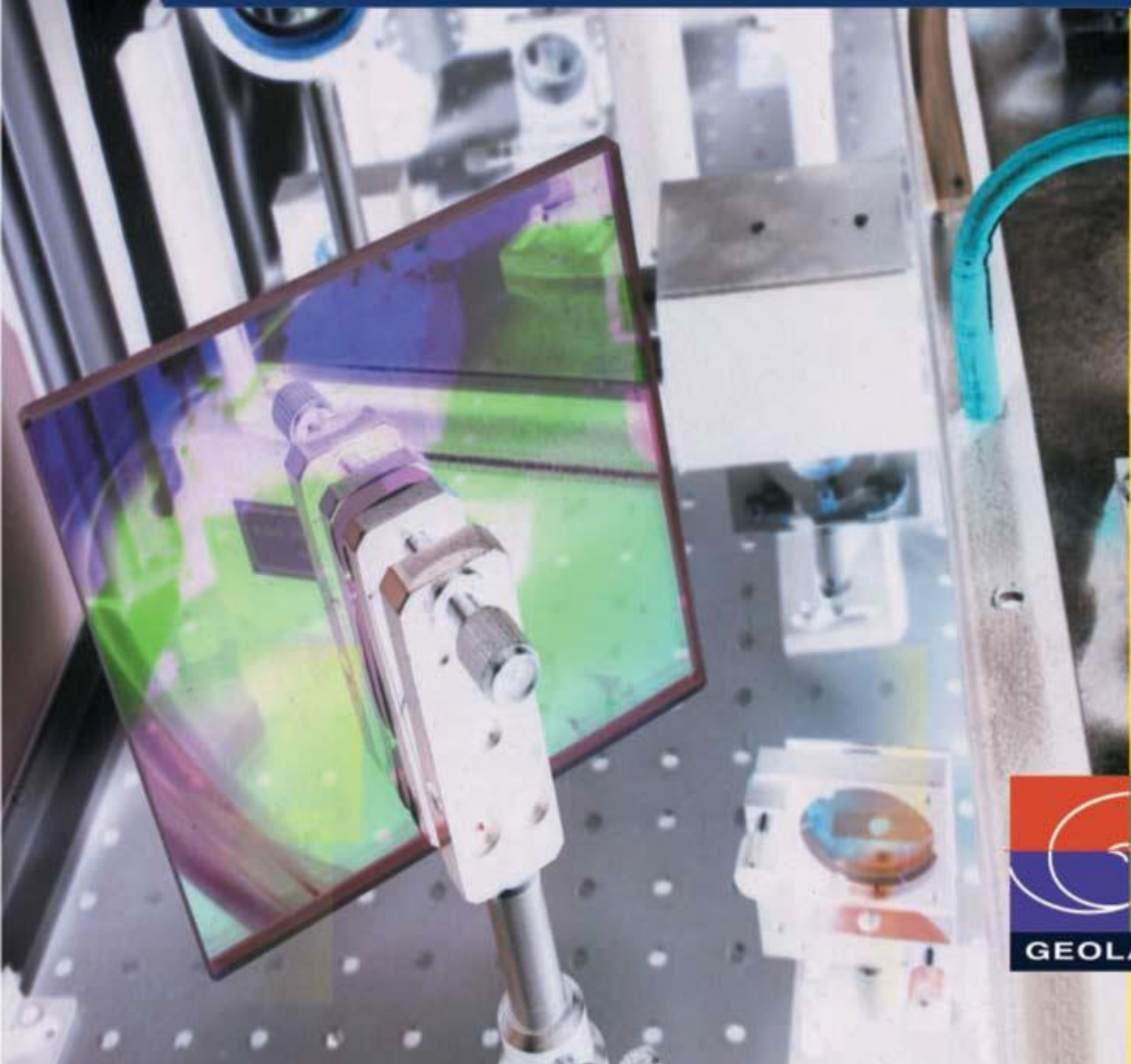


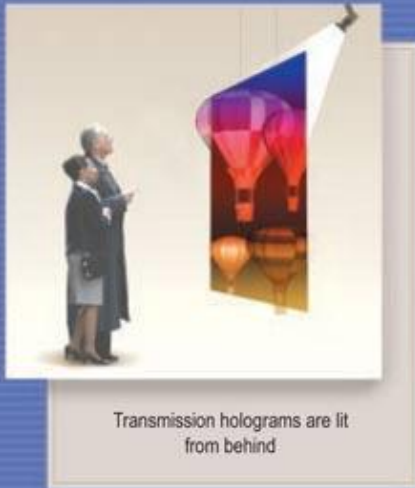


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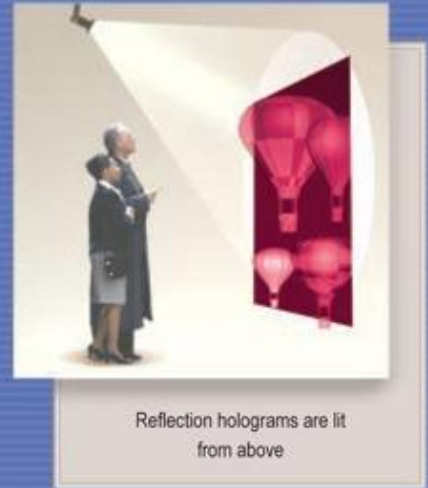
**TURNKEY
HOLOGRAPHIC
MINI-STUDIOS
AND SYSTEMS**

GEOLA GENERAL OPTICS LABORATORY





Transmission holograms are lit from behind



Reflection holograms are lit from above

DISPLAY HOLOGRAPHY & 3D PRINTING

Holograms, also known as 3D prints, are essentially extremely high-fidelity 3D photographs. Like photographs, holograms are recorded onto a photographic plate or film. The resolution and quality of the photographic material used in holography is substantially superior to that used in photography. Thus a standard hologram may contain up to ten thousand times the information contained in a photograph of the same size.

