

Lutron® Intelligent Hembar Alignment™

Technical white paper
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1.1 Introduction

Automated window treatments can become misaligned and give an unappealing look to a space. The eye can detect a difference of 1/4" at a distance of 5 feet, making even the smallest variation in hembar alignment detectable.

Lutron "Intelligent Hembar Alignment™," or IHA, is a system designed to synchronize all motorized shades in a single space or an entire building. IHA uses a patented, two-part electronic control system to maintain hembar alignment within 1/8" during motion, and at all resting positions. IHA is included on all sizes and models of Lutron's Sivoia® QS and Sivoia QED® shade treatments and can be further fine-tuned in the field for custom applications.

1.2 Science behind IHA

IHA eliminates the possibility of shade misalignment with a two-part electronic control system:

Part 1: Closed Loop Electronic Speed Control: Cruise control for shades

Many factors affect the speed of the standard electric motor inside all shade drives:

1. Electric motors slow down as they lift heavier loads
 - a) The load on the motor changes from nearly zero at the open position to maximum load at the closed position
 - b) Shade to shade variations such as width, fabric, and installation type vary loads on the motor greatly
2. Motor to motor variations can cause drives to run at slightly different speeds (even with the same load)
3. Normal wear over the life of the motor will cause it to slow down
4. Wiring type and run length vary
5. Local line voltage and frequency vary
6. Normal variations in power supply output voltage

All Lutron drives contain a precise digital speed control system that monitors the speed of the shade 500 times per second. It contains:

- A sensor monitoring the speed of the motor at its output
- A microchip calculating the error in the speed of the drive
- A motor drive circuit adjusting power to correct any changes in speed

This closed loop system eliminates speed variations caused by any of the above factors for precise speed control across all shade types and sizes, and over the lifetime of the drive.

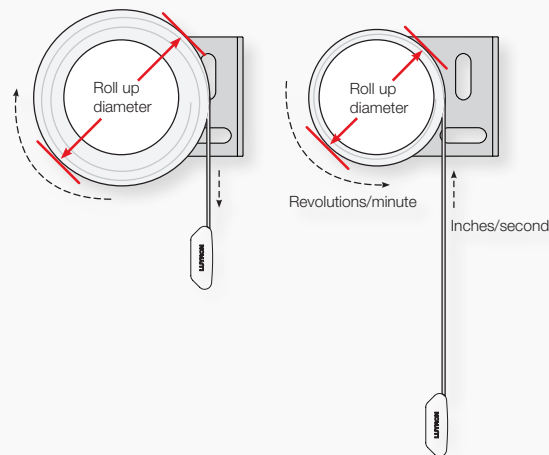
Part 2: Roll up diameter compensation

If a drive moves at a constant speed the hembar will move slower near the closed limit and faster near the open limit.

- As a shade moves up or down, the *roll up diameter*¹ changes as wraps of fabric are added to the tube.
- This changing diameter causes the *hembar speed*² to constantly change as the shade rolls up

A patented algorithm in the microcontroller of all Lutron drives takes into account the height and fabric thickness of the shade it is controlling. Instead of maintaining a constant *drive speed*³, the speed control system continuously changes the RPM of the motor so that the hembar linear speed remains constant.

Even when a bank of shades is adjusted with a raise or lower command to a non-preset position, all of the shades will stay aligned to within 1/8”.



1. **Roll Up Diameter:** The outside diameter of the shade tube, including any rolled up fabric. (Inches.)
2. **Hembar Speed:** Linear speed of the hembar and fabric in the vertical direction. (Inches per second.)
3. **Drive Speed:** Rotational speed of the tube and drive. (Revolutions per minute or RPM.)

1.3 Causes of misalignment in shades without IHA:

Drive Type: Different size drives run at different speeds.

Tube Size: Different size tubes will cause large differences in hembar speed.

Fabric Thickness: Different fabric thicknesses affect roll up diameter differently and change hembar speed.

Installation Variables: Inconsistent levelness and tracking in each installation can cause differences in the motion of the hembar.

Drive Age: Motor wear will slow down drives over normal lifetime



Industry standard - shades misalign over time

1.4 Industry standard alignment vs. IHA:

Industry standard systems can provide gross preset alignment through the use of “timed presets.” There are no alternatives that can match the alignment accuracy of IHA. Systems that use timed presets do not sense the absolute position of the shade. Using timed presets can allow preset positions to drift significantly over time, resulting in costly field service calls for realignment.

	“Timed Presets”	IHA
Maintains position over time		●
Works at non-preset positions		●
Works across shade/drive types		●
Accounts for installation variable		●
Preset positions and Open/Close limits	●	●

1.5 Application of IHA:

Standard IHA: All Lutron shades are pre-calibrated to run at the same drive speed before leaving the factory. In most installations shades will be aligned within 1/8”.



Standard IHA - keeps shades aligned

1.5 Application of IHA (continued):

Customized IHA: Once shades are installed and leveled, IHA is applied in the field via a laptop connection. Simple measurements are taken directly from each shade and entered into the IHA application. Customized IHA accounts for all variables that can affect hembar alignment, including lot-to-lot fabric variations and shim tape applied in the field. Similar length shades will stay within 1/8" of alignment at all times.

