



G B V I

High performance  
optical blending solutions

# WHY OPTICAL BLENDING?

Essentially it is all about preservation of display dynamic range. Where projected images overlap in a multi-projector display, common content must be seamlessly blended together to result in one continuous scene.



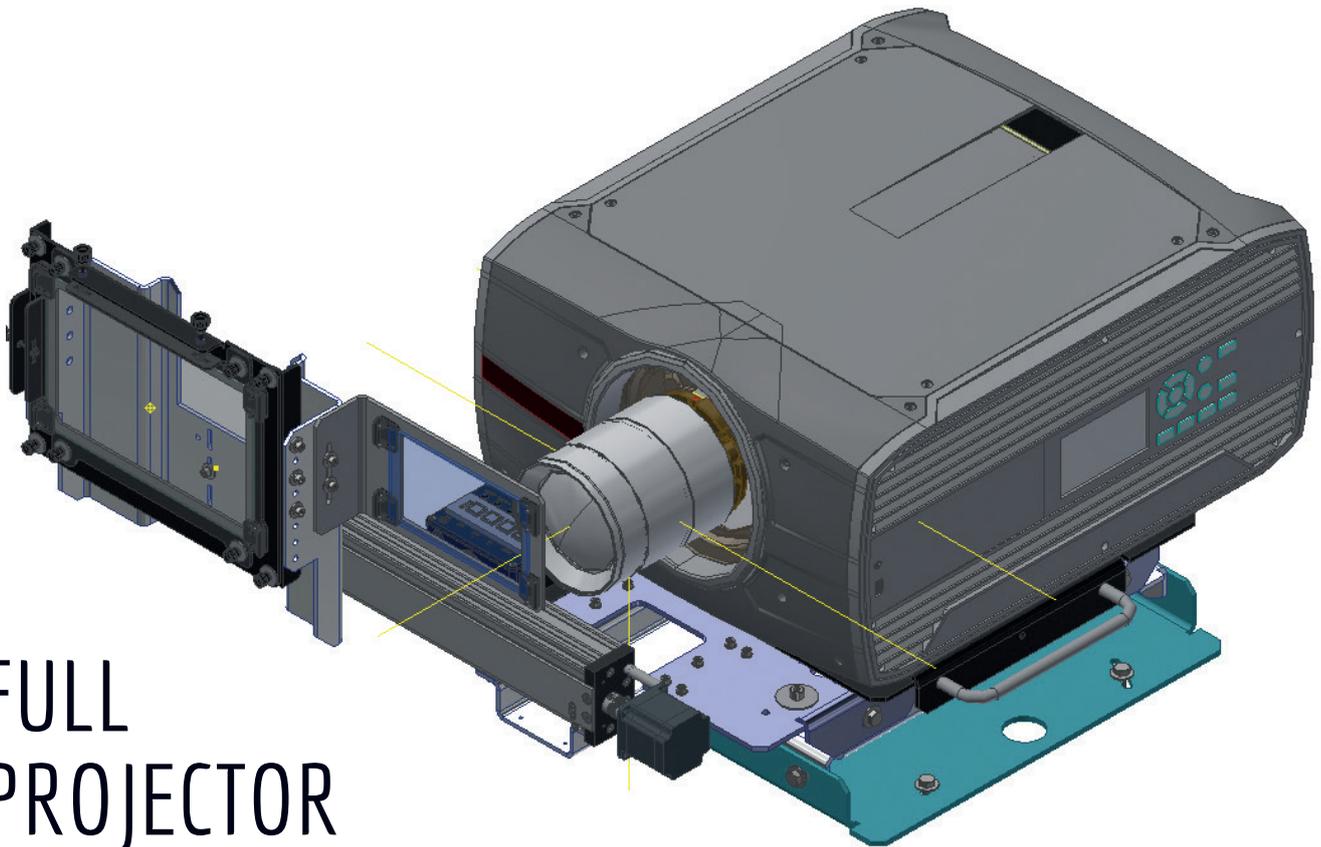
Blending may be performed by optical masking or by digital intensity management. If blended digitally, bright scenes will look good but, as average scene intensities drop, an unwanted artifact will start to appear where 'leakage' light levels are summed in the overlap regions. Most projectors have limited sequential contrast, which is the ratio of maximum to minimum light output - so they emit 'leakage' light even when the image should be black.

