



Open Edition
Holographic Prints

Introduction

No printed medium can capture a viewer's attention faster or remain in a viewer's memory longer than the magical three-dimensional image of a properly displayed, high-quality hologram. Because of their high cost, large format image holograms have been found primarily in galleries, museums, and the homes of affluent collectors. Recent advances in photopolymer hologram recording materials and automated production processes have lowered set-up and production costs, making image holograms an affordable option for home decor.

Hughes Power Products is pleased to present this family of open edition holographic prints. Each work is created by artists specializing in holography and replicated by Hughes Power Products using the latest in materials and production technology.

Figure 1

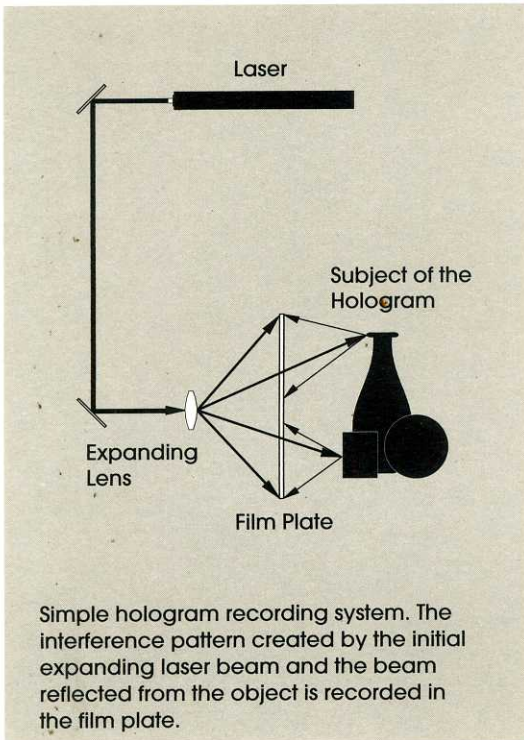
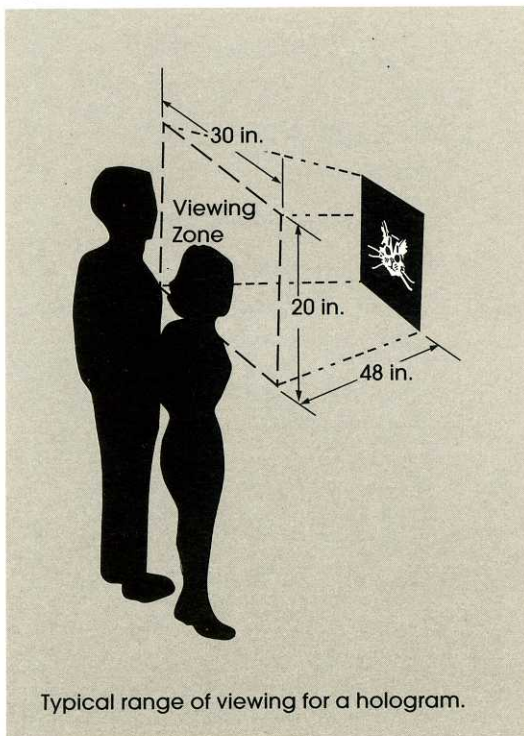


Figure 2



Creation of a Hologram

To understand how a hologram works, consider a pebble dropped into a pool of still water, causing a series of concentric waves to expand outward across the surface. When these waves strike an object, such as a rock extending above the surface of the pool, they reflect, creating a second set of waves propagating in a different direction. Where these two sets of waves overlap, a stationary pattern is created temporarily on the surface. This pattern is caused by the interaction, or interference, of the two sets of waves. If the water was instantly frozen to permanently record this pattern, it would be possible to measure and analyze the pattern and calculate the exact shape of the object that reflected the waves, without actually seeing the object itself.

A hologram is also a recording of the interference pattern caused by two sets of overlapping waves. In this case, the waves are the pure light generated by a laser, and the recording is frozen in a special type of film.