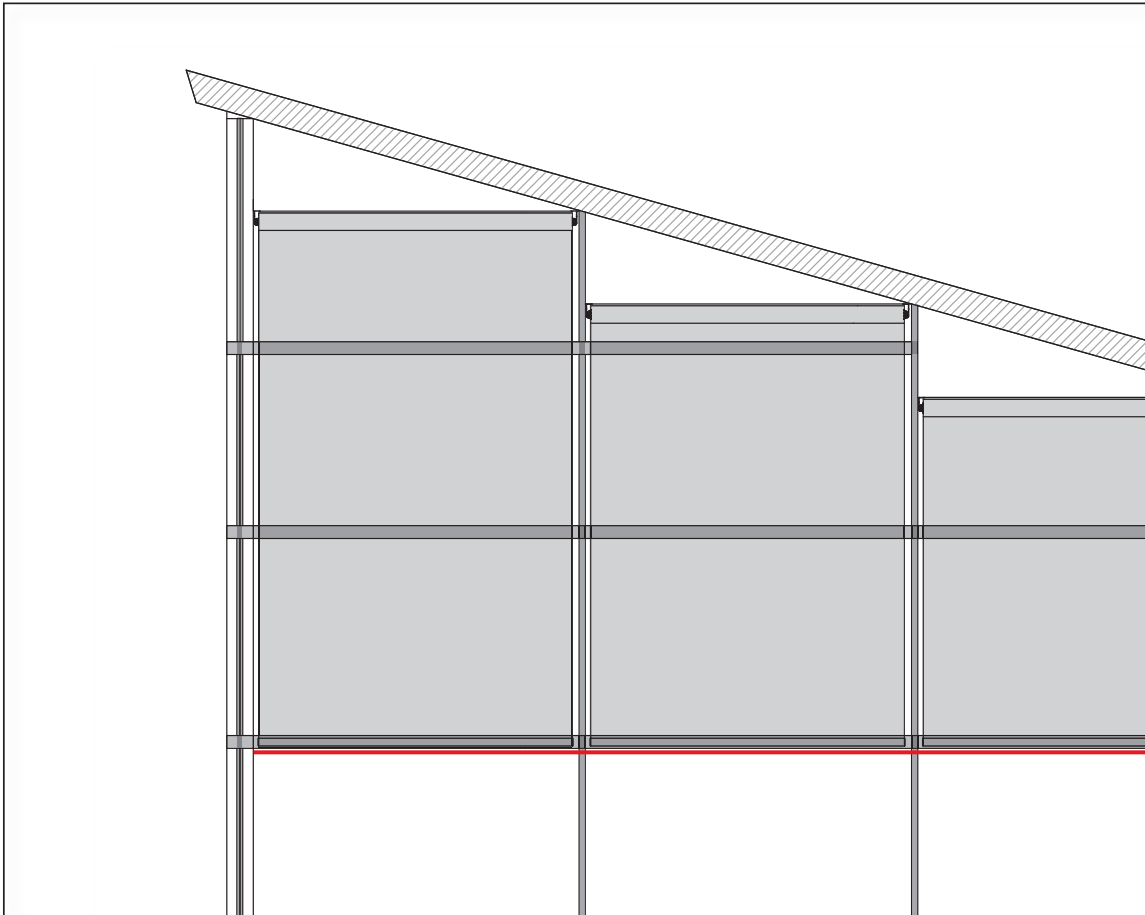
The screenshot shows the 'QS Shade IHA Tool - Rev 3.5' window. At the top, it displays 'QS Shade IHA Tool' and 'QSE-NWK Port 3' with 'Connect' and 'Disconnect' buttons. Below this, a status bar reads 'Read successfully.' and a dropdown menu shows 'Serial #: 0026005A, Model #: QSSC-EDU-R100, Code Revision: 0064, Boot Revision: 0209'. The main interface is divided into three sections: 'Manually Adjust Shade Parameters', 'Calculate Shade Parameters', and 'Suggested Parameters'. The 'Manually Adjust Shade Parameters' section has two columns: 'Edit Shade Parameters' with input fields for 'Fabric Thickness' (0 /1000) and 'Tube Diameter' (2.562 inches), and 'Shade Testing' with buttons for 'Open', '50%', 'Close', and up/down arrows. The 'Calculate Shade Parameters' section includes a list of instructions, a dropdown for 'QSSC-EDU-R100', input fields for measurements, and 'Set Defaults' and 'Calculate' buttons. The 'Suggested Parameters' section is currently empty.

In a job that contained three Sivoia QS roller 64's and two roller 100's that were in the same space using similar fabrics and sizes, Customized IHA was used to synchronize all of the shades in the field in under an hour using the program above.

1.5 Application of IHA (continued):

Advanced IHA: Through integration with a Quantum® system, any size group of Lutron shades can be programmed to move in any custom configuration. By combining the precise and constant speed control of IHA with a programmable system, any type of shade can be made to move in a predefined pattern to achieve a desired effect. Advanced IHA can accommodate the following situations:

- Multiple shades along a slanted roof (uneven length shades)
- Shades mounted vertically above/below one another
- Choreographed movement of shades



Advanced IHA - accounts for sloped ceilings to keep hembars aligned

1.6 The importance of IHA

Misaligned shades will affect interior light levels. In a presentation setting for example, a boardroom with AV equipment and misaligned blackout shades can allow light into the space and disrupt the occupants' ability to see the presentation.

In an open office space using solar tracking software to control the shades, misalignment of shades can impact productivity. Solar tracking shade systems move throughout the day, if the shades are misaligned they could let too much light in causing glare issues for occupants.

Shade misalignment can have a significant impact to the interior and exterior aesthetics of a building. When shades become misaligned, hembars can be out of place and distracting at all positions. Preset positions may not precisely align with window mullions. When fully open, hembars may hang below the ceiling. When fully closed, hembars may rest on windowsills.

IHA is the most advanced system for controlling shade movement and maintaining hembar alignment that is currently available. It is just one of the features that makes Lutron shades the most precise and most customizable shading system in the world.



The importance of IHA - aligned shades create clean lines

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For more information about Sivoia® QS
shading systems, contact your local Lutron
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at www.lutron.com/shadingsolutions

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