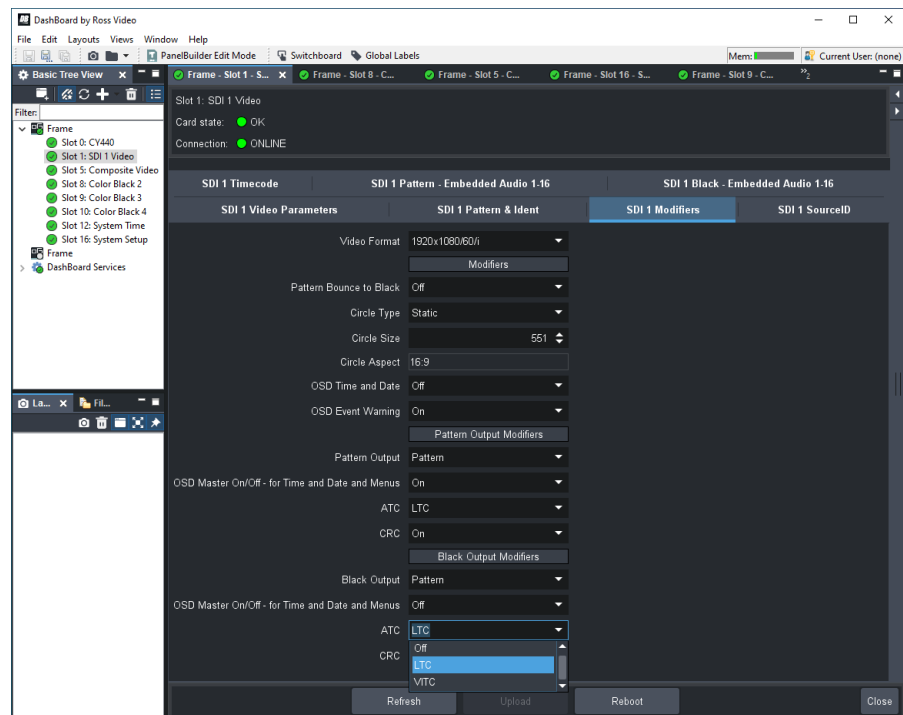
Connect the output labeled Tri Black 3 to the Lock's REF LOOP port.

Set up SDI video cameras

- **Vicon Studio**

Set the SDI output as shown in step 6. The CY440 can generate only one type of SDI signal at a time, although it has two physical BNC connectors, labeled **SDI 1** and **SDI 2**.

This means the standard chosen must be suitable for syncing both the Lock and the SDI. If there is no suitable SDI standard, the Lock must be synced from the CY440, using either tri-level or composite. If tri-level is used, LTC is required for timecode because tri-level sync does not include timecode. You can configure independently whether the two outputs are black or show a test pattern, but this is usually irrelevant for sync and timecode. Make sure that embedded timecode is enabled. This is described as **ATC** in the software and must be set to **LTC**.



Connect SDI 2 to the Lock's SDI port.



29.97 Hz non-drop frame

Some older versions of the Courtyard firmware do not support 29.97 Hz timecode in non-drop-frame mode. For more information, contact Courtyard.

Set up SDI video cameras

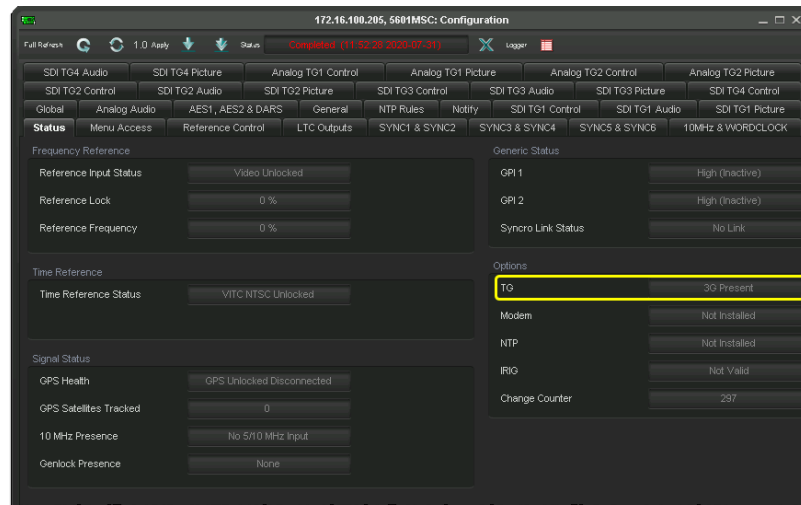
Set up an Evertz 5601MSC timecode generator

You can set up the Evertz 5601MSC to provide reference and timecode to both the SDI camera and the Vicon system. The URSA Mini 4K always requires two cables to provide both timecode and sync. The Vicon system requires one cable that can carry both reference sync and timecode. Consequently, at least three connections on the timecode generator are used.

VistaLINK PRO¹² software is used to control the timecode generator.

To set up the timecode generator:

1. Check that the Evertz 5601MSC has a suitable HD or 3G SDI module. These modules are known as +HDTG and +3GTG by Evertz. To check that the correct module is selected:
 - In VistaLink, go to the **Status** panel and in the **Options** group ensure that the **TG** option is **HD Present** or **3G Present**.

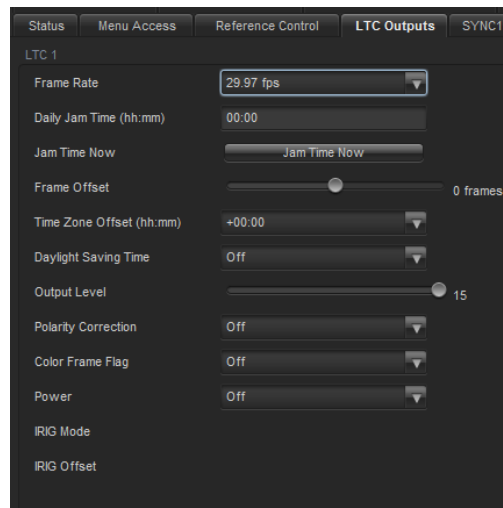


If the TG option is **Not Valid**, upgrade your Evertz 5601MSC to include the HD or 3G SDI modules.

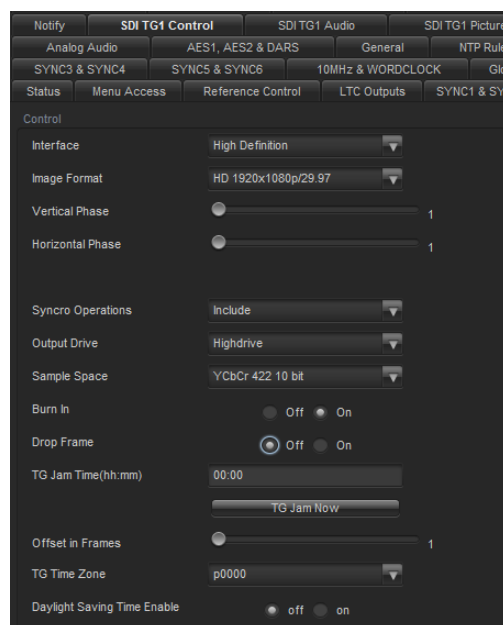
¹² <https://evertz.com/solutions/vistalink>

Set up SDI video cameras

2. Set the frame rate for the timecode signal (LTC) for the URSA camera. This must be set to the base rate associated with the desired video standard on the camera. For example, for 59.94 Hz video standards, the timecode frame rate is 29.97 Hz.

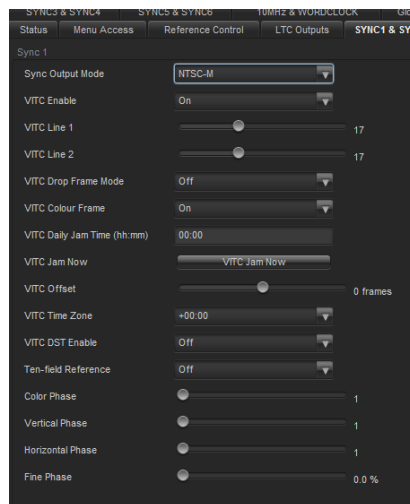


3. Set up the SDI reference signal for the camera. This must be the same as the video standard that is selected on the camera.

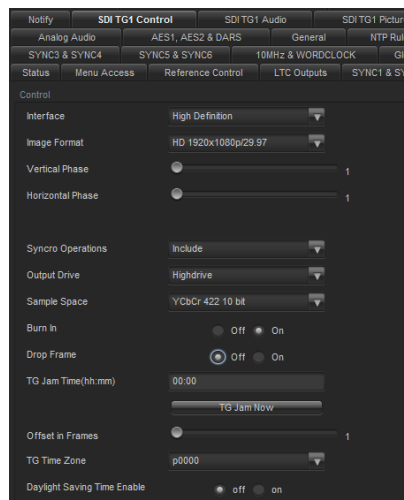


Set up SDI video cameras

4. Set up the timecode reference to the Vicon Lock unit. The connection to use depends on your Vicon Lock model:
 - **Vicon Lock or Lock+ :** Use one of the SYNC outputs from the timecode generator. Lock or Lock+ supports only analog black-burst sync with VITC. This means that only base rates of 25 Hz (PAL) or 29.97 Hz (NTSC) are available (for true 30 Hz, use a Lock Studio). Choose either PAL or NTSC-M, to match the base rate of the SDI video standard.



- **Vicon Lock Studio:** Use one of the SDI TG-x outputs on the timecode generator. Lock Studio supports HD-SDI with embedded timecode. Ensure that the settings match those you specified in step 2 for the camera.



Set up SDI video cameras



Drop frame setting

Shogun Live supports 29.97 Hz timecode in drop-frame or non drop-frame mode. However, the drop-frame setting must be consistent between all three outputs on the timecode generator.

Set up SDI video cameras

Set up cameras for SDI video in Shogun Live

These cameras are supported for SDI video in Shogun Live 1.6 and later:

- [Set up a RED Komodo camera in Shogun Live, page 86](#)
- [Set up a Blackmagic URSA Mini 4K camera, page 92](#)
- [Set up an ARRI Alexa Mini LF camera, page 95](#)

Set up SDI video cameras

Set up a RED Komodo camera in Shogun Live

The RED Komodo camera is supported for SDI video in Shogun Live. Full details of how to set up and use the camera can be found in the [Komodo Operation Guide](#)¹³. This document includes the extra information required to set up and use the camera with Vicon Shogun Live.



- [Global shutter sensor, page 87](#)
- [Sync and timecode, page 87](#)
- [Set up the SDI output, page 90](#)

¹³ <https://www.red.com/download/komodo-operation-guide>

Set up SDI video cameras

Global shutter sensor

This camera has a global shutter sensor which makes it particularly suitable for use with the calibrated video feature of Vicon Shogun Live.