As illustrated in Figure 1, the simplest system for recording image holograms is very similar to the rock-in-the-pond analogy described above. The expanded beam from a laser is transmitted through the recording film plate to illuminate the subject of the image. The light reflected from the subject also illuminates the film plate. The interference pattern created by the intersection of the original laser beam and the reflected light is recorded in the film. After development of the film and with proper illumination, this recording is a three-dimensional image of the subject.

The artists who create our open edition holographic prints use more complex equipment and optical techniques than shown in Figure 1. Each artist creates an original, or master, hologram using their own proprietary equipment and recording techniques. Hughes Power Products then makes copies on an automated production line originally developed to produce holographic optical elements for industrial applications. Each copy is a laser recording in film of the image stored in the artist's master hologram—essentially a hologram of a hologram. The copying system is very similar to that shown in Figure 1, with the subject of the hologram replaced by the master hologram.

Hughes Power Products fabricates the open edition holographic prints using the latest in materials technology. The holograms are recorded in a recently developed, extremely durable, photopolymer material. Each print is a three-layer laminated structure. The outer layer is a heavy abrasion-resistant transparent film that also blocks ultraviolet light that might fade the recorded image. The center layer is the photopolymer film containing the actual hologram recording. The back layer is a thick plastic sheet that keeps the hologram smooth and flat.

Hologram Placement

The key to proper placement of a holographic print is to understand two properties of holograms that are unlike photographs and printed media.

First, a deep image print can be viewed over a relatively small range of angles, as illustrated in Figure 2. Note the range of viewing angles is determined by the artist during creation of the original image, and is different for each holographic print. Thus, the height of the print on the wall must be selected to accommodate the heights of the expected viewers. In general, holographic prints should be hung lower than most other art. It is easy for a tall viewer to bend, but difficult for a shorter viewer to appreciate a hologram that has been hung too high.

As shown in Figure 3, tilting the holographic print from the vertical plane (such as in an easel mounted on a table) will accommodate a wider range of viewers.

Second, the holographic print will reflect an image for each light source that provides illumination. To avoid objectionable multiple ghost images, the print must be positioned where it will not be illuminated by any bright light source other than the spot lamp dedicated to the hologram.

Lighting

The open edition holographic print will look best only when illuminated by a single non-frosted light source, such as a small diameter spot lamp. Track-lighting and ceiling-mounted fixtures suitable for wall-hung photographic prints can be obtained at any lighting or home improvement store. Some halogen desk lamps are well suited to lighting smaller images. Track lighting fixtures which incorporate an MR-16 narrow spot lamp are ideal for illuminating holographic prints. This lamp is available in 20, 35, 42, 50, and 75 watt versions, allowing the brightness of the light to be matched to the general illumination level where the print is hung. Other suitable lamps include the PAR-16, Designer-16, PAR-20, and JDR types which are available from 50 to 100 watts. In some cases, a single higher power medium spot or narrow flood lamp may be used to light multiple holographic prints.

The correct position for the light fixture is illustrated in Figure 4. First measure the distance from the center of the print to the ceiling. Then temporarily position the lamp on the ceiling this same distance from the wall. Starting from this position, adjust the lamp to achieve the ideal viewing conditions. Moving the lamp farther from the wall will raise the viewing region and shift the hologram color toward the red portion of the color spectrum. Moving the lamp closer to the wall will lower the viewing region and shift the color toward blue. Thus, the lamp position can be used to "tune" the hologram color to your personal taste.