In dark scenes, this will show as objectionable bright steps that must be compensated in some way. While digital blending solutions can allow for 'infil' to bring all backgrounds up to match the worst-case leakage, this will dramatically degrade the useful dynamic range of the display system.

Optical blending eliminates this issue by physically modulating the projected light in the overlap regions.

Successfully achieving optical blending in high-fidelity environments turns out to be challenging - which is why GBvi has specialised in this field so that we make it easy for display integrators to succeed.

GBvi's Chronos range of optical blending products enable display system integrators to match the most appropriate blend technology, mechanical solutions and supporting services to their needs.



# FULL PROJECTOR COMPATIBILITY

Chronos has been successfully implemented on WUXGA, WQXGA and 4K single-chip DLP, WUXGA and 4K 3-chip DLP and 4K LCOS projectors, including lamp, laser-phosphor and LED illuminated models. We continually adapt to projector technologies as they evolve and develop.



## CHRONOS PERFORMS WELL FOR ALL SCENE CONTENT, NOT JUST DARK SCENES

- Options available for a wide range of projector makes and models - up to the highest light outputs and resolutions.
- Resolves "Saccade" visual effect often seen with DLP electronic blends.
- Low-complexity installation.
- Minimised (zero with Greyscale) diffraction blurring means that pixels remain resolved in the blend region
- Blending is achieved throughout the spectral range, including near-IR up to 900nm.
- Complex blend geometry can be supported.
- Alignment test patterns are available at no extra cost that enable high-channel-count domes to be successfully aligned.
- A wide range of Chronos blend technologies and configurations are available so that solutions can be tailored to the display system design, projector type and budget.

# HIGH-RESOLUTION SOLUTION

## Chronos Glass: Greyscale

Chronos Glass: Greyscale addresses the 'small 4K' and 8K class of projection systems where some optical trade-offs are most challenging, particularly with laser-phosphor illumination.



Our new greyscale technology has been developed in-house to provide blend masks that have genuine 'variable density', opening up new options and combinations of projector and display types. Artifact-free projected throughput is achieved to result in seamless blends and even hot-spot correction in rear-projected display environments.



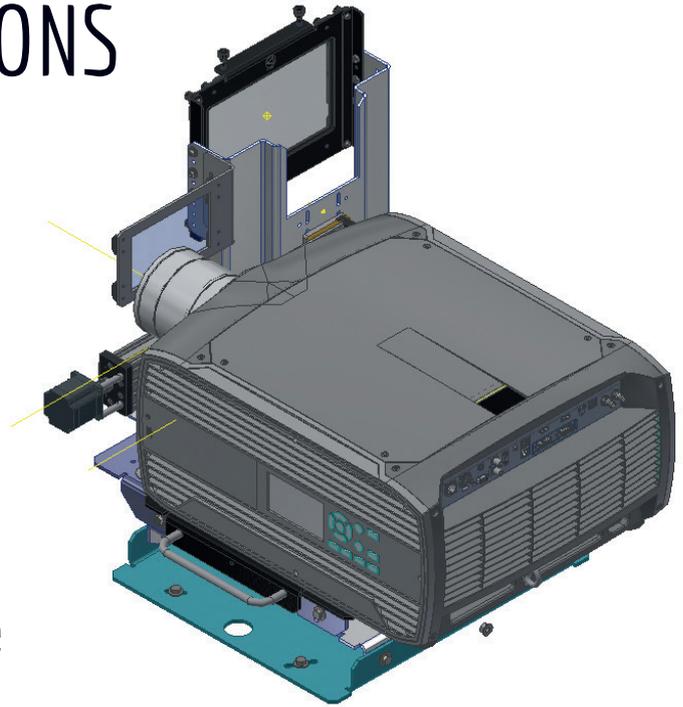
### Key Benefits

- True variable density blend regions, eliminating diffraction blurring and interaction with mask patterns.
- Compatible with laser-phosphor and LED light source projectors.
- Lifetime greater than 20,000 hours with typical simulation scene content.
- Introducing a new feature: hot-spot correction, which can be of particular benefit with some display layouts and screen types where there is a large luminance variation. By performing the majority of this correction optically, there is much reduced impact on artifacts such as contouring that may be caused by applying digital uniformity correction.
- Suitable for highly complex systems.