Sync and timecode

To calibrate the camera in Shogun Live, both genlock and timecode are required. The camera requires the RED Komodo Expander Module to give easy access to genlock and timecode. Ensure this is fitted according to the manufacturer's instructions.



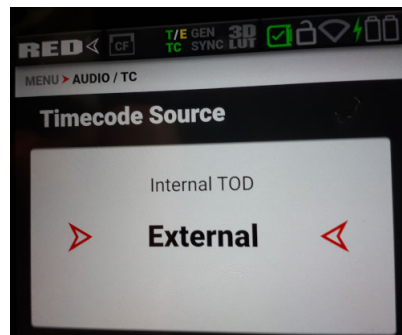
Two cables are required to connect the timecode generator to the Komodo Expander module: one for genlock and one for timecode.

- [Set up the required timecode, page 88](#)
- [Set up the required genlock, page 88](#)
- [Check timecode and genlock, page 88](#)

Set up SDI video cameras

Set up the required timecode

1. Connect the timecode to the BNC connector labeled **Timecode**.
This must be the LTC timecode from the port on the timecode generator labeled **TC**, **Timecode** or **LTC**.
2. On the camera's onscreen display, select **Menu > Audio / TC > Timecode Source** and then select **External**.



Set up the required genlock

Tri-sync genlock is supplied to the BNC connector labeled **Genlock**. This must be tri-sync genlock from the port on the timecode generator, usually labeled **Sync N** or **Tri-Black N**.

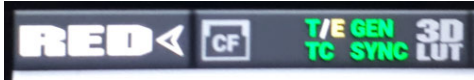

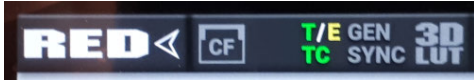

Check timecode and genlock

Check these settings on the camera display:

- **GEN** Must be green, indicating external sync is being received.
- **TC** Must be green, indicating timecode is being received.
- **SYNC** Must be green, indicating sensor is synced with timecode and the camera's output is synced with genlock.

Any other colors (gray, red, yellow, etc) indicate a setup problem, which may not be immediately apparent in Shogun Live but which will cause problems for capturing calibrated video later. For more detailed information including the meaning of each status color, see the *Komodo Operation Guide*.

Set up SDI video cameras

Status	On-screen display	Explanation
Genlock and timecode being received		✓ Ready to capture in Shogun Live.
Genlock being received but not timecode		✗ Fix problems with camera setup before capturing or calibrating in Shogun Live.
Timecode being received but not genlock		
Neither timecode or genlock being received		
<p>⚠ Important</p> <p>Shogun Live does not visually indicate whether the camera is getting a genlock signal and cannot tell whether the camera is getting external timecode or generating it internally, so you must check this on the camera itself.</p>		

Set up SDI video cameras

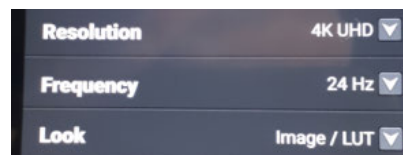
Set up the SDI output

Connect the SDI output to the capture PC's capture card. If multiple outputs are required (eg, for a monitor), we recommend using an SDI distribution amplifier.



Set resolution and frame rate

- To set the resolution for the SDI output, on the camera's onscreen display select **Menu > Monitoring > SDI > Resolution**.
- To set the frame rate, select **Menu > Monitoring > SDI > Frequency**.



UHD and DCI

Shogun Live supports progressive video standards up to 4K, as long as a compatible capture card is used.

However, it has been more rigorously tested with the UHD standards (1920 × 1080, 3840 × 2160) than the DCI standards (2048 × 1080, 4096 × 2160).

Set up SDI video cameras

Disable onscreen displays

We strongly recommend that you disable all the monitoring features on the SDI output. The onscreen display can interfere with calibrating in Shogun Live, unless the text is masked, and if the display features are changed after calibrating, the calibration may be invalidated.

On the camera's onscreen display, select **Menu > Monitoring > SDI**. Change all of **Guides**, **Tools**, and **Overlay** to 0 (red color, meaning off).



Set up SDI video cameras

Set up a Blackmagic URSA Mini 4K camera

The Blackmagic URSA Mini 4K camera is supported for SDI video in Shogun Live.



Documentation for using all cameras in the URSA Mini range can be found in the [Blackmagic URSA Mini Manual](https://documents.blackmagicdesign.com/UserManuals/BlackmagicURSAMiniManual.pdf)¹⁴.

- [Global shutter sensor](#), page 93
- [Sync and timecode setup](#), page 93

¹⁴ <https://documents.blackmagicdesign.com/UserManuals/BlackmagicURSAMiniManual.pdf>

Set up SDI video cameras

Global shutter sensor

This camera has a global shutter sensor which makes it suitable for producing calibrated reference video in Shogun Live.

Newer cameras in the range, the URSA Mini 4.6K, URSA Mini 4.6K G2, URSA Mini Pro and URSA Mini Pro 12K all have rolling shutter sensors that make them much less suitable for use with Shogun Live, so we do not recommend using these cameras.

Sync and timecode setup

The URSA Mini 4K has an unusual set of inputs for sync and timecode. A single connector is used for tri-sync reference and timecode (LTC) meaning that it is not possible to use tri-sync reference still get external timecode. There is also an SDI input that accepts reference SDI but ignores any embedded timecode in the SDI stream.



Since Shogun Live requires both genlock and timecode, the only combination of inputs that will allow this is:

- SDI In Used for reference input
- REF-IN/TC-IN Used for LTC timecode input

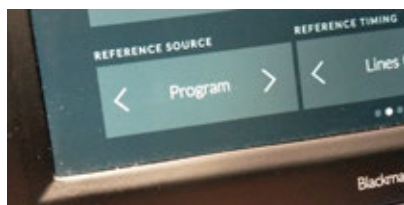
This means that the timecode generator must also be capable of providing SDI reference video. This is usually an optional extra in timecode generators, and older models may not have it.

To set up the camera:

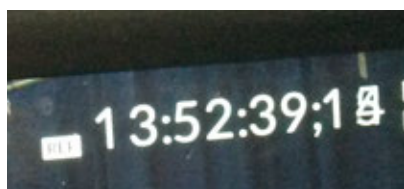
1. Ensure that the software on the camera is version 4.9 or later. This reduces video latency.
2. From the onscreen display, choose the correct video standard.

Set up SDI video cameras

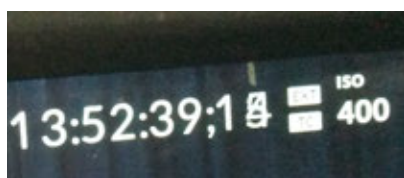
3. Set Reference Source to Program.



REF is now displayed on the camera monitor.



4. Check that timecode is working correctly. The timecode should be in sync with the timecode generator and EXT should be displayed above TC on the camera monitor.



Set up SDI video cameras

Set up an ARRI Alexa Mini LF camera

The ARRI ALEXA Mini LF camera is supported for SDI video in Shogun Live.



The following topics provide information about setup and calibration. Read them in conjunction with the [ARRI ALEXA Mini LF Manual](#)¹⁵ (PDF download from [arri.com](#)).

- [Use of the rolling shutter](#), page 96
- [Sync and timecode](#), page 96
- [Set the required video standard](#), page 101

¹⁵ <https://www.arri.com/resource/blob/176542/b9f286327d89a155c06e3cca81bf6fc6/alex-mini-lf-sup-6-0-user-manual-data.pdf>

Set up SDI video cameras

Use of the rolling shutter

The ARRI ALEXA Mini LF camera has a roller shutter sensor. In general, we don't recommend the use of cameras with rolling shutter sensors. However, the acceptability depends on the speed of the readout from the sensor. A good test is whether the calibrator detects wands during a normal fast wand wave. If it does, this indicates that the rolling shutter time is fast and the amount of distortion is unlikely to be problematic except for very fast movement.

If you are forced to use a deliberately slow wand wave to enable the calibrator to detect wands, it is likely the rolling shutter effect will be problematic in normal use.

Satisfactory results were obtained with a normal, fast wand wave with this camera.

Sync and timecode

The ARRI ALEXA Mini LF camera takes a separate timecode and sync/genlock connection. It can also extract reference sync from the timecode signal, but we do not recommend this mode of operation. As with all SDI video cameras, both sync/genlock (SYNC IN) and timecode (TC) are required for the camera to be calibrated in Shogun Live. The sync/genlock and timecode signal can come from a sync and timecode generator (SPG), such as the Evertz 5601MSC, or Courtyard CY440 or CY460.



Set up SDI video cameras

Set up the required timecode

The timecode cable is used to carry an LTC signal from the sync and timecode generator. At the camera end, a 5-pin lemo connector plugs into the port on the camera labeled TC, and at the other end is either BNC or XLR, depending on the type of device being used. Plug it into an LTC output on the timecode generator, which is usually labeled LTC or Timecode.

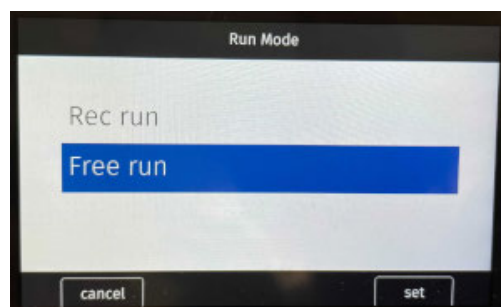


As usual when using timecode, set the timecode generator to provide LTC at a rate equal to, or exactly half the video frame rate desired, as LTC rates only go up to 30 Hz.

To set up the camera for timecode:

1. Navigate to **HOME > TC > Options > Run Mode** and ensure that the value is set to **Free Run**.

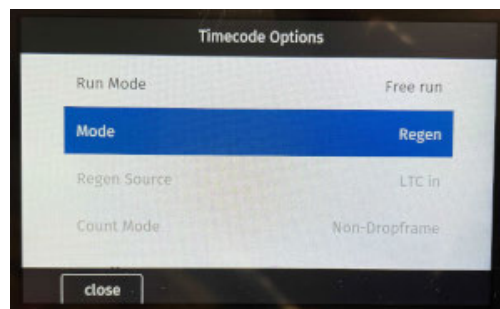
In this mode, the timecode continues to count up, even when not recording on the camera, which is the behavior required by Shogun Live.



Set up SDI video cameras

2. Navigate to **HOME > TC > Options > Mode** and ensure that the value is set to **Regen**.

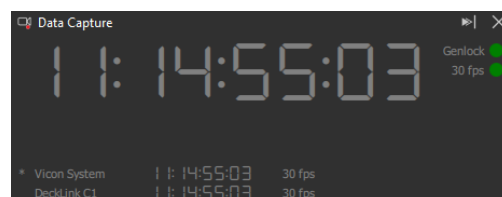
In this mode, the timecode does not sync to the input once, but keeps in track with it, except when the camera is recording. If the timecode generator is also providing sync/genlock and the standards are set correctly on both outputs, there should be no discontinuities in the timecode received.