Figure 3

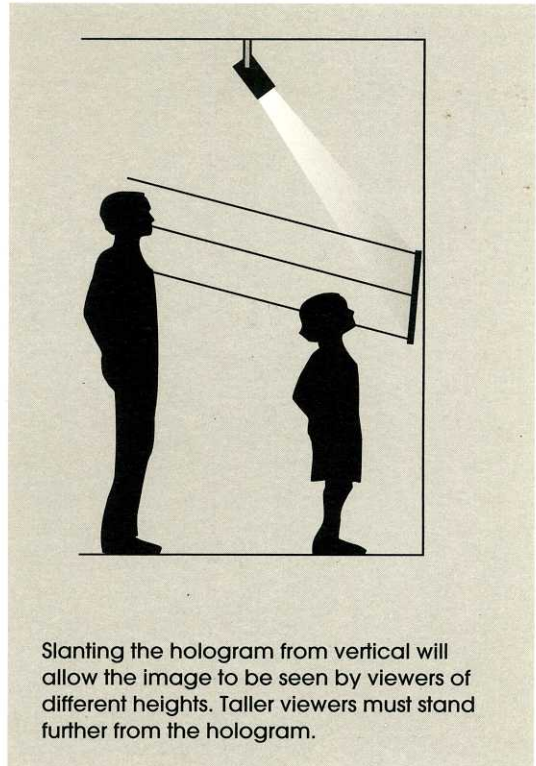
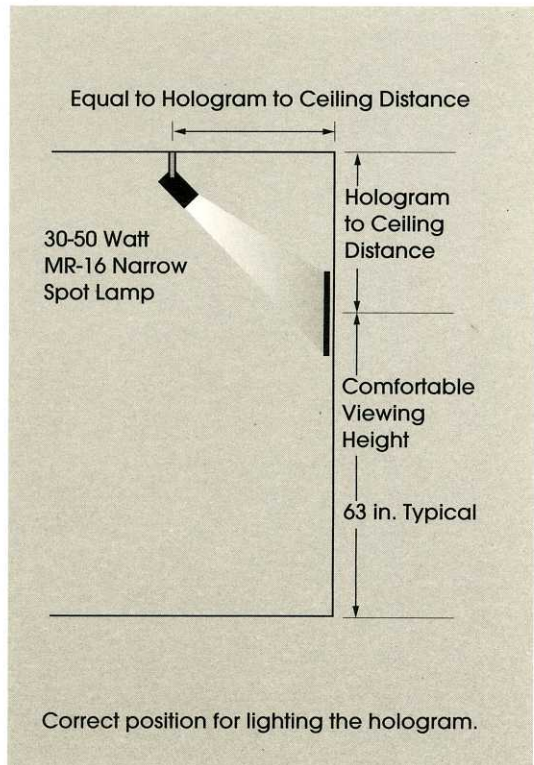


Figure 4



Hologram Care

The open edition holographic prints have a scratch-resistant exterior coating and are more durable than many forms of art. The surface of the prints can be cleaned with a soft cloth and any commercial alcohol-based glass cleaner. Strong solvents, such as acetone, must be avoided. Precautions must be taken during handling and storage to avoid scratching the surface with sharp objects or dirt particles. The prints should not be folded or compressed under heavy objects. In addition, the prints should not be exposed to temperatures in excess of 130°F as permanent damage may result.

A set of handling and framing instructions is provided with each holographic print. The prints will have a nearly unlimited life if handled in this manner.

Framing

To frame an open edition holographic print:

- Clean the holographic print as described above.
- If desired, cut a mat with the appropriate opening as specified in the hologram data sheet.
- Use a foam board or mat board backing. Assemble the pieces with the print centered on the mat opening. Tape one edge of the print to the mat, or hinge the print to the backing.
- Use clear or antireflection glass if desired. Do not use matte finish antiglare glass. If glass is used, a spacer or mat must be used to separate the glass from the surface of the holographic print.

Hughes Power Products

For the past 25 years, Hughes Aircraft Company has been a pioneer in the use of holographic optical elements in complex aerospace and defense systems. With the incorporation of Hughes Aircraft Company into the General Motors family in 1985, and with the anticipation of increasing commercial markets for holography, Hughes began developing techniques for the cost-effective mass production of high quality holographic prints. In 1993, Hughes Power Products was formed as a subsidiary company with the charter to develop commercial markets for holography and related technologies.

In addition to production and distribution of open edition holographic prints, Hughes Power Products originates and produces high-quality 3-D image holograms for advertising, promotions, and fine arts applications. Origination may be done internally or subcontracted to nationally regarded artists. Hughes Power Products will also provide production services for customers who prefer to arrange for image origination independently.

For additional information, please call
(310) 414-7086
or send inquiries by facsimile to
(310) 726-0008



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