# HIGH-LUMEN SOLUTIONS

## Chronos Glass: Chrome

High-output projectors, typically using 3-chip DLP architecture, need the most resilient optical blend mask technologies to withstand the light flux without damage or degradation.

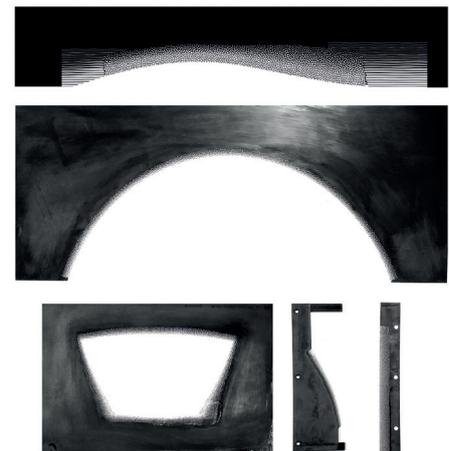


Currently the highest-performance optical blending solution for such devices can be found from Chronos Glass: Chrome. This is the first high-end solution fielded by GBvi and remains a very high-performance option. We have invested heavily in developing system design tools, mask pattern algorithms and alignment processes to optimise the performance achievable and - with 3-chip DLP in particular - achieve optical blend quality approaching that of our Greyscale product. This is because the larger-format optics present a 'friendlier' trade-off than those found with small-chip projectors, so blurring artifacts can be barely visible and resolution is maintained through the blends. Chronos Glass: Chrome continues to be successfully installed into high-end systems; for example at the Maloka planetarium in Bogota, as well as in large-FOV simulators.

## Chronos Foil

Chronos Metal Foil mask technology is a recent introduction to the GBvi product range, initially designed for use with low-cost UST projection systems, employing mask actuation systems to switch between day and night/dusk display modes. It is a novel, highly robust solution, which differs from other foil solutions in that it does not use a sawtooth or comb profile, but instead migrates our pattern algorithms that have been used for high-quality glass and film blend masks. As such, surprisingly good optical blending is achieved, enabling its use into dusk & dawn as well as night scenes and has recently been installed with excellent results into a marine simulation application that employed LCOS UST projectors - a particularly challenging combination.

Being a metal substrate, Chronos Foil can also be a successful lower-cost option for use with very high brightness projectors, as no substrate degradation occurs and for most scene content provides excellent results.



### Key Benefits

- No practical limit to projector light output levels.
- Lower-cost.
- Independent blend edge blades possible.
- No light loss through clear aperture.



Produced using the same algorithms as our Chronos Glass range, Chronos Film offers an equally high quality blend pattern but on an emulsion film.

Often used with day/dusk-night actuation systems to switch between digital and optical blending, Chronos Film will produce an excellent quality blend at a lower cost, with no risk of degradation.