3. As an additional check that the settings are correct, navigate to **HOME > TC > Options > Regen Source** and ensure that **LTC in** is displayed.

The camera displays TC in white when it has a timecode. The timecode itself is also shown on the camera's display.

When the timecode is set up correctly, it is displayed in Shogun Live below the Vicon system timecode. In this example, it is listed as **DeckLink C1**, referencing the SDI capture card in use.



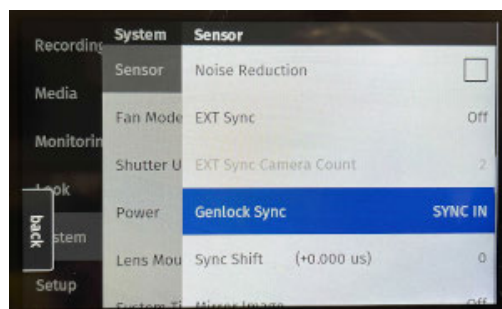
Set up the required genlock

The genlock cable is a BNC-to-BNC cable that is used to carry genlock from the timecode generator.

1. On the camera, plug the cable into the connector labeled **SYNC IN**.
2. Ensure the cable is connected to a tri-sync output on the timecode generator, and set the video standard to that required for the camera.

Set up SDI video cameras

3. Navigate to **MENU > System > Sensor > Genlock Sync** and set the value to **SYNC IN**.



Important

Check that the GEN message changes to orange when the cable is removed. It is important to do this to verify that the genlock input is being used, rather than the camera obtaining sync from timecode, which we don't recommend.

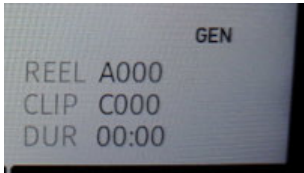
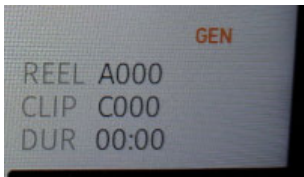
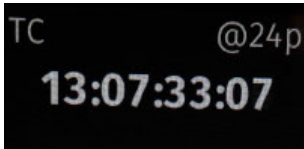
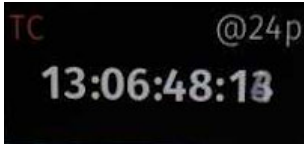

Check timecode and genlock

When timecode and genlock are being received, on the display TC in white and GEN in black are displayed, as shown here:



When there is a problem with timecode or genlock, the ARRI ALEXA Mini LF camera shows TC or GEN in amber respectively.

Set up SDI video cameras

Status	On-screen display
Genlock / Sync In working	
Genlock / Sync In disconnected or not working	
Timecode working	
Timecode disconnected or not working	
<p> Important Shogun Live does not visually indicate whether the camera is getting a genlock signal, so it is particularly important to check this on the camera itself.</p>	

Set up SDI video cameras

Set the required video standard

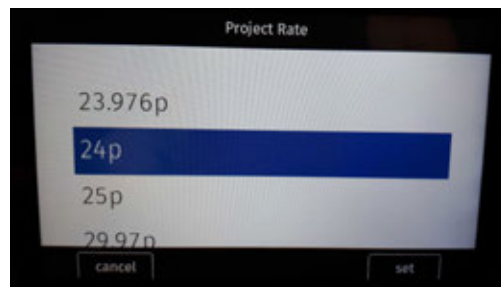
The ARRI ALEXA Mini LF camera supports 1.5 G and 3 G video standards on the outputs labeled SDI 1 and SDI 2. It supports only 6 G video standards on its SDI 2 output.

Connect the SDI 2 output to the Shogun Live PC. If SDI connections to other devices are required, use a distribution amplifier. Distribution amplifiers should not introduce a significant delay to the signal, but we recommend that you set up all of the cabling before calibrating, rather than plugging and unplugging cables after calibration.

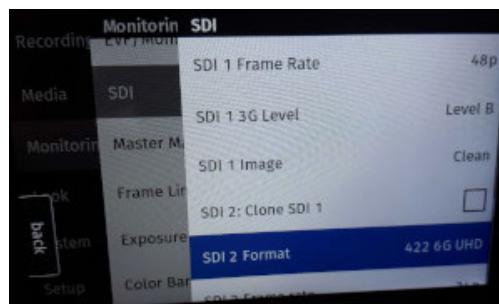
The camera doesn't have a direct video standard setting. The video frame rate is determined in the **Project** settings. The transport format on the SDI output is set in the **Monitoring** settings.

To change the video standard:

1. Navigate to **HOME > FPS** and use the jog wheel to choose the desired frame rate.

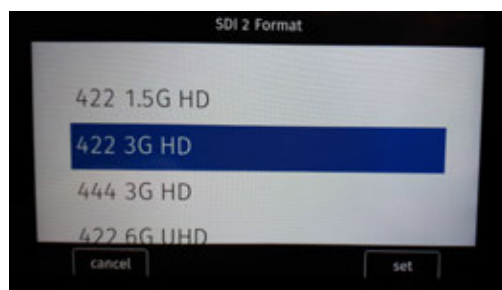


2. Navigate to **MENU > Monitoring > SDI > SDI 2: Clone SDI** and ensure that the checkbox is cleared.



Set up SDI video cameras

3. Navigate to MENU > Monitoring > SDI > SDI 2 Format and set it to the desired video transport format. For example, to enable 2160 p (4K) output, change SDI 2 Format to 422 6G UHD.



Set up SDI video cameras

Check and connect the SDI video system components

Before you begin to connect your system components, check that your hardware is included in [Recommended SDI video hardware, page 54](#). For setup instructions for the components, see:

- [Set up a capture card for SDI video in Shogun Live, page 64](#)
- [Set up timecode generators \(SPG\) for SDI video in Shogun Live, page 72](#)
- [Set up cameras for SDI video in Shogun Live, page 85](#)

Connect the SDI video system components

To ensure that the camera shutters are aligned, the SDI camera must be genlocked to the Vicon system. This ensures that the SDI camera reliably see strobes from the Active Wand.

Timecode is used to identify the time at which data from the SDI camera and the Vicon system was captured. This ensures that the data from the two sources can be aligned. The calibrator can then determine any small remaining discrepancy and apply an offset to the video input to correct for it.

Consequently, both the SDI camera and the Vicon system must have a valid genlock signal and a valid timecode. Two cables are required to transmit reference sync and timecode to the camera, whereas the a single cable can carry both reference sync and timecode to the Vicon Lock unit.

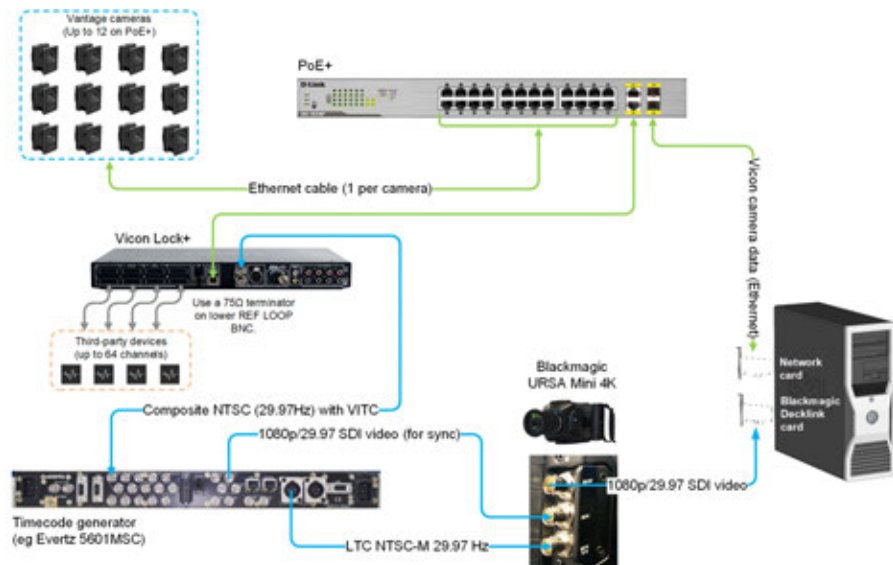
Note

In the following instructions and except where differences are noted, references to Vicon Lock units apply to Vicon Lock, Vicon Lock+ and Vicon Lock Studio.

Set up SDI video cameras

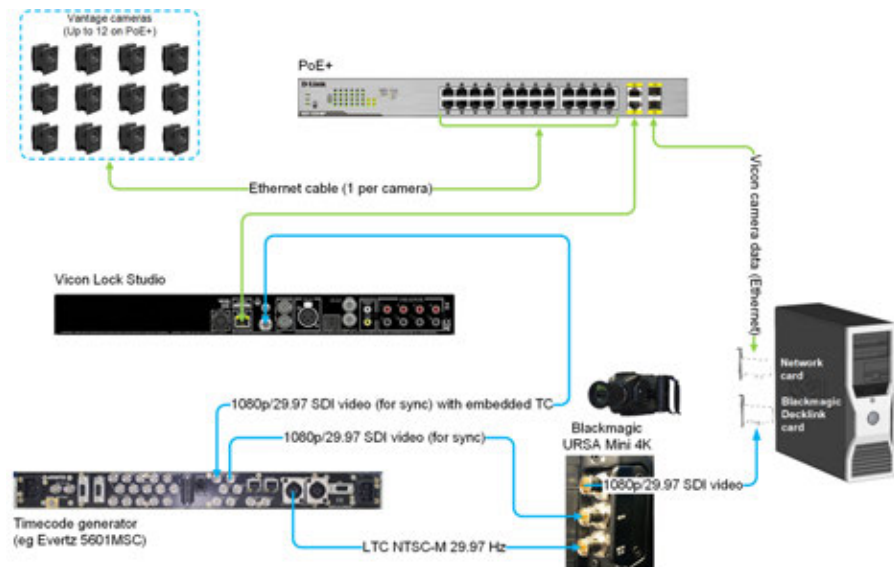
To connect the system components:

1. On the Blackmagic URSA Mini 4K:
 - a. Connect **SDI Out** to the input on the DeckLink card on the PC that will run Shogun Live.
 - b. Connect **SDI In** to TG1-2 on the Evertz 5601MSC.
 - c. Connect **REF IN / TC IN** to LTC OUT 1 on the Evertz 5601MSC.
2. Connect from the Evertz 5601MSC to the Vicon Lock unit, depending on your Lock model:
 - **Vicon Lock or Vicon Lock+:** Connect **SYNC 1** on the Evertz 5601MSC to **REF LOOP** on the Lock or Lock+. Put a 75Ω terminator on the other **REF LOOP** connector. (Note that Lock or Lock+ can capture only PAL (25 Hz) or NTSC (29.97 Hz): for true 30 Hz, you must use a Lock Studio.)