The real magic of a hologram is, of course, its ability to reproduce the third dimension. Nothing can reproduce the visual sensation of a real object - just being there - quite like a hologram can.

The 3D images displayed by a hologram can appear either behind, in front of, or straddling the physical hologram surface. The technique of projecting images in front of the hologram surface, particularly at large format, produces an astonishing visual effect. Images appear to swim in the air as mesmerized observers pass their hands through the virtual object.

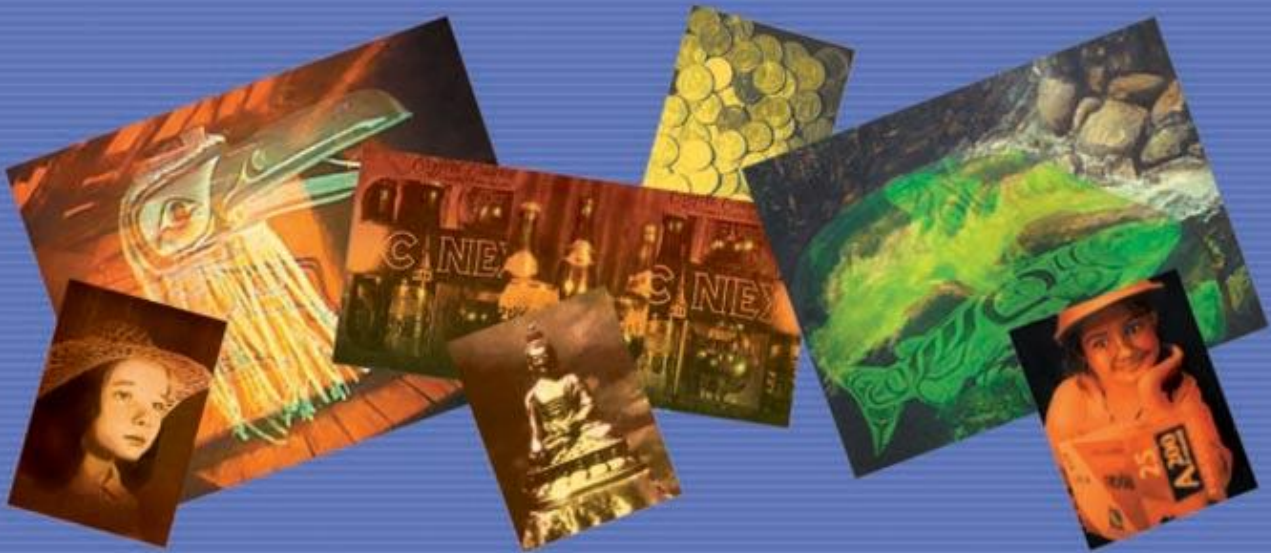
HOLOGRAM TYPES

Holograms come in two different varieties - Transmission Holograms and Reflection Holograms. Simply speaking transmission holograms are viewed by the transmission of light as in the viewing of a photographic slide. Reflection holograms are viewed by the reflection of light as in the viewing of a normal photograph.