# Chronos Film

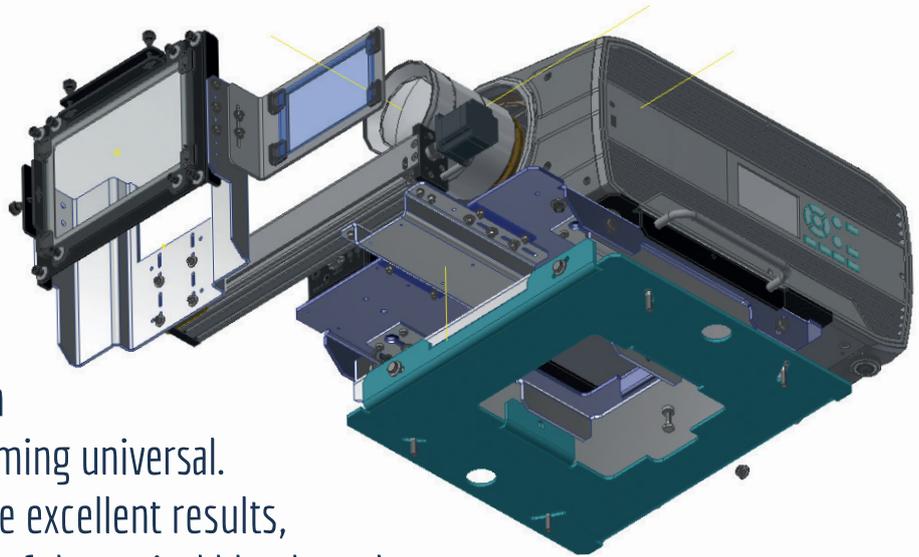
For systems that can operate in night/dusk mode only - such as when used with actuators - or where the projector light output is low, Chronos Film is the ideal lower-cost option.

## Key Benefits

- Low cost alternative to chronos glass and shares same quality characteristics.
- For LED and lower light output projectors or for actuated day/night systems.
- Non-planar masks such as cylinders are possible.



# Chronos Rewind



Use of Auto-Alignment (AA) systems for projection display calibration is becoming universal. While these systems produce excellent results, some benefit from removal of the optical blend masks from the light paths so that unrestricted projected coverage can be sensed.

Chronos Rewind is our dedicated solution that allows for these AA systems to be integrated alongside our Chronos optical blend masks as part of multi-channel projected displays.

Designed for use with a broad range of digital displays, Chronos Rewind uses an actuated platform and simple trigger interface to move the blend mask to and from the projector lens as required in a carefully controlled and precise manner.

This process allows for the blend to be retracted from the lens, auto calibration to be completed, and for the blend mask to be returned to its original, correct position.



## Key Benefits

- Precision actuated retraction system to enable auto calibration operation with minimal manual intervention.
- Compatible with any projector. This solution is for customers who need a solution that needs integrating with an auto alignment system.
- Axial or lateral movements according to your preferences.
- When using lateral translation, optional dummy glass can be switched into lightpath to eliminate auto calibration errors.

## Compare the Chronos range

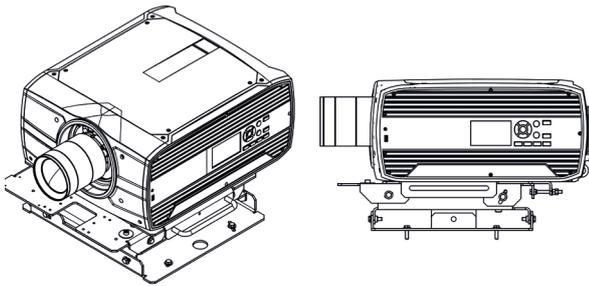
	Overview	Suitable for
<b>Chronos Glass: Chrome</b>	Designed to enable a seamless image across multiple projector channels, it is ideal for digital planetarium applications.	Very high light output projectors.
<b>Chronos Glass: Greyscale</b>	The highest performance glass blend mask technology available in the market. Addresses the 'small 4K' and 8K class of projection systems where some optical trade-offs are most challenging, particularly with laser-phosphor illumination.	LED and laser-phosphor projectors.
<b>Chronos Film</b>	Low cost alternative to chronos glass and shares same quality characteristics.	For LED and lower light output projectors or for actuated day/night systems.
<b>Chronos Foil</b>	Designed for use with mask actuation systems and with very high brightness projectors.	For very high light output projectors and actuated day/night solutions.
<b>Chronos Rewind</b>	Precision actuated retraction system to enable auto calibration operation or day/night switching with minimal manual intervention.	Any projector.

