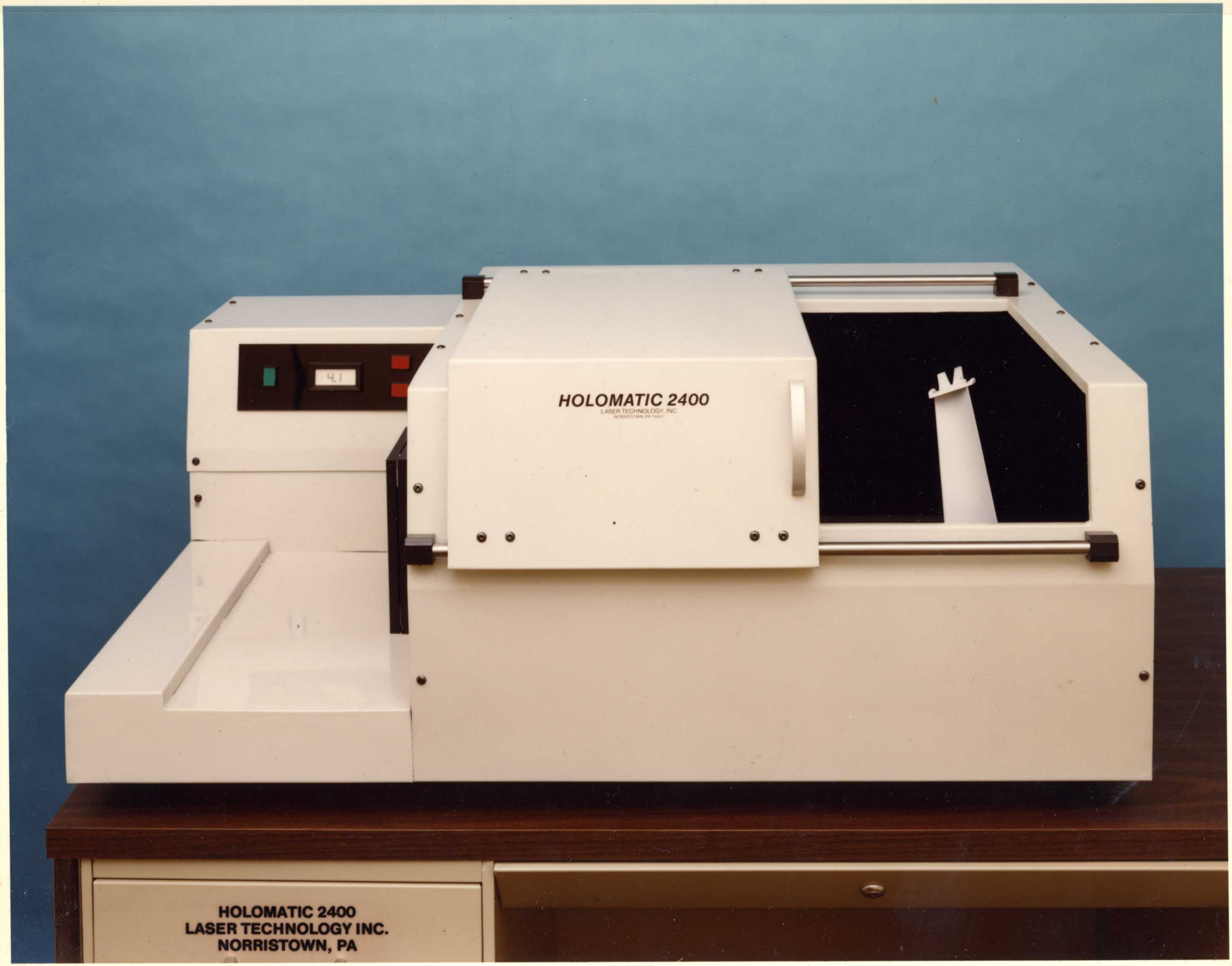
PRODUCT INFORMATION

LTI™ LASER TECHNOLOGY, INC.
1055 WEST GERMANTOWN PIKE • NORRISTOWN, PA 19401
TELEPHONE (215) 631-5043 • TELEX 846134

PRODUCT INFORMATION


HOLOMATIC 2400
LASER TECHNOLOGY, INC.
PS-4 EXCITER


HOLOMATIC 2400
LASER TECHNOLOGY, INC.
NORRISTOWN, PA 19401
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HOLOMATIC 2400
LASER TECHNOLOGY INC.
NORRISTOWN, PA