Set up SDI video cameras

- Vicon Lock Studio: Connect TG1-1 on the Evertz 5601MSC to SDI In on the Lock Studio.



Set up SDI video cameras

Choose shutter duration, video standard and system frame rate

The SDI video standard frame rate and Vicon system frame rate must both be multiples of the same SMPTE base rate. The SMPTE base rates are 23.98 Hz, 24 Hz, 25 Hz, 29.97 Hz, and 30 Hz.

As shown in the following table, it is usually best to have the Vicon system rate higher than the video standard frame rate, so that the Vicon cameras can accurately track fast movement, but so the video cameras do not produce data at a rate that is higher than the PC can capture.

Base rate (Hz)	SDI video standard	Vicon system frame rate (Hz)
24	1080p/24 (1x)	96 (4x)
25	1080p/25 (1x)	50 (2x)
25	1080p/50 (2x)	100 (4x)
29.97	1080p/29.97 (1x)	59.94 (2x)
29.97	1080p/59.94 (2x)	119.88 (4x)



Note

Vicon Active Wands do not work at system frame rates below 50Hz.

When the system is set up in this way, the Vicon system strobes several times during each video frame. The active wand calibration device also strobes in sync with the optical system, so when the wand is moving, the video camera may see it in more than one place during each video frame. For this reason the shutter duration must be set within a particular range:

- If the shutter duration is set too low, the camera may not see the wand at all because the shutter is not open while it is strobing.
- If the shutter duration is set too high, the camera will see the wand in several places because the wand strobed more than once during the period the shutter was open.

Set up SDI video cameras

The first situation is easy to spot by looking at the video screen on the camera. As long as the video is synced to the same source as the Vicon system, the strobes are clearly visible. If they are not, increase the shutter duration to cause them to appear.

The second situation is harder to spot. You can detect it by pausing live video of a wand wave in Shogun Live and carefully stepping through the video frames to look for multiple wands. Alternatively, set the shutter duration to a safe maximum value, as shown here:

Base rate (Hz)	SDI video std	Video frame period (ms)	Vicon system rate (Hz)	Vicon frame period (ms)	Vicon frames per video frame	Safe max. shutter duration
25	1080p/25 (1x)	40	50 (2x)	20	2	$1 / 60 = 16.7 \text{ ms}$
25	1080p/25 (1x)	40	100 (4x)	10	4	$1 / 120 = 8.3 \text{ ms}$
25	1080p/50 (2x)	20	100 (4x)	10	2	$1 / 120 = 8.3 \text{ ms}$
29.97	1080p/29.97 (1x)	33.4	59.94 (2x)	16.7	2	$1 / 60 = 16.7 \text{ ms}$
29.97	1080p/29.97 (1x)	33.4	119.88 (4x)	8.3	4	$1 / 120 = 8.3 \text{ ms}$
29.97	1080p/59.94 (2x)	16.7	119.88 (4x)	8.3	2	$1 / 120 = 8.3 \text{ ms}$



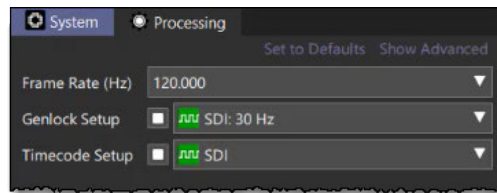
Caution

It might seem a good idea to reduce the shutter duration during calibration and then increase it afterwards for capture. However, this is not good practice because the shutter timing on the Blackmagic URSA 4K Mini is not center-aligned. In other words, the middle of the shutter-open time shifts as the duration is changed. If your video is always too dark, it may be better to reduce the Vicon system frame rate for calibration and increase it afterwards for capture, or choose a higher frame rate video standard.

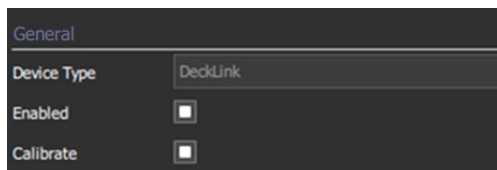
Set up SDI video cameras

Set up the video input device

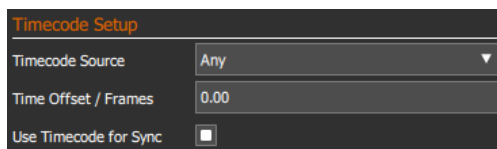
1. On the **System** tab, ensure the required frame rate is selected ([Choose shutter duration, video standard and system frame rate, page 106](#)).



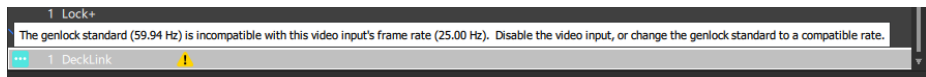
2. In the System Properties for the video input device, in the **General** section, ensure the **Enabled** and **Calibrate** options are selected.



3. Under **Timecode Setup**, ensure that **Use Timecode for Sync** is selected.



4. Ensure that the video standard is compatible with the Vicon system standard, and that there are no warnings such as this one:

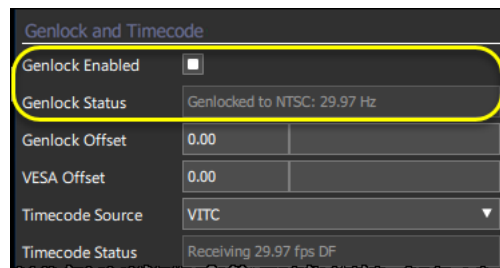


5. Ensure that the correct timecode is present on the video. You should be able to see it counting up.

Set up SDI video cameras

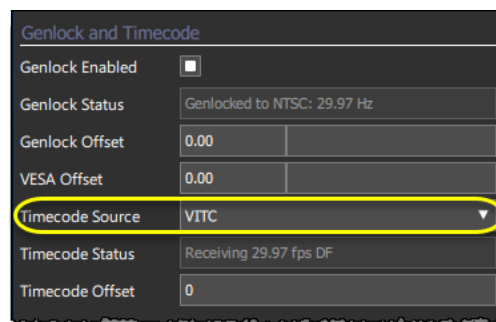
Set up the connectivity device

1. Go to the System Properties for the Vicon Lock unit, and in the **Genlock and Timecode** section, ensure that **Genlock Enabled** is selected.
2. Ensure that **Genlock Status** shows that the Vicon Lock unit is genlocked.



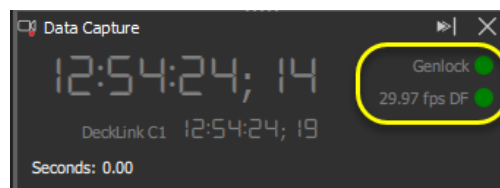
3. Ensure that a valid timecode source is set for the Lock unit.

- Lock or Lock+ Set the timecode source to VITC.



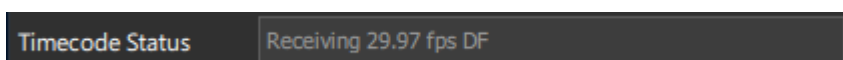
- Lock Studio Set the timecode source to SDI.

4. On the **Capture** tab on the right, in the **Data Capture** panel, ensure that the system is genlocked and has timecode. This is indicated by two green circles.

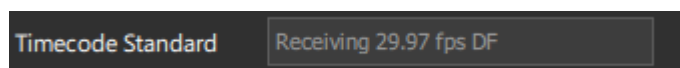


Set up SDI video cameras

- If you are running at 29.97Hz timecode, ensure that drop-frame modes are compatible between the Vicon Lock and the video input device.
For example, if the Lock shows this:



The video input should show this:



Set up SDI video cameras

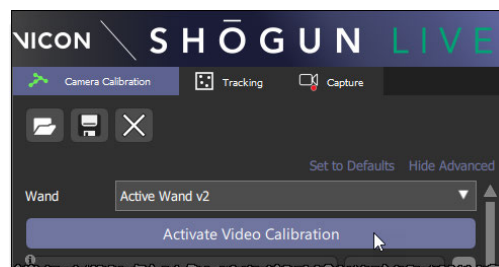
Calibrate the SDI video system

Before attempting to calibrate, ensure you have completed all the steps in the previous sections (for a list of the relevant sections, see [Set up SDI video cameras, page 52](#)).

Note that tracked circles are not visible until you select Activate Video Calibration, as described below.

If you want to add an SDI camera to a Vicon system that is already calibrated, see also SDI lens calibration example in *Getting started with Vicon Shogun*.

1. In the **Camera Calibration** panel, display the advanced options and click **Activate Video Calibration**.



Tip

If you can't see any tracked circles on the wand, this may be due to the system and camera not being frame-aligned. To correct this, in the **Genlock & Timecode Settings** section, drag the slider for the Advanced setting, **Genlock Offset**, until the circles appear.

2. Ensure that video camera is positioned so that items in its field of view, including the wand, can also be seen by the Vicon cameras.

Set up SDI video cameras

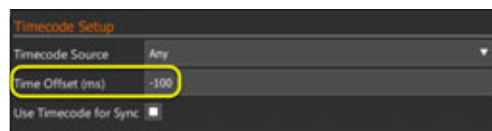
3. As normal, mask out any artifacts that could be mistaken for circles by selecting **Start Masking**. To ensure that the image is not so bright that the whole view is masked, but not so dark that the camera is prevented from seeing the wand, do one of the following:
 - On the camera, reduce the aperture, ensuring that the wand is still visible; or
 - In Shogun Live, go to the System Properties for the Decklink card and in the **Optical Mode** section, adjust the **Threshold** setting.



Tip

A setting of 0.6 is a good starting point for most studios, but for a very bright space, you may need a slightly higher value.

4. Click **Start Wave** and ensure that the wand is waved so that it is seen by the SDI video camera as well as the Vicon cameras.
Note that video cameras normally see less wand information than optical cameras: half the amount seen by the optical cameras is usually enough for a good calibration.
5. During calibration, any time offset between the video camera and the system is calculated and automatically applied. If necessary, you can change the offset in the **Timecode Setup** section of the DeckLink properties.



6. With video calibration turned off, you can now set the origin as normal.

Export and use an ST map

You can export lens maps (ST map as a 32-bit EXR file) for calibrated video cameras from Shogun Live as distortion maps. You can then import your calibrated video camera/lens into a game engine such as Unreal, or into your compositing software.

The ST map contains information about the distortion of the lens and has four channels: R, G, B, and A:

- B and A store the location of the pixels in a pinhole/undistorted image, ranging from 0 to 1 in proportion to the width and height of the image. These two channels are used to distort the CG image to match the SDI camera output.
- R and G store the location of the pixels in a raw/distorted image (currently unused).

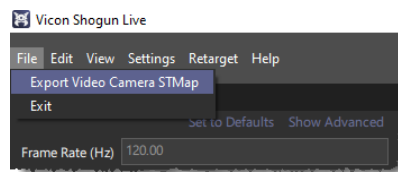
To use a Shogun Live ST map, the first step is to export it from Shogun Live.

