



LightLouver™ Unit Maintenance Manual

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The LightLouver Daylighting System is protected under U.S. Patent Numbers 6,239,910 B1, 6,480,336 B2 and 6,714,352.

Failure to adhere to the maintenance procedures described in this Manual may result in damaging the LightLouver units and voiding the Limited Warranty. See the LightLouver Limited Warranty for more details.

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LightLouver™ Unit Maintenance Manual

1.0 Introduction:

This building incorporates an innovative daylighting concept as part of the building's overall energy and environmental design features. This daylighting concept, the LightLouver™ Daylighting System, has been designed to collect and redirect daylight onto the ceiling of the daylit spaces of the building. LightLouver units have been installed in the upper portions of some of the building's windows.

The LightLouver Daylighting System is a passive, optical daylighting device requiring no adjustment throughout the year to collect and redirect daylight. The LightLouver Daylighting System is designed to assist the electric lighting system meet the ambient lighting needs of the daylit spaces. Figure 1 presents a concept drawing of the LightLouver Daylighting System.

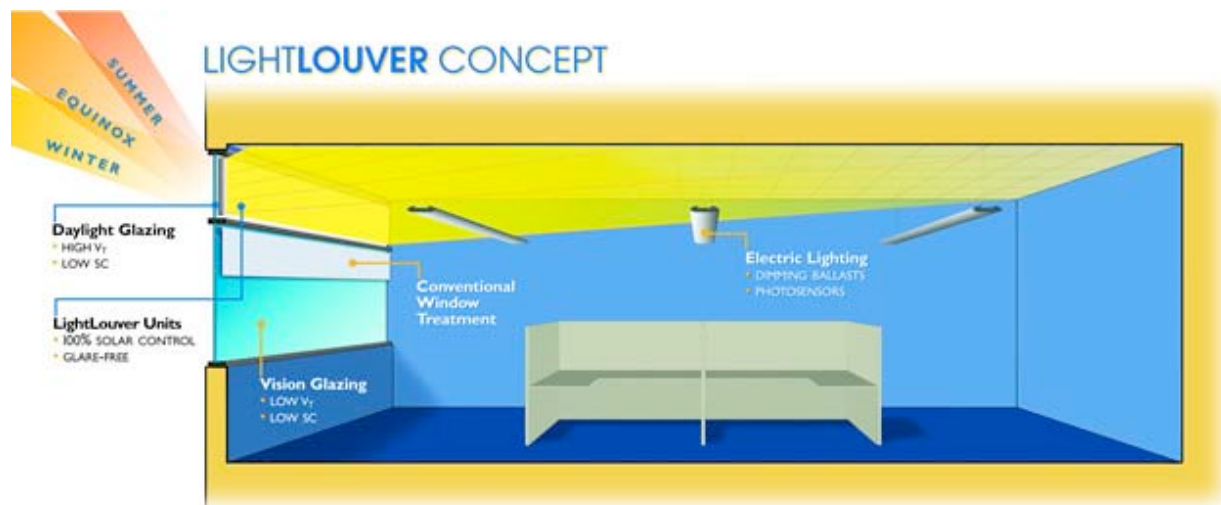


Figure 1: LightLouver Daylighting System Concept Drawing

Figures 2 and 3 on the next page illustrate the LightLouver daylighting concept. Sunlight at various angles (acceptance angles) strikes the reflective surfaces of the LightLouver slats and is redirected to the ceiling of the daylit space. The illuminated ceiling provides the ambient lighting needs of the space. When the available daylight is insufficient to meet the space's ambient lighting needs, the electric lights should be adjusted to provide the required ambient light level. Typically, a photosensor reads the ambient light levels in the space and adjusts the electric lighting accordingly.

Electric lighting should incorporate dimming ballasts, providing only the minimum amount of electric light required to meet the ambient light needs of the daylit space. Task lights, stand-alone lamp fixture or integrated into the office furniture system, can provide any extra light desired by the users/occupants.

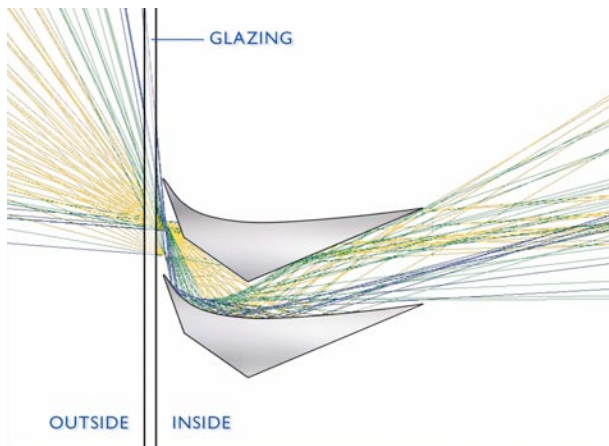


Figure 2: LightLouver daylighting concept – raytracing diagram for various solar angles



Figure 3: Daylight redirected by LightLouver units onto the ceiling

The LightLouver Daylighting System is designed to provide a substantial portion of the building's ambient lighting needs. This will result in significant annual energy cost savings through electric lighting costs savings and cooling costs savings when the electric lights are off or dimmed. The potential annual energy cost savings will only be achieved if the lighting controls are properly operated and maintained and the LightLouver units are properly maintained.