HOLOMATIC 1800
LASER TECHNOLOGY INC.
NORRISTOWN, PA

HOLOMATIC 6100
HOLOGRAPHIC INSPECTION SYSTEM
LASER TECHNOLOGY, INC.
NORRISTOWN, PA

HOLOMATIC 6000

INSTANT HOLOGRAM RECORDING SYSTEM

- Produce holograms in 10 seconds, up to 6 per minute.
- *Permanent* Holograms made with standard Holographic Film over a magnitude more sensitive than thermoplastic recording equipment.
- View each hologram seconds after the exposure, using the video monitor provided.
- Microprocessor control HOLOMATIC 6000 makes REAL TIME, TIME AVERAGE or DOUBLE EXPOSURE holograms.
- Eliminate all dark room processing of holograms.

LTI™ LASER TECHNOLOGY, INC.

HOLOMATIC 6000 INSTANT HOLOGRAM RECORDING SYSTEM

Description

Combining the latest microprocessor technology and a revolutionary monobath processing fluid, the HOLOMATIC 6000 is the fastest and most sensitive holographic recording and production control instrument available. Programmed to produce REAL TIME, DOUBLE EXPOSURE or TIME AVERAGE holograms at the touch of a button, the HOLOMATIC 6000 opens new dimensions in holography. For modal analysis, scan the test part through a range of vibrational frequencies with any shaker and oscillator. The REAL TIME hologram will show the modal patterns moving and changing as the frequency changes. A 10 second hologram will then make a permanent record of the modal response of the test part for detailed analysis with our MODEL HV-160 Hologram Viewer.

Applications

Modal Analysis
Thermal Deformation Studies
Stress-Strain Relationships
Creep Studies
Strain Analysis of Mechanical Components
Nondestructive Evaluation

Other Required Equipment

LS-2400 Laser System or use your laser, optical components and vibration isolation table.

For more information, contact your nearest LTI representative or our factory directly.

Specifications

Control Console

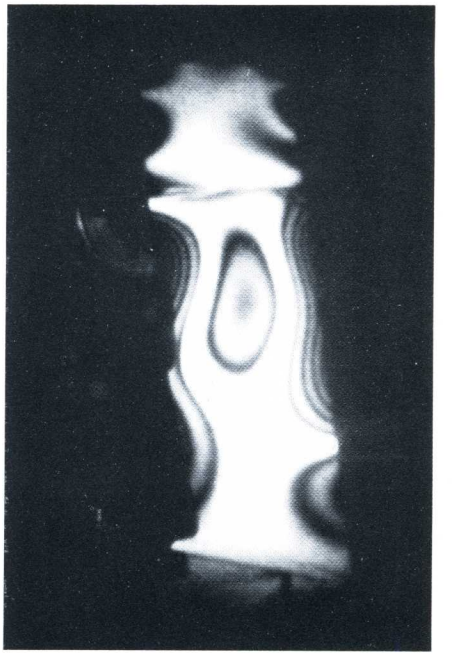
Height	16 inches
Width	19 inches
Depth	21¼ inches
Weight	22 pounds
Electrical Requirements	110 VAC, 2A

Camera Unit

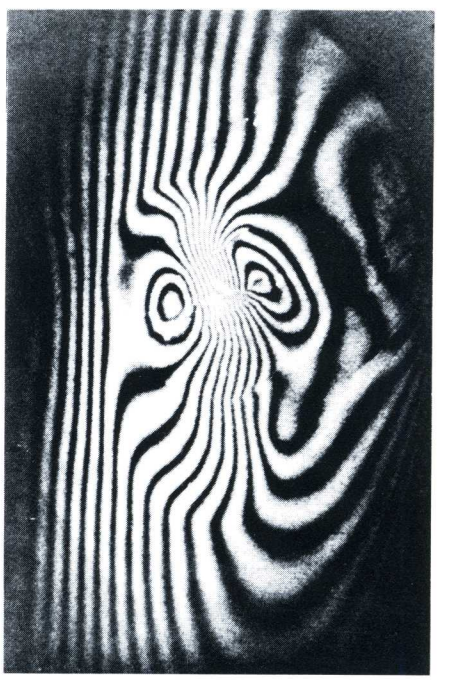
Height	9¾ inches
Width	12 inches
Depth	15¼ inches
Weight	18 pounds
Film	35 mm, unsprocketed LASER-TEST
Spacial Resolution	1200 Lines/mm
Exposure Sensitivity at 633nm.	8 ergs/cm^2
Processing Fluid	HOLOBATH
Hologram Process Time	2 to 8 seconds

The HOLOMATIC 6000 Holographic camera is patented in the United States and abroad with additional patents pending.