The reflection holograms produced by the systems described in this brochure are generally monochromatic. The hologram colour may be adjusted chemically from blue right through to red. The spread of colours may also be adjusted using chemistry giving a variety of pleasing visual effects.

The transmission holograms produced by the systems described in this brochure are what are known as Rainbow Holograms. The perceived colour of a rainbow hologram changes from red to blue as the height of the viewer's head changes.

The holographic photoemulsion is usually protected by lamination of a self-adhesive protective film.



HOW A HOLOGRAM IS PRODUCED

Holography is similar to the photographic process but there are two important differences. The first is that the object being holographed must be lit by light from a special laser source rather than by normal white light. The second difference is that, in addition to the illuminating light, holography also requires a second light beam known as the reference light. This light evenly illuminates the holographic plate.

In order to make a hologram, first a "master hologram" must be made. This may be thought of as being similar to the photographic negative except that it is rather larger (usually 30x40cm, 40x60cm or even 80x100cm).

The master holographic plate is developed using a technique very similar to black and white photography. After it has been processed it may be used to generate the final reflection or transmission hologram much as a photographic negative is printed to produce the final photographic image.

CHARACTERISTICS

The final hologram must be viewed in the light of an ordinary halogen spotlight (see diagrams on the opposite page).

MARKET & APPLICATIONS

- Advertising & Promotion: 3D Posters & Displays, POP Displays
- Product Enhancement, Sales Presentations, Interactive & Mixed Media Displays
- Celebrity Product Endorsement
- 3D Portraiture: VIPs, Celebrities, Family, Children, Wedding, Pets & Animals
- Medical 3D imaging for Surgery and Analysis
- Reproduction of Museum Exhibits and Archival Artifact Recording
- Virtual Prototyping and 3D Copying
- Artistic Development and Teaching
- 3D Capture & Analysis of Ultra-High Speed Events



A 3D portrait is made with an **HS** Mini-Studio (2 diffusers provide subject illumination)



The **HS** Mini-Studio - main optical unit and power/control rack



Transfer Rig used in an **HS** Mini-Studio

THE **HS** SERIES OF AUTOMATED HOLOGRAPHIC MINI-STUDIOS

The **HS** series of compact holographic mini-studios are integrated machines that produce both the master and the finished hologram up to a size of 40 x 60cm (or to 1m x 1.4m with the large format option). Based on Geola's unique expertise in the field of Neodymium pulsed lasers, the **HS** machines are reliable, compact and easy-to-use systems. With an **HS** mini-studio you will be able to print large format reflection and transmission holograms on glass or film with ease.

AUTOMATION

The **HS** mini-studios are digitally controlled and automated for easy use. Two diffusing illuminators are provided for subject illumination in the mastering mode of operation. This mode is used to produce the initial master hologram of a subject, scene or model. Digital control of the left/right lighting ratio, subject/reference ratio and of the total laser energy are provided for in this mode. The **HS** systems are, of course, suitable for use with human or animal subjects.

Equipped with a standard Geola 2 or 5 Joule laser, an **HS** mini-studio is capable of shooting one master hologram every two minutes. Switching from mastering to copy mode is as easy as pressing a button. The setup time is just under two seconds. In copy mode a processed master hologram is placed in the transfer rig (shown above). This master hologram can then be transferred onto a new holographic plate or film by simple digital selection of the reference/copy ratio and the transfer exposure energy. When equipped with a standard Geola GxJ series laser, the mini-studio is capable of shooting one final reflection or transmission hologram every 2 minutes. Installation of a Geola QuickFire laser and an automated film advance system brings this rate up to 5 holograms per second.

SYSTEM AND SPACE REQUIREMENTS

All **HS** holographic mini-studios require single-phase electricity and tap water. The average power consumption is similar to a television set. Space requirements are 25m² with a ceiling height of more than 2.8m. The **HS** system comprises the main laser & optical unit (seen to the left in the center picture), an electrical rack containing the laser power supply and the system controller, a transfer rig (above to the right) and a mirror set. The standard mirror set consists of 4 special mirrors that are mounted on photographic style tripods and are arranged in strategic positions around the main laser unit, in addition to two other ceiling-mounted mirrors. Custom mirror sets are available that can accommodate various non-standard room geometries.