# Atlas-4 Projector Mount

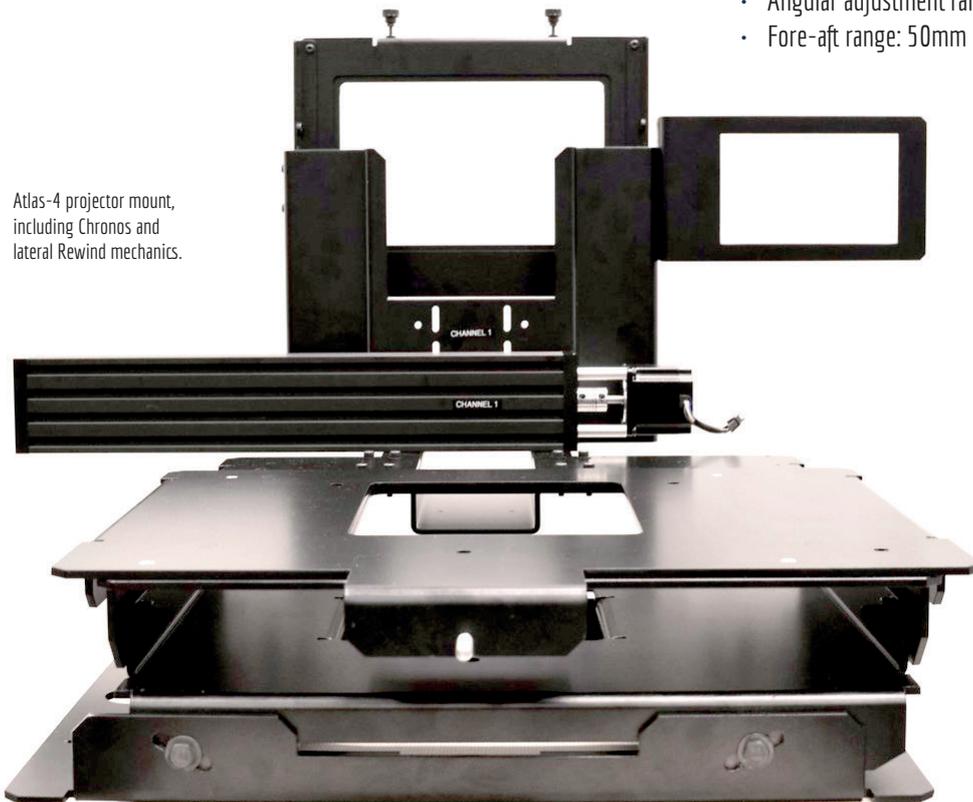
Atlas-4 is GBvi's projector mount, designed to significantly ease projector installation and optical alignment.

Atlas-4 robustly interfaces a projector to the support structure while providing all necessary mechanical adjustments to optimise projection geometry.

By designing a family of projector mounts that not only eases interfacing to Chronos optical blending but also behaves the way installers like for predictable alignment, a complementary addition to our product range has emerged.



Atlas-4 projector mount, including Chronos and lateral Rewind mechanics.



## Key Features

- Four Degrees-of-Freedom (4DOF) adjustability provides yaw, pitch and roll rotations that pivot about the projection point and fore-aft translation along the projection axis, significantly easing the bore-sighting process.
- Motion compatible.
- Semi-custom configuration accommodates a wide range of projectors, including the Barco F70 and FL40, Sony VPL-GTZ270/280, and Norxe P1.
- Highly configurable - variants for other projectors are easy to introduce.
- Small footprint allows it to sit under the projector body without compromising tight projector cluster designs typical in simulator designs.
- Front interface points support Chronos optical blending system.
- Quick-release plate and side grab handles make for rapid projector removal and replacement without disturbing projector alignment or optical blending hardware.

## Applications

- Simulation displays; flight (fixed & rotary wing), marine, ground vehicle,
- Planetariums.
- Staging and Installation.
- Entertainment systems (e.g., dark rides).

## Specifications:

- Size in mm (for F70): 580Lx500Wx129H (with mid-range adjustments)
- Angular adjustment range:  $\pm 2.5^\circ$  in Yaw & Roll  $\pm 2^\circ$  in Pitch.
- Fore-aft range: 50mm

## Material:

Aluminium fabrications with steel fixings

Mass: 14kg



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