Specifications subject to change without notice.



Time-average hologram showing modal patterns on a turbine blade vibrating at 10,575 hz



Holographic determination of impact damage in a composite structure

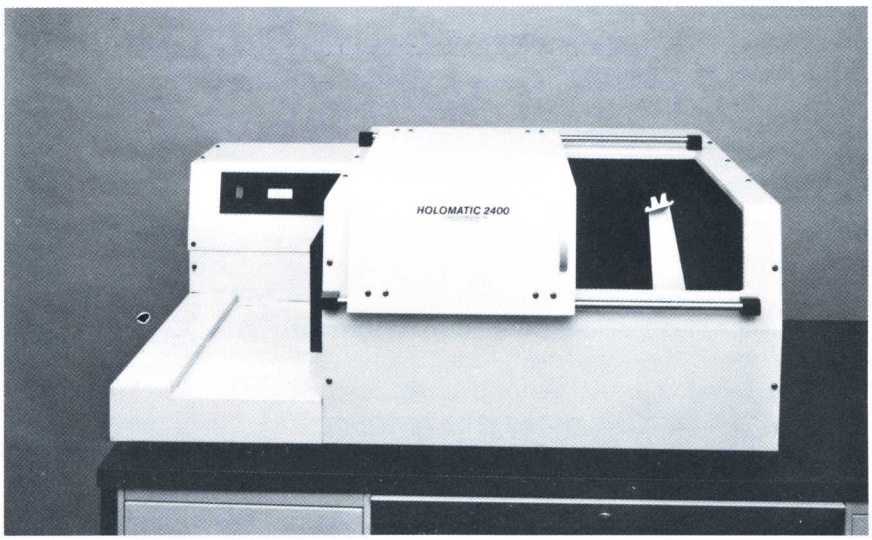
For full information, write or phone:

LASER TECHNOLOGY, INC.
1055 W. Germantown Pike, Norristown, PA 19404 • Phone 215/631-5043 • Telex 846134

HOLOMATIC 2400

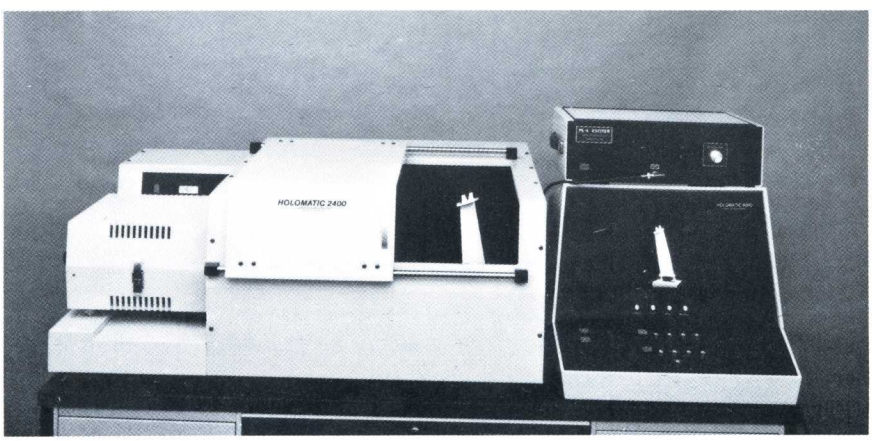
MODULAR TABLE TOP HOLOGRAPHIC CAMERA SYSTEM

TECHNICAL BULLETIN 241



The HOLOMATIC 2400 Modular Table Top Holographic Camera

Operates in your office, laboratory or shop floor. Holograms are made on 70 mm holographic film.