SAFETY

All **HS** mini-studios have been designed to respect European and American laser safety, electrical and radiation standards.

LASER UPGRADE OPTION

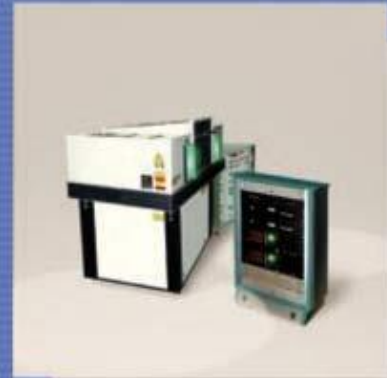
The standard **HS** system is fitted with a 2 Joule Neodymium glass laser. This laser produces adequate energy for the recording of most holograms even when the system is upgraded with the large format option. However, for large format deeper images Geola is able to offer a laser upgrade to either 5 Joules or 8 Joules either before shipping or as a retrofit.



HSL and HSLD Systems - main unit
(for holograms up to 0.8 x 1.0m)



HSL and HSLD Systems - transfer rig
(for holograms up to 1.0x1.4m)



HSD Mini-Studio - main unit, power/control and digital racks

LARGE FORMAT OPTION

A standard **HS** system is capable of producing both master and final holograms of 40 x 60cm. The large format option increases the maximum master hologram size to 0.8m x 1m and the maximum final hologram size to 1m x 1.4m. The large format option may be fitted either before shipping or as a retrofit at the client's facilities. The large format option (**HSL** or **HSLD** System) includes:

- A large master plateholder to replace the standard master plate holder
- An overhead illuminator to supplement the two standard side illuminators
- A large transfer rig to replace the standard rig
- A set of large transfer mirrors to replace the standard set
- A large spherical collimating mirror to replace the standard mirror

DIGITAL OPTION

The digital option effectively converts an **HS** mini-studio into a 3D digital printing machine i.e. into an **HSD** or **HSLD** System. Monochrome reflection and rainbow transmission holograms of up to 40cm x 60cm may now be produced from a digital computer model or from 3D digitally scanned data.

HOW IT IS DONE: The existing laser installed in the **HS** system is used in the "pilot-mode" of operation to produce a 2Hz low energy beam. This beam is used in a highly specialized electro-optical and electromechanical scheme (patent pending) that is installed beneath the main optical table. The equipment fitted below the table takes information from the client's computer and converts it into a form where it can be written onto a photographic plate or film by the pulsed laser beam. The result is a digital master that can be transferred, using the **HS** copy mode of operation, to produce either a reflection or transmission hologram of high quality.

SOFTWARE: Most well known names such as 3D StudioMax™, Lightwave™, Softimage™, Bryce 3D™, POV-Ray, VRML™ etc. are compatible with our software. Geola's HRIP™ software (included) provides:

- Job Queue management;
- A Web Browser, Printer Manager;
- Network Administration.

OVERVIEW: The system is supplied with its own computer server (including console and keyboard) onto which files to be printed are uploaded. The operator can select jobs, preview them and control all major printing parameters either automatically or manually.

The main server is connected via a standard 10/100 Mbit/s Ethernet network using TCP/IP protocol. Files may be spooled and printing status may be monitored from a remote computer connected either to the client's intranet or to the Internet.



1. Adjustment of the desired illumination of the subject



2. Exposure: 2 illuminating and 1 overhead reference beams

THE OPERATION OF AN **HS** MINI-STUDIO

Each **HS** system comprises the following elements:

- A main laser & optical unit,
- A power supply and control unit housed in a rack,
- A transfer rig,
- Three tripod-mounted flat mirrors,
- One tripod-mounted spherical mirror,
- Two ceiling-mounted flat mirrors.

A room of 5m x 5m is required for standard systems with a ceiling height of more than 2.8m. When in use red light of a moderate intensity should be used for ambient illumination.

SHOOTING THE MASTER HOLOGRAM

The subject or model to be holographed is placed on the red stool (shown in the diagrams above) and the height adjusted for the desired visual result. The control unit is then set to mastering with a 100% reference beam ratio and the pilot mode of operation is selected. In the pilot mode, low intensity laser flashes of up to 2Hz are produced by the camera. This light is suitable for verifying the subject illumination. The left-right lighting ratio control is altered until the desired subject illumination is achieved. All other control settings are then set to default values and the laser is reset for single pulse exposure.