- [Export an ST map, page 114](#)
- [Set up a live composure in Unreal Engine, page 115](#)

Export and use an ST map

Export an ST map

1. Ensure the video camera(s) have been calibrated, then from the **File** menu, select **Export Video Camera STMap**.



2. In the **Save Camera Distortion Map** dialog box, locate a folder to which to export the ST maps.
ST maps for all video cameras are exported to this folder.
Each filename has the format: <Camera DeviceID>_<focal length in pixels-integer part>_<focal length in pixels - decimal part>_<date time stamp>.exr, for example, vi101_1064_535479_20210623165749.exr.

The ST map contains information about the distortion of the lens and has four channels: R,G,B,A:

- B and A store the location of the pixels in a pinhole/undistorted image, ranging from 0 to 1 in proportion to the width and height of the image. These two channels are used to distort the CG image to match the SDI camera output.
- R and G store the location of the pixels in a raw/distorted image (currently unused).

This is an example of an ST map:

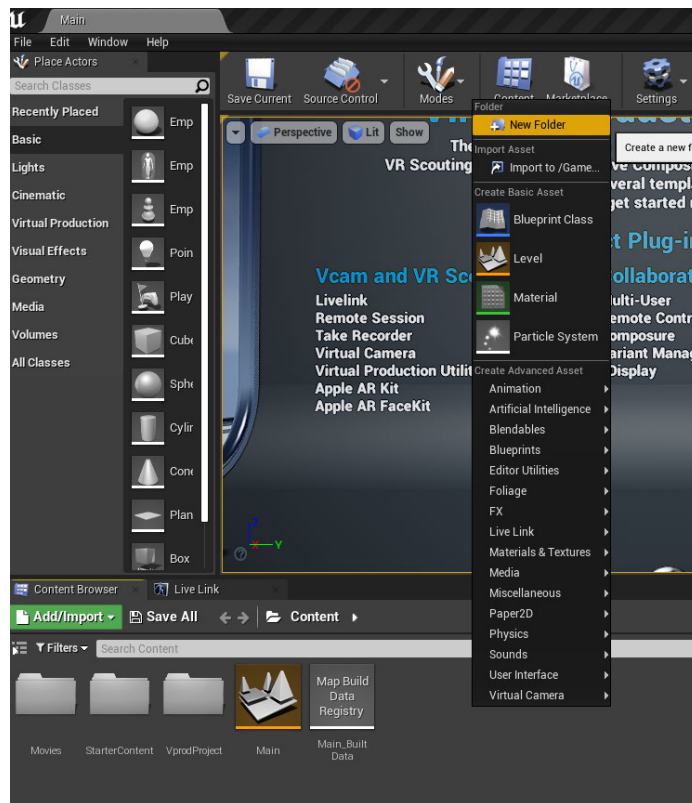


You can use the exported ST maps in a number of ways, including in game engines, such as Unreal Engine, or in compositing software. The following example shows how to use the ST map to set up a live composure in Unreal Engine, using the Virtual Production template project.

Export and use an ST map

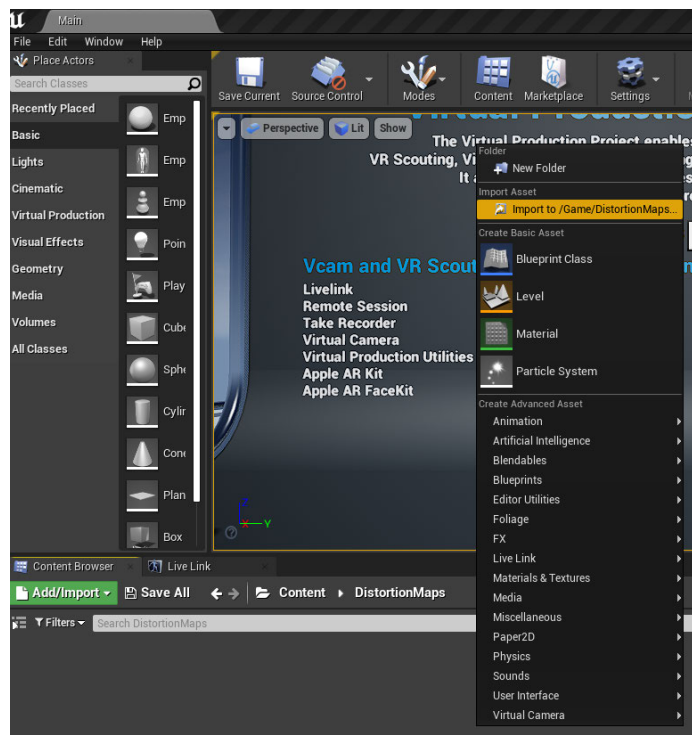
Set up a live composure in Unreal Engine

1. In Unreal Engine, to import the ST map into the content, right-click to create a new subfolder in the content folder.

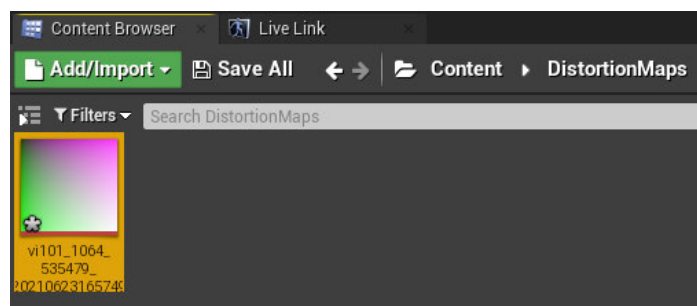


Export and use an ST map

2. Browse to the new folder, right-click and select **Import to /Game /Distortion Maps** to import the ST map that you exported from Shogun Live.

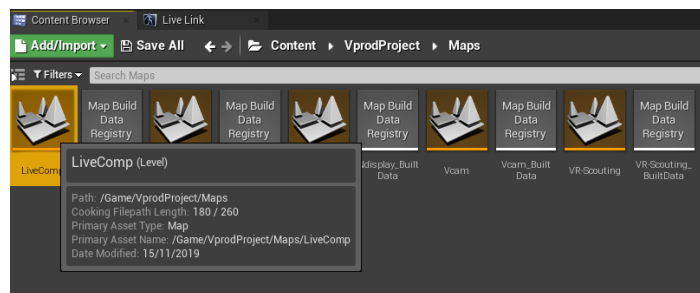


3. In the **Import** dialog box, locate and select the ST map file. The ST map is displayed in the Content Browser.

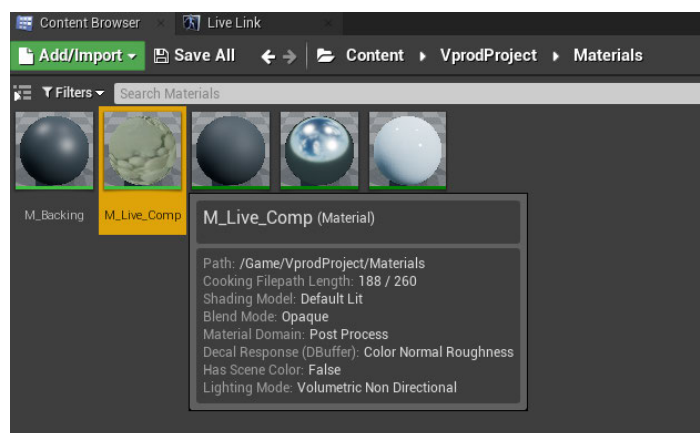


Export and use an ST map

4. In the Content Browser, navigate to Content > VprodProject > Maps and double-click the LiveComp map.

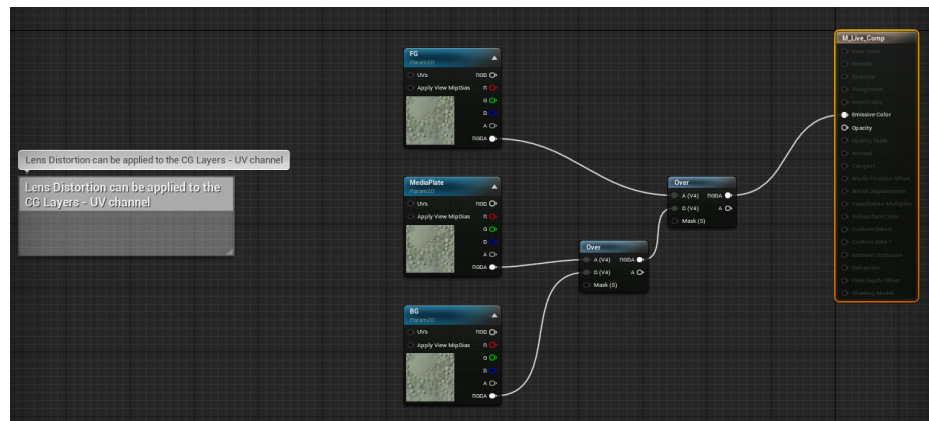


5. In the Content Browser, navigate to Content > VprodProject > Materials and double-click the M_Live_Comp material.

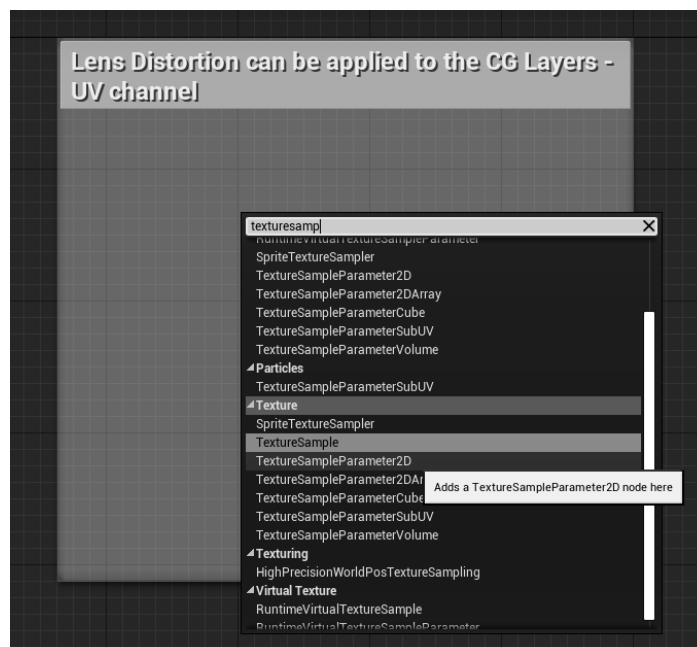


Export and use an ST map

The default graph for the material looks like this:

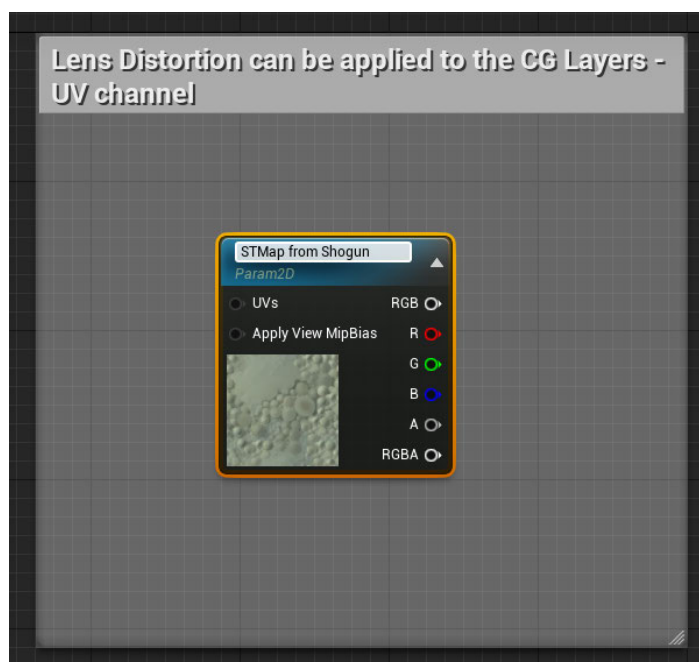


- Expand the note and right-click to add a new `TextureSampleParameter2D` node to the graph:



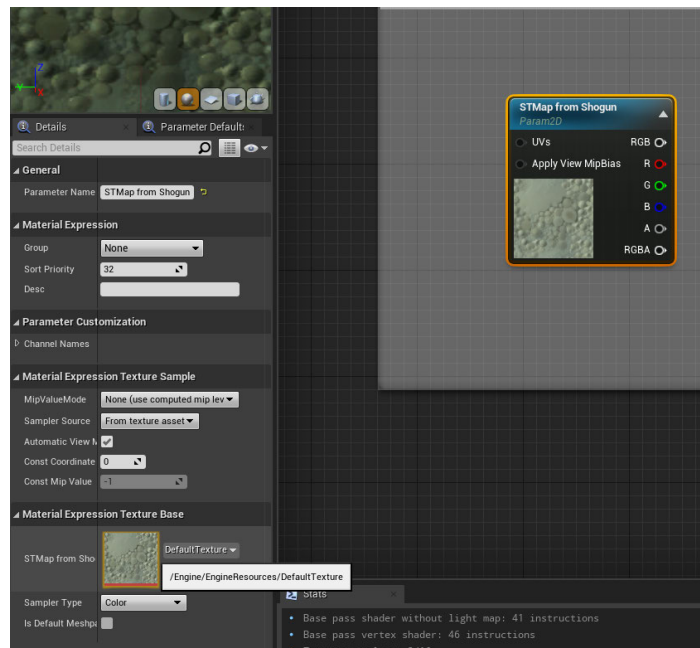
Export and use an ST map

7. Give the node an appropriate name:



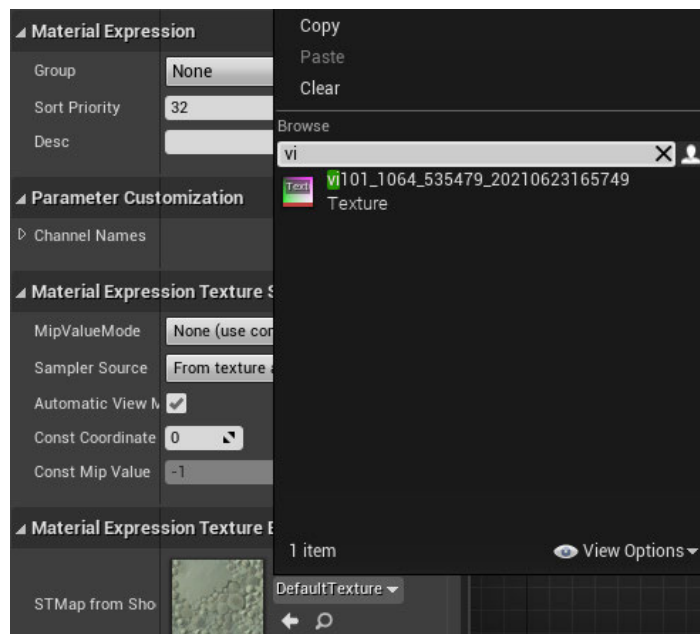
Export and use an ST map

8. With the node selected, in the Details panel, find the Material Expression Texture Base.

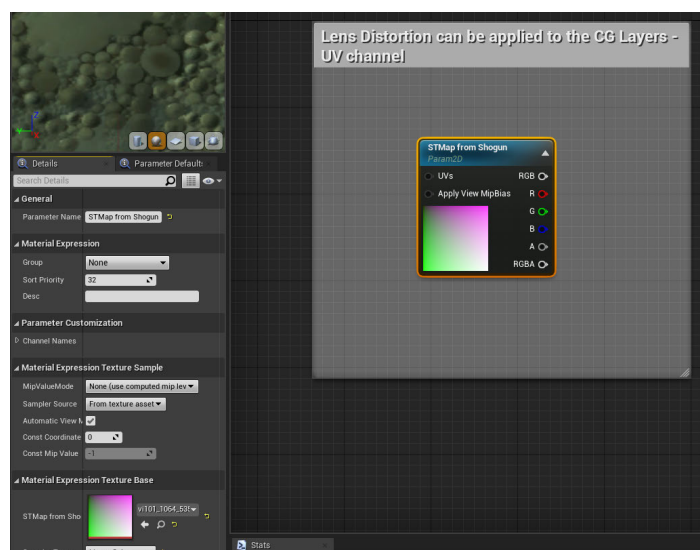


Export and use an ST map

- Click on the default texture to browse for the ST map and start typing the name of the file.

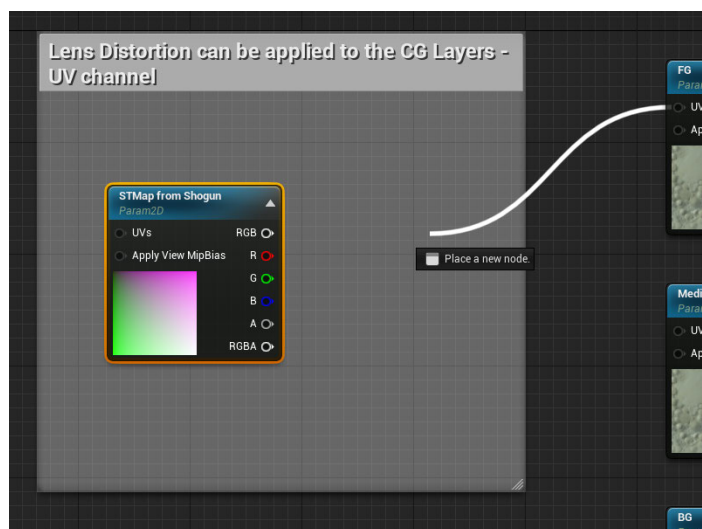


The ST map image is displayed in both the Details panel and the node in the graph.



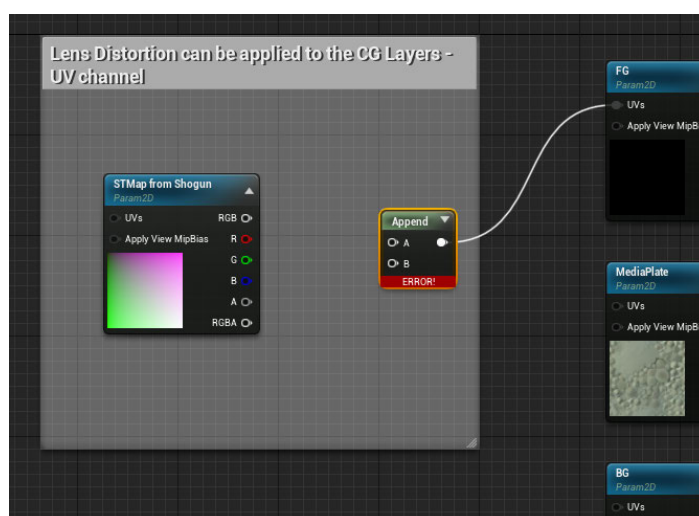
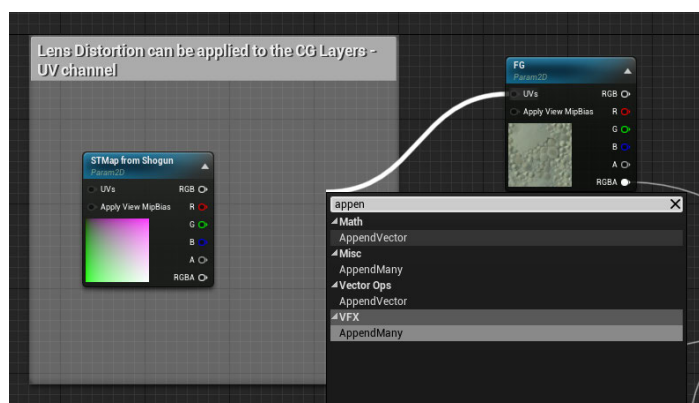
Export and use an ST map

10. Drag from the UV's pin on the FG (foreground) node:



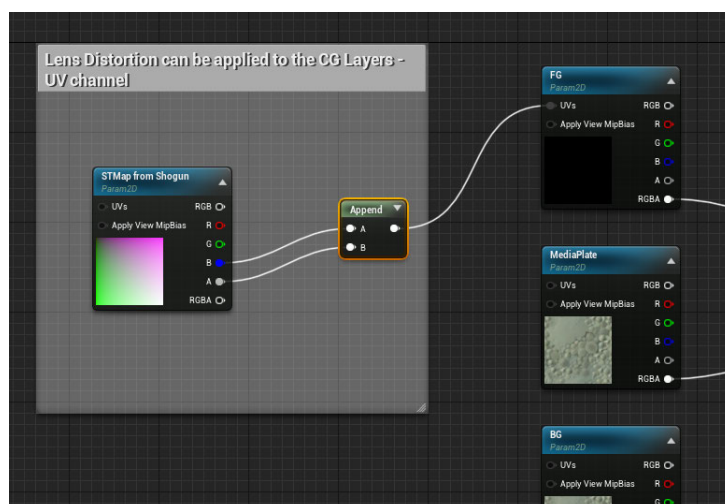
Export and use an ST map

11. Add a new **AppendVector** node:

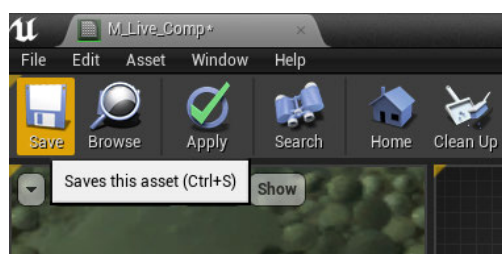


Export and use an ST map

12. To 'undistort' the foreground layer in this example, connect in this way:



13. Save the asset:



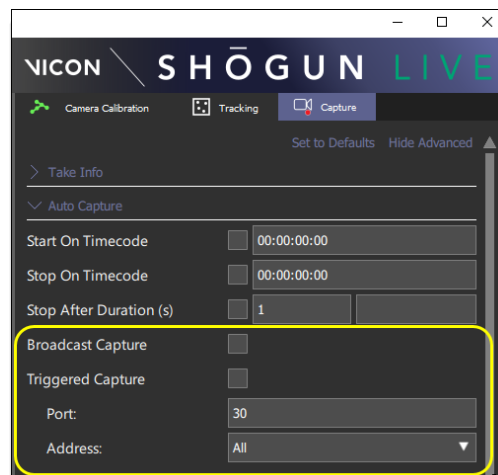
UDP capture broadcast/trigger

UDP capture broadcast/trigger

Vicon Shogun supports a simple UDP protocol to broadcast when capture has started. Shogun can also receive these messages, which can be used to trigger a capture remotely.