The Holomatic 2400 with the Holomatic 6000 Instant Hologram Recorder and PS-4 Exciter

With a HOLOMATIC 6000, PERMANENT Holograms are made in 10-15 seconds at the press of a button and then displayed on a high resolution Video Monitor for immediate examination.

LTI T.M.

LASER TECHNOLOGY, INC.

1055 WEST GERMANTOWN PIKE • NORRISTOWN, PENNSYLVANIA 19403
TELEPHONE (215) 631-5043 • TELEX 846134

HOLOMATIC 2400 MODULAR TABLE TOP HOLOGRAPHIC CAMERA SYSTEM

Holography Has Never Been Easier Than With The Holomatic 2400 Modular Holographic Camera System

- **Complete Holography Camera in one package with many accessories available.**
- **Built-in Vibration Isolation System for Table Top Operation**
- **Digital Beam Ratio Meter and Push-Button Beam Ratio Control**
- **Digital Exposure Meter**
- **Will Accommodate the Holomatic 6000 Instant Holograms in REAL TIME, TIME AVERAGE or DOUBLE EXPOSURE, at the press of a button.**

Technical Description

The HOLOMATIC 2400 is a complete laser-holography camera for making transmission holograms of engineered mechanical components. The camera contains a 5 mw HeNe polarized laser, electronic laser beam shutter, spatial filter and test part mounting stage. A vibration isolation system is built into the base of the HOLOMATIC 2400, allowing the camera to be placed on a table top in an office or laboratory or in a factory shop. The large access door mounted on linear roller bearings provides easy access to the test stage. Objects as large as 12 X 12 inches (305 X 305mm) may be easily placed on the stage for holographic analysis.

Manually Processed Holographs

The HOLOMATIC 2400 makes holograms on 70 mm acetate film, loaded into the camera in film carriers. This film is then processed in a single processing fluid by placing the film carrier into the processing tank. The entire hologram processing time is less than one minute.

Instant Holograms

The HOLOMATIC 2400 is a modular system accepting a wide variety of accessory equipment, including the HOLOMATIC 6000 Instant Hologram Recording System for making REAL TIME, TIME AVERAGE and DOUBLE EXPOSURE holograms at the touch of a button. These PERMANENT holograms are exposed and processed completely automatically in 10-15 seconds. The hologram is then reconstructed and viewed on the Video Monitor of the H6000.