The following LightLouver Maintenance Manual has been prepared to assist the building operation and maintenance staff in properly maintaining the LightLouver Daylighting System.

2.0 Material Required to Implement Maintenance / Cleaning Procedures

- Two stepladders or a moving platform with room for two people, depending on the size of the LightLouver unit to be cleaned / serviced
- Swiffer® 360 Duster (This is the preferred duster, as it will not leave smudges on the reflective slats.)

- Soft cotton cloths / rags
- Soft cotton gloves
- One or more pair of “ Hold-Open “ Prop Rods
- Gunk® Glass Cleaner (A foam-based glass cleaner without ammonia -- Product No. GC 3 or an ammonia-based glass cleaner – Product No. GC 33) or Windex® Powerized Vinegar Glass Cleaner (Commercial line product which is a vinegar-based glass cleaner)
- Normal window cleaner, to be used to clean the window behind the LightLouver unit

3.0 General Maintenance Recommendations

The LightLouver units are composed of multiple extruded, foam-filled plastic slats, with a reflective film on two of the slats’ surfaces, supported by an aluminum support assembly. The reflective film has a clear protective coating, but is still susceptible to fingerprints and damage. Please follow the recommended maintenance procedures listed below:

- **ALWAYS** wear soft cotton gloves when handling the LightLouver units for maintenance and repair, or when cleaning the windows behind the LightLouver units. The use of cotton gloves will help to minimize fingerprints and the potential for scratches on the reflective slat surfaces.
- Use one or two stepladders or a rolling platform when cleaning the windows behind the LightLouver units or when cleaning or repairing the LightLouver units.

Place the stepladder(s) or moving platform directly in front, or on either side, of the LightLouver unit to be cleaned. It is important to be able to see the surfaces – from above and from below -- of the LightLouver reflective slats to ensure that they are completely



cleaned. If the units are cleaned during sunny days, care must be taken to not have sunlight reflected from the LightLouver unit reflect directly into the eyes of the cleaning personnel.

- To gain access to the window behind a LightLouver unit, **ALWAYS** grasp the LightLouver unit near the center of the bottom slat, and as near to a vertical slat support rod as possible. **NEVER** open a LightLouver unit from a bottom corner, as this will apply torque (twisting) on the LightLouver unit, possibly causing damage.



- Insert the provided “Hold-Open” prop rods as shown in Figure 4 and the image to the right..



- **NEVER** force open a LightLouver unit past the point at which it firmly stops. The support brackets are designed to allow the LightLouver unit to pivot out to approximately 45 degrees and not beyond. Forcing the LightLouver unit beyond the stopping point can result in damage to the LightLouver unit or to the window, and may result in bodily injury.

- Using your normal window cleaning supplies, clean the window behind the LightLouver unit, being extremely careful not to dislodge the Hold-Open Prop Rods.
- After cleaning the window, carefully lower the LightLouver unit. DO NOT let the LightLouver unit drop and hit the glass, as damage to the glass or to the LightLouver unit may occur.
- Using the Swiffer® 360 Duster, start at the top slat of the LightLouver unit at either end, and make two complete passes over the slat in a back-and-forth motion. Be sure that the Swiffer® fiber cleaning element is inserted deep into the slat, but ensuring that the plastic elements which hold the Swiffer® cleaning element are not exposed or touching the slat surface, as this may cause damage (scratching) of the reflective slat surface. However, do not apply too much pressure as to bend or damage the slat.



A polyester fiber duster can also be used. This type of duster, such as a Total-Reach® Poly Duster, has long polyester fibers over a 12 to 15 inch height and can remove dust from 4 or 5 slats simultaneously. Static electricity generated by swiping the polyester fiber over the slats attracts the dust to the duster.

Two different types of polyester fiber duster are shown in the images to the right.