The port for broadcast and trigger is configurable and defaults to 30.

Note that the packet contents are null terminated.



UDP capture broadcast/trigger

The XML file contains the following notifications:

- [Start notification, page 127](#)
- [Stop notification, page 128](#)
- [Complete notification, page 129](#)
- [Timecode Start notification, page 130](#)
- [Timecode Stop notification, page 132](#)
- [Duration Stop notification, page 133](#)

UDP capture broadcast/trigger

Start notification

The following example shows a Start notification. Note that the broadcast must fit into one UDP packet.

The indents in the following example are for clarity: the actual packet is not indented. White space between tokens is removed.

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<CaptureStart>
  <Name VALUE="dance"/>
  <Notes VALUE="The pets ants crime deer jump. "/>
  <Description VALUE="The crowd pencil pets alert fold deer. With welcome
practice representative complete great? Or jolly tiny memorise thread. However
wool insect pipe! "/>
  <DatabasePath VALUE="D:/Jeremy/Susan/Captures/Take"/>
  <Delay VALUE="33"/>
  <PacketID VALUE="33360"/>
</CaptureStart>
```

Where:

Name	The name of the trial, which is used as the filename for the capture files, for example <Name>.x2d.
Notes	Any notes provided
Description	Any description provided. Avoid very long description strings as the broadcast must fit into one UDP packet. If it does not, the broadcast is not sent.
DatabasePath	The target path for the capture files.
Delay	The number of milliseconds that the broadcast is made before the capture starts. This delay enables clients to do any preparation required to respond.
PacketID	A number that individually identifies the packet. It is incremented for each packet generated. Use it to discard duplicate packets that are delivered by UDP. (This can happen if there are multiple paths between the broadcasting and listening machines.)

UDP capture broadcast/trigger

Stop notification

The following example shows a Stop notification. It is a notification that capturing has stopped.

Note that writing the file to disk may not be complete. Wait for the corresponding Complete notification before trying to open the file.

Possible values for the result are:

- SUCCESS - Everything was ok.
- FAIL - Everything was not ok. Perhaps the disk ran out of room, or the system was unplugged. You may get a truncated file.
- CANCEL - The user stopped the capture process. There will not be a Complete notification.

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<CaptureStop RESULT="SUCCESS">
  <Name VALUE="dance"/>
  <DatabasePath VALUE="D:/Jeremy/Susan/Captures/Take"/>
  <Delay VALUE="33"/>
  <PacketID VALUE="33361"/>
</CaptureStop>
```

UDP capture broadcast/trigger

Complete notification

The following example shows a Complete notification. It indicates that the captured file is ready at the path specified. Note that:

- When capture is complete, buffers have yet to be flushed to disk.
- If the file is on a remote drive, it may be captured locally and then copied to the final location. This may take some time.

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<CaptureComplete>
  <Name VALUE="dance"/>
  <DatabasePath VALUE="D:/Jeremy/Susan/Captures/Take"/>
  <PacketID VALUE="33362"/>
</CaptureComplete>
```

UDP capture broadcast/trigger

Timecode Start notification

The following example shows a Timecode Start notification. It is generated when the system is armed. Note that:

- Capture starts when the system receives the timecode specified.
- Additional notifications may be generated if the start timecode is updated after the system is armed.

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<CaptureStart>
  <TimeCode VALUE="0 38 10 17 0 0 0 4"/>
  <Name VALUE="slip"/>
  <Notes VALUE="The last ants great blade jump. "/>
  <Description VALUE="The truthful pencil pets ants crime deer. With geese
trail representative complete crowd? Or jolly toothbrush slip thread. However
worried insect nest! "/>
  <DatabasePath VALUE="D:/Captures/Take/DayOne/Final"/>
  <PacketID VALUE="33364"/>
</CaptureStart>
```

Where:

TimeCode is represented as a sequence of integers delimited with spaces.

- Hours
- Minutes
- Seconds
- Frames
- Sub-Frame (Always zero)
- Field
 - 0 - Even Field
 - 1 - Odd Field
- Standard
 - 0 - PAL
 - 1 - NTSC
 - 2 - NTSC Drop

UDP capture broadcast/trigger

- 3 - Film at 24fps
- 4 - NTSC Film
- 5 - 30Hz exactly
- Sub-Frames Per Frame (the multiple of the timecode rate that the system is running at)

UDP capture broadcast/trigger

Timecode Stop notification

The following example shows a Timecode Stop notification. Note that additional notifications may be generated if the Timecode Stop is updated after the system is armed or possibly even capturing.

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<CaptureStop>
  <TimeCode VALUE="0 46 27 15 0 0 0 4"/>
  <Name VALUE="slip"/>
  <DatabasePath VALUE="D:/Captures/Take/DayOne/Final"/>
  <PacketID VALUE="33365"/>
</CaptureStop>
```

The values for TimeCode are as listed in [Timecode start notification, page 130](#).

UDP capture broadcast/trigger

Duration Stop notification

The packet is generated when the system is armed, or immediately prior to the capture being started.

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<CaptureStop>
  <Duration FRAMES="12867" PERIOD="32865" TICKS="5553087"/>
  <Name VALUE="memorise"/>
  <DatabasePath VALUE="D:/Take/DayOne/Final/Susan"/>
  <PacketID VALUE="33367"/>
</CaptureStop>
```

Where:

Duration is the number of frames that will be captured.

The packet may contain extra information describing the frame rate:

- PERIOD is the number of clock ticks between each frame
- TICKS is the number of ticks in each second

The frames per second of the system can be calculated as $TICKS/PERIOD$. This representation of the frame rate avoids rounding errors for rates such as NTSC, which cannot be stored in a double without a loss of precision.

```
<Duration FRAMES="12867" PERIOD="653254" TICKS="135000000" />
```

UDP capture broadcast/trigger

Example Code

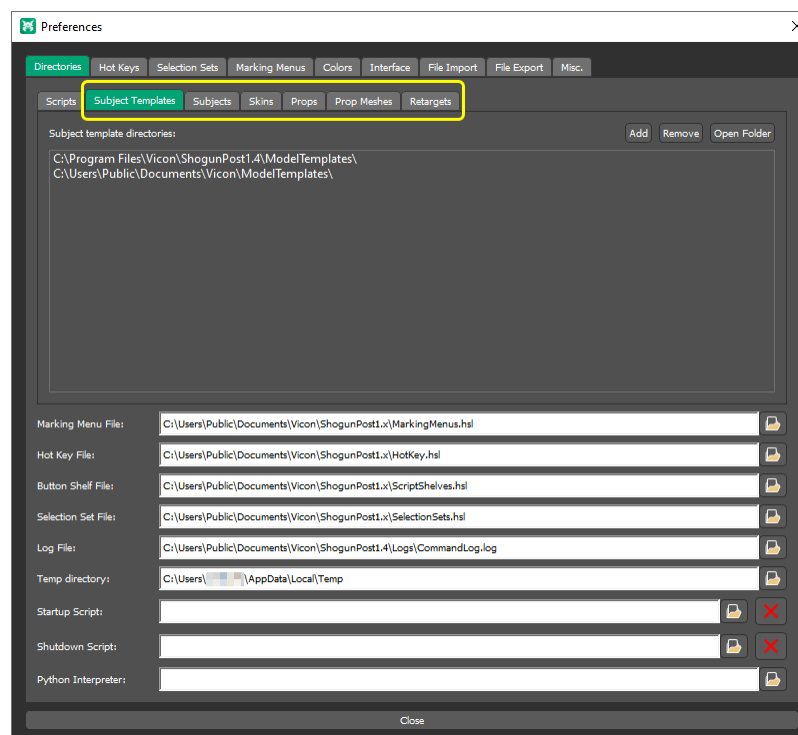
The examples are provided in C++ and require the *boost* library for communications.

1. CaptureBroadcastMonitor shows how to monitor for and decode the capture notifications described above.
2. RemoteStartStop shows how to package and send the packets to trigger capture start and stop.

Specify folders in Shogun Post

Specify folders in Shogun Post

Shogun Post lets you define folders for subject templates (VST or VSS files), subjects, skins, props, prop meshes and retargets. You do this in the Preferences dialog box.



In a similar way to the Scripts tab, the default folders are listed at the top of the tab.

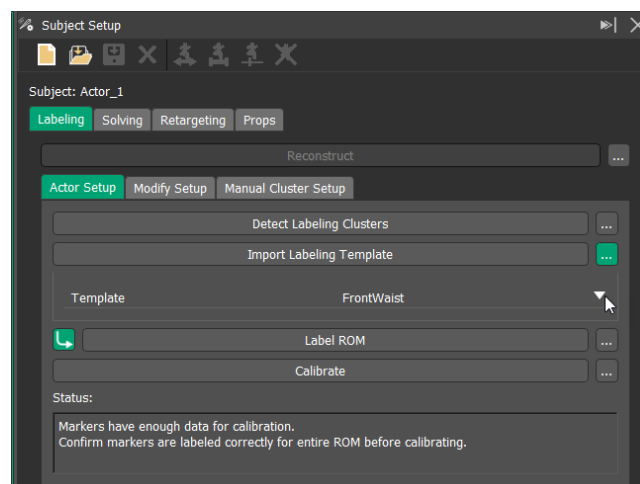
Specify folders in Shogun Post

To add or remove folders, click the **Add** and **Remove** buttons at the top right of the dialog box. You can also open the selected folder by clicking **Open Folder** or the browse button.

- **Subject Templates folders:** Contain the VST or VSS files that you load to create and calibrate a new subject.
- **Subjects folders:** Contain VSK and VSS files (labeling and solving setup files) for saved subjects.
- **Skins folders:** Contain FBX files that can be used to define the mesh used with a VSS skeleton.
- **Props folders:** Contain VSK and VSS files (labeling and solving setup files) for saved props.
- **Prop Meshes folders:** Contain FBX files that can be used to define the mesh used with a prop.
- **Retargets folder:** Contains VSR files used in retargeting.