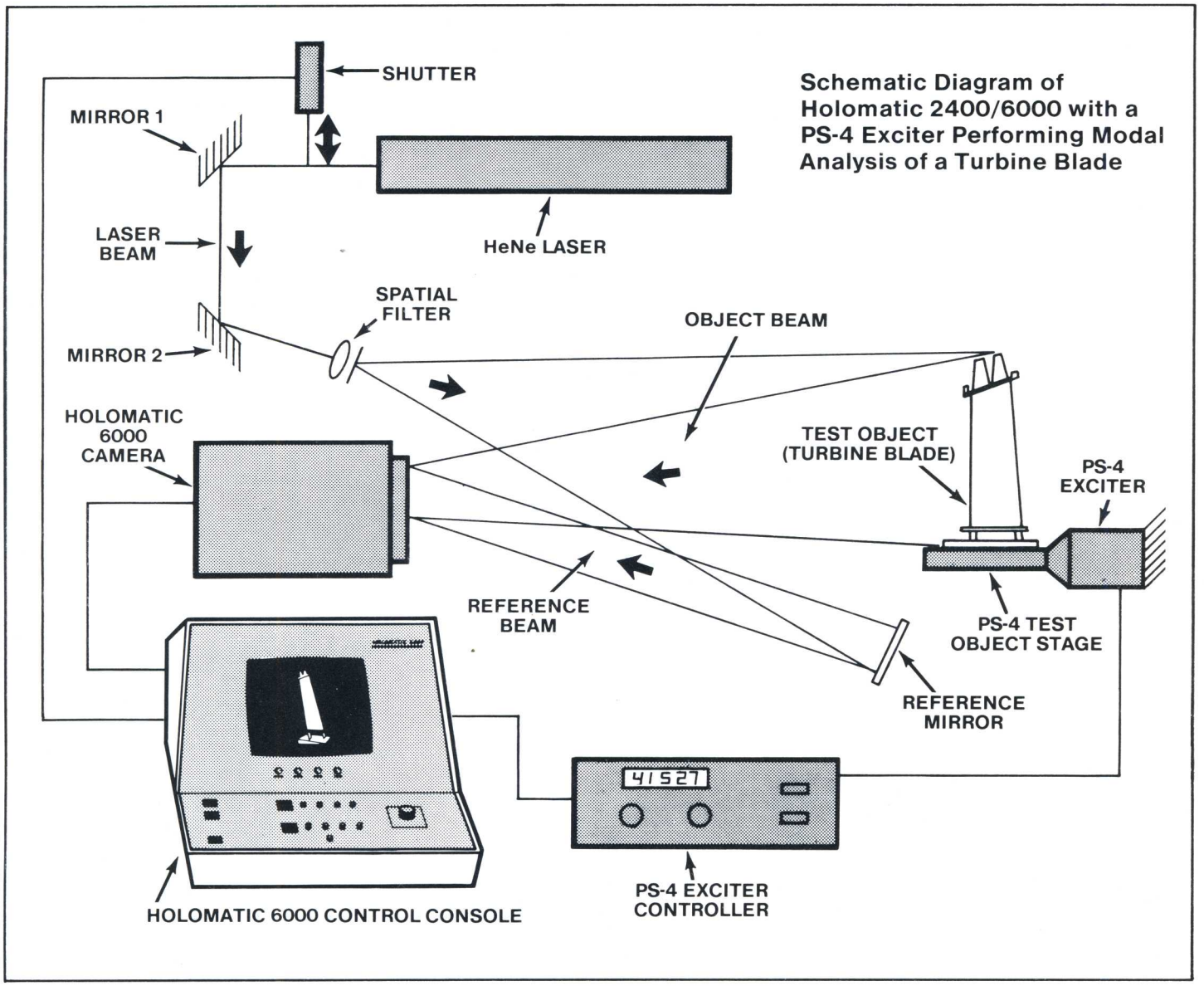
Other Accessory Equipment

MICROSCAN™ Holographic Microscope

The MICROSCAN Holographic Microscope may be used to resolve small objects such as microcircuits, silicon chips, laminates, or other objects as small as .025 inches (.635 mm).

PS-4 Vibration Excitation Stage

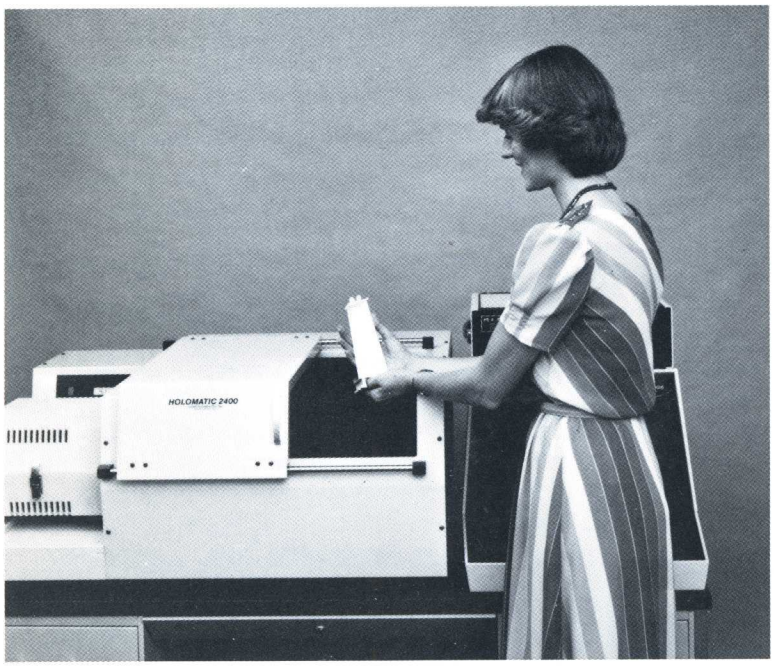
For modal analysis and nondestructive evaluation, the PS-4 Vibration Excitation Stage provides a variable high-frequency generator, 2500 watt amplifier, matching network and a high frequency piezo-electric exciter built into a test sample mounting stage. Composites, bonded or brazed structures, castings and forgings are only some of the components that may be examined using the PS-4 Vibration Excitation Stage.