An unexposed holographic photoplate or film (shown in blue in the diagrams above and to the left) is now loaded into the main plateholder. Exposure is made simply by pressing the "fire" button located on a small remote control unit that is designed to be held by the holographer. At exposure, a flash of laser light, lasting for a mere 25 nanoseconds, is emitted from both of the two front illumination ports and additionally from the rear reference beam port.

During exposure, information concerning both the three dimensional shape and the brightness distribution of the holographed object is recorded onto the holographic photoplate or film.

After exposure the holographic photoplate/film is taken away and processed using a conventional photographic process. If required, chemical processing may be done with a delay of up to eight hours.

Chemical processing may be done either manually or by machine. After chemical processing the photoplate/film must be dried and this is the most time consuming part of the process, typically taking one hour. During this time up to 20 other master holograms may be shot.



3. Adjusting the copy hologram for final image position and framing



4. Shooting the copy - H1 beam comes from the left, H2 from the right

SHOOTING THE TRANSFER HOLOGRAM

When the master hologram is dry it is inserted into the transfer rig. Copy and pilot modes are selected on the control unit, the copy beam ratio is set to 100% and a white screen is placed in the transfer rig in the transfer hologram holder. The pilot mode then illuminates only the master hologram which then projects a two-dimensional image onto the white screen. This image allows the holographer to quickly and effectively align the master hologram and to define the final image geometry (left/right & up/down alignment in addition to image projection).

After the master hologram has been aligned the white screen is removed and replaced by an unexposed holographic plate. The laser is set for single pulse exposure and default settings are used for the total exposure energy and master/transfer ratio. As in the mastering mode, exposure is made simply by pressing the "fire" button located on the remote control unit.

During the short exposure time (~25 nanoseconds) information about the three-dimensional shape and brightness distribution of the holographed object is transferred from the master hologram to the fresh holographic plate. In this way a three-dimensional image of the object is imprinted by laser light onto the copy hologram.

From one master hologram many thousands of transfers can be effected and many thousands of white-light viewable holographic copies can thus be made.

The exposed photoplate or film, now containing the transferred three-dimensional image, is processed either manually or by machine using conventional photographic techniques. The desired colour of the final reflection hologram is chosen at this stage by choice of chemical additives in various of the processing fluids.

The processed and dried hologram should be protected from humidity and UV light. The best way to protect the emulsion of reflection holograms is by lamination of a black self-adhesive film. For the emulsion protection of transmission holograms transparent double-sided self-adhesive film is used. One side of the double-sided film is applied to the emulsion side of the hologram and the other side is adhered to a plexiglass substrate. The application of self-adhesive film onto the hologram copy can be done either by hand (rubber roller) or by using a standard cold lamination machine.

SAFETY AND THE USE OF LASER LIGHT ON HUMAN SUBJECTS

The light emitted by Geola holography systems onto the subject is below the federal limits set forth by both the US Food and Drug Administration and the Laser Institute of America. Geola holography systems are Class 4 laser products that have been designed for human portraiture applications without ocular (eye) risk to the subject when used in accordance with the manufacturer's instructions for use, according to the definitions of FDA Section 1040.10 of CFR Chapter I, Subchapter J, Concerning Radiological Health and Published by the U.S. Department of Health and Human Services Center for Devices and Radiological Health 1988.



HOLOGRAPHIC MATERIALS

From 1998 Geola supplies photomaterials for holography world-wide

PULSED LASERS

Geola manufactures a large range of state-of-the-art pulsed lasers.

OPTICAL COMPONENTS

Geola supplies a large range of extremely high-quality custom laser optics for Holography and non-Holography applications.

CONSULTANCY

Geola undertakes consultancy projects in various fields of Holography, Laser Physics and Engineering.

VIRTUAL PROTOTYPING AND CUSTOM HOLOGRAPHY SERVICES

Geola is able to offer various services to clients that require custom holograms – both digital and analogue.

CUSTOMER TRAINING

A 1-day training programme is provided on-site to all laser and holography mini-studio customers at the time of installation. Further training programmes are available on request.

WARRANTIES AND AFTER-SALES SERVICE

Every Geola product is manufactured with quality and reliability foremost in mind. We will do everything we can to make sure you will have a lifetime's use out of your Geola purchase.

Each product comes with a 12-month standard warranty. All parts are carried ex-stock. Warranty extensions are available on request.

DISCLAIMER

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