The folders listed on these tabs affect the choices that are displayed in the **Subject Setup** panel, on the **Labeling**, **Solving**, **Retargeting** and **Props** tabs.

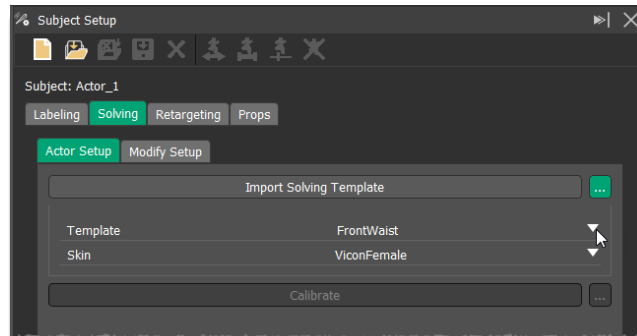
On the **Labeling** tab, when the **More** button () next to **Import Labeling Template** is selected, the VST files found in the **Subject Templates** folders that are defined in the **Preferences** dialog box are listed. To see all the VST files, click the down arrow below.



Similarly, on the **Solving** tab, when the button next to **Import Solving Template** is selected, the VSS files found in the **Subject Templates** folders that are defined in

Specify folders in Shogun Post

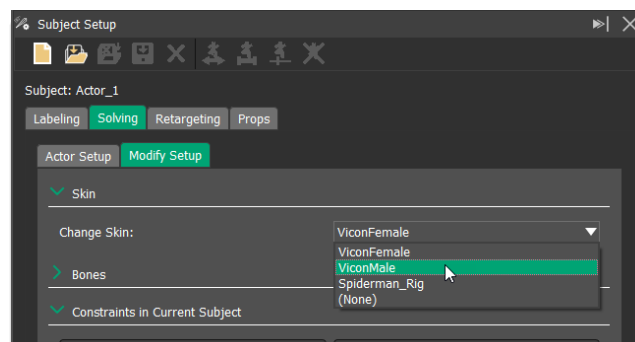
the Preferences dialog box are listed. To see all the VSS files, click the down arrow below.



The skin FBX files that are found in the Skins folders that are defined in the Preferences dialog box are also listed. To see all the skins files, click the down arrow.

To change the skin for an existing subject:

1. With the VSS subject selected, in the **Subject Setup** panel, on the **Solving** tab, click the **Modify Setup** tab.
2. In the **Skin** section, from the **Change Skin** list, select the required skin. (The skins listed are all the skin FBX files that are defined in the Preferences dialog as described above.)



Tip

Avoid giving templates or skins the same name in multiple folders. If you use the same names, you will find it difficult to select the required file from the the drop down lists, as only the name of the file is listed, not the full path.

Specify folders in Shogun Post

In a similar way, you can change the mesh for an existing selected prop by clicking the **Props** tab, and on the **Modify Setup** tab, selecting the required mesh from the **Change Mesh** list.

Using marking menus

Marking menus are tool sets that pop up as you work. They provide easy access to Shogun Post commands or scripts, regardless of where your mouse is pointing or what you are doing. Custom marking menus are a great way to create groups of commands for common tasks.

The scripts used in marking menus must exist within the directories specified in the **Preferences** dialog box (**General > Preferences**), on the **Scripts** tab within the **Directories** tab (explained in Set script folder locations, in HSL scripting with Vicon Shogun).

Shogun Post has three default marking menus: each contains five zones. Each zone has three mouse buttons. Each zone/mouse button combination has positions for eight menu items containing scripts or commands.

You can customize the marking menus by assigning scripts and commands to suit your preferences. You can save marking menu settings to the Shogun Post marking menu file (*MarkingMenus.hs*) or create marking menu files of your own. You can use marking menus whenever you want to quickly access assigned scripts or commands.

You may also find it useful to create your own folder for storing any marking menus you create or customize.

To specify the location of the Marking Menu folder:

1. Open the the **Preferences** dialog box (see above).
2. On the **Directories** tab, click the **Scripts** tab and enter or browse to the location in the **Marking Menu File** field.

For more information, see:

- [Default marking menus, page 140](#)
- [Customize marking menus, page 142](#)
- [Use marking menus, page 145](#)

Using marking menus

Default marking menus

The following tables describe the high-level contents of the default marking menus supplied with Shogun Post. For details of the individual commands in each of these zones, see the Marking Menus tab in the Preferences dialog box as described in [Customize marking menus](#), page 142.

Default (Space) marking menu contents

Zone	Left mouse	Middle mouse	Right mouse
Center	Tracking	—	Parent/Child
Top	—	—	—
Left	Capture	—	—
Bottom	—	—	—
Right	Solving	—	—

Ctrl (Ctrl+Space) marking menu contents

Zone	Left mouse	Middle mouse	Right mouse
Center	—	—	—
Top	—	—	—
Left	—	—	—
Bottom	—	—	—
Right	—	—	—

Using marking menus

Shift (Shift+Space) marking menu contents

Zone	Left mouse	Middle mouse	Right mouse
Center	Select Sets	—	—
Top	—	—	—
Left	Select Types	—	—
Bottom	—	—	—
Right	Hierarchy Selections	—	—

Using marking menus

Customize marking menus

You can customize marking menus by assigning new commands to zones and mouse buttons.

To customize marking menus:

1. Open the Preferences dialog box (**General > Preferences**).
2. Click the **Marking Menus** tab, which contains drop-down lists and location controls.
3. From the **Select a Marking Menu to edit** drop-down list, click one of the default marking menus:
 - Default Menu (Space)
 - Ctrl Menu (Ctrl-Space)
 - Shift Menu (Shift-Space)
4. From the **Select a zone to edit** list, click one of the available zones:
 - Center
 - Top
 - Left
 - Bottom
 - Right
5. From the **Select a mouse button** list, click the desired button:
 - Left Button
 - Middle Button
 - Right Button
6. In **Entry label**, type the name you want to use for this marking menu.
7. Click the **Commands** button to display the Script Viewer.

Using marking menus

8. Click the **Style** list and select an option for the way you want to view the available menu commands and scripts that can be assigned to marking menus (those that can execute without arguments):
 - **List:** All items listed in alphabetical order.
 - **Hierarchy:** Items grouped into categories of commands: Native Commands, Menu Commands, Plugin Commands, C:/Users/Public/Documents/Vicon/Shogun Post#.#/Scripts, C:/Users/Public/Documents/Vicon/Shogun Post#.#/Layouts, C:/Program Files/Vicon/Shogun Post#.#/Scripts, C:/Program Files/Vicon/Shogun Post#.#/Layouts.
 - **Category:** Items grouped into script categories.
9. From the list, click the command or script you want to assign to a marking menu and click **OK** to close the Script Viewer.

The selected command or script is displayed in the **Command string** and **Entry label** fields in the Marking Menu Preferences dialog box.
10. Click the button that represents the mouse direction to which you want to assign the command:
 - North
 - Northeast
 - East
 - Southeast
 - South
 - Southwest
 - West
 - Northwest

The button is highlighted, and the name of the selected command is displayed in it.

Using marking menus



Tip

You can replace the default command name displayed in the selected mouse direction field with a custom name by entering a new value in the **Entry label** field. You can add additional scripts to a single mouse direction by entering a semicolon and a space, and then manually typing in the name of an additional command. Separate each additional script with a semicolon and a space, for example: `rewind; play;`

To assign commands to any of the other mouse directions for the currently selected zone and mouse button, repeat steps 6–10 .

To assign commands to a different mouse button in the currently selected zone, Repeat the procedure from step 5.

To assign commands to a different zone and mouse buttons, repeat the procedure from step 4.

11. When you are finished customizing marking menus, click **Close** to save the changes and close the Preferences dialog box.

Using marking menus

Use marking menus

You can access marking menus from anywhere and at any time while you are working with data in Shogun Post. The menu that pops up depends on your current zone and the mouse button that you are using.

To use a marking menu:

Note that the following instructions assume that default menu has been assigned the Space hotkey, the Ctrl menu has been assigned the Ctrl+Space hotkeys and the Shift menu has been assigned the Shift+Space hotkey. You can find information on how to do this in [Set hot keys, page 145](#).

1. In a view pane, display the desired marking menu as shown in the following table.

To display this marking menu	Press and hold keys
Default menu (<code>showMarkingMenu</code> command)	Space
Ctrl menu (<code>showCtrlMarkingMenu</code> command)	Ctrl+space
Shift menu (<code>showShiftMarkingMenu</code> command)	Shift+space

2. Hover the mouse over the right, left, top, bottom, or center zone and then left-click, middle-click, or right-click to view the sets of commands defined for that zone/mouse button.
3. Left-, middle-, or right-click the desired mouse direction to run the associated script or command.

Set hot keys for marking menus

If required, you can set or clear hot keys for displaying marking menus, by changing the hot key for `showMarkingMenu`. For information on how to set hot keys for this and other commands, see Set hot keys in Post in *Getting started with Vicon Shogun*.

Vicon Shogun command line options

You can use command line options for Shogun Live and Shogun Post.

- [Shogun Live command line options, page 147](#)
- [Shogun Post command line options, page 148](#)

Vicon Shogun command line options

Shogun Live command line options

Shogun Live supports the following command line options:

Option	Description
--help	List supported command line options.
--log <level>	Set logging level to one of [Off, Always, Error, Warn, Info, Default, Debug].
--force-gles	Load in Graphics Compatibility mode.
--terminal-port <port number>	Specify a port number for the Live API terminal server (the default is 52800).
--nosplash	Do not show the splash screen.
--log-dir <path>	Specify a directory in which to save the log file (overrides default location).
--agent-host-ip=<host IP>	Where host IP is the IP address of the machine. Used to extract a subnet for harvesting network interfaces when setting up multi-machine Shogun processing. For details, see Run Shogun processing on multiple machines, page 42 .

Example usage:

```
> C:\Program Files\Vicon\ShogunLive1.7\ShogunLive.exe --log Info
--log-dir C:\tmp\ShogunLiveLogs

> C:\Program Files\Vicon\ShogunLive1.7\ShogunLive.exe --agent-
host-ip=192.168.1.100
```

Vicon Shogun command line options

Shogun Post command line options

Shogun Post supports the following command line options:

Option	Description
<code>--force-gles</code>	Load in Graphics Compatibility mode.
<code>--SkipSplash</code>	Do not show the splash screen.
<code>--crash-handler <string></code>	Optionally, specify quiet or system. If used with no argument, the Vicon crash handler is used.
<code>--exit-after-script</code>	Close Shogun Post after running the init script.

Example usage:

```
> C:\Program Files\Vicon\ShogunPost1.7\ShogunPost.exe --SkipSplash
```