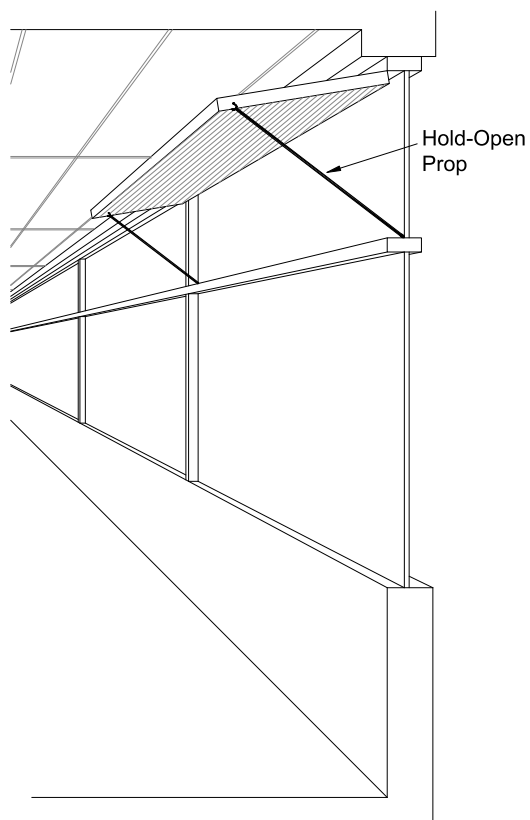
- Using a clean cotton cloth, make two complete passes over the slat in a back-in-forth motion to remove any remaining dust or smudges. Repeat this process as needed to clean and shine the reflective slat.

For stubborn dirt or smudges, spray a small amount of the Gunk window cleaning fluid on a clean, soft cotton cloth and wipe the slat in a smooth motion. **DO NOT SPRAY THE WINDOW CLEANER DIRECTLY ON THE SLAT**

- Step down from the ladder or moving platform and look up at the cleaned unit, and determine if any dust or smudges still remain on the unit. If any dust or smudges are observed, using a clean cotton cloth or a slightly damp cotton cloth

with a small amount of the Gunk window cleaner, clean the slat or slats where the dust or smudge was observed.

- **ALWAYS** use the recommended cleaning products to clean the LightLouver unit (see Sections 2.0 and 4.0).
- The LightLouver units should be cleaned on the same schedule as the windows or other window treatment (i.e. mini-blinds) are cleaned, but not less often than every 6 months.



Hold-Open Prop

Figure 4: “Hold-Open” Prop Rods holding LightLouver unit open

4.0 Window Cleaning

The LightLouver units are designed to pivot away from the glass, as shown in Figure 5, to enable the “daylight” glazing to be cleaned. Be careful not to allow the front tip of the top slat to strike the window frame above the unit, as this could severely damage the slat and possibly the LightLouver unit.

To avoid damage to the LightLouver unit or to the glass, carefully lower the unit when finished cleaning the window. Do not allow the unit to swing freely back into position or slam into the glass.



Figure 5: LightLouver unit being opened

5.0 LightLouver Slat Cleaning

All slats in the LightLouver unit have highly reflective top and bottom surfaces, and should be cleaned or dusted on the same schedule as the windows or window treatments (i.e. mini-blinds). Please adhere to the following recommendations when cleaning the LightLouver unit reflective slats.

Use only a clean, soft cotton cloth to clean the LightLouver unit reflective slats. Other materials, such as microfiber wipes, may have cleaning chemicals imbedded in them that may cause dulling or smudges on the slat surfaces. The reflective surfaces can be easily marred or scratched if the recommended cleaning materials are not used.

The following cleaning products may be used to clean the LightLouver reflective slats:

- To remove fingerprints or other surface marks:
 - Use a glass cleaning product only, such as Windex® (original formula), Gunk® (Product No. GC33) or Glass Plus®, follow the cleaning procedures described in Section 3.0. Do not use a general cleaning product, such as PRO 409® or Mr. Clean®, which contain high levels of surfactants and will leave a residue on the slat surface.
 - Apply a small amount of the glass cleaning product (i.e. Gunk®) to a soft cotton cloth and then clean the reflective slats. **DO NOT SPRAY THE CLEANING PRODUCT DIRECTLY ON TO THE SLATS.**
- To remove dust:
 - Use a Swiffer® 360 Duster that has long, soft fibers that will reach deep between the slats while simultaneously cleaning the top and bottom reflective surfaces of the slats. Care must be taken to ensure that the plastic handle and the plastic fingers that hold the fiber cleaning material do not come into contact with the reflective slats, as this can cause scratching.

Do not use a duster made of lamb's wool, as it will leave an oil deposit on the slat surface. A box of the Swiffer® 360 Duster has been provided as part of the installation.

- A polyester fiber duster can also be used. This type of duster, such as a Total-Reach® Poly Duster, has long polyester fibers over a 12 to 15 inch height and can remove dust from 4 or 5 slats simultaneously. Static electricity generated by swiping the polyester fiber over the slats attracts the dust to the duster's polyester fibers.

6.0 A Final Word

With proper maintenance and care, the LightLouver Daylighting System will provide many years of reliable energy saving performance. The cleaning and other maintenance described in this manual are essential to achieving this long-term performance. Please be diligent in following the maintenance instructions provided.

Thank you for your efforts and adherence to these LightLouver Daylighting System Maintenance Instructions.