Theory of Operation

The HOLOMATIC 2400 contains a 5 mw polarized HeNe laser. An electromagnetic shutter passes the beam during the exposure to a series of mirrors and through the spatial filter. Here, the laser beam is expanded and optically filtered to remove any "noise" caused by dust on the lens and mirrors. The expanded beam is directed to illuminate the object placed on the TEST OBJECT STAGE. A portion of the illumination beam strikes a mirror/polarizer assembly to generate a clean reference beam which is directed toward the film. The rotation of the polarizer, controlled by the operator, is used to adjust the beam ratio to the ideal 4:1 aspect. A microprocessor-based photo-detector determines and displays the set beam ratio. With a HOLOMATIC 6000 Instant Hologram Recorder, the exposure and processing of the hologram is completely automatic, with the hologram displayed on the video monitor within 10-15 seconds of the exposure.

Operation With the HOLOMATIC 6000 Instant Hologram Recorder

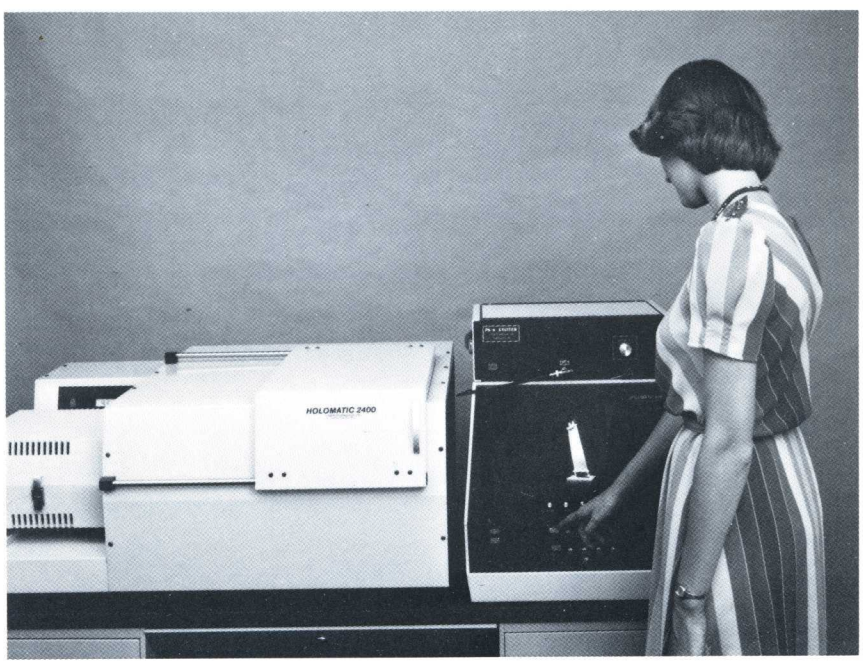


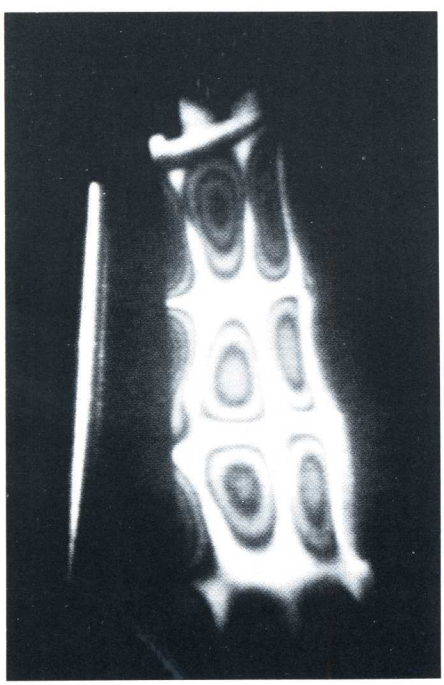
The HOLOMATIC 2400/6000 is a powerful combination providing engineering data quickly at the push of a button. Here, a single exposure hologram is made with the object vibrating at the desired frequency, using the PS-4 Vibration Exciter.

The turbine engine stator is mounted on the PS-4 Test Object Stage.The large access door permits objects up to 12 × 12 inches to to be examined.

The access door is closed, the excitation frequency selected, and the exposure is made by pressing a button.

After the exposure, the hologram is processed in 10-15 seconds. The image on the hologram is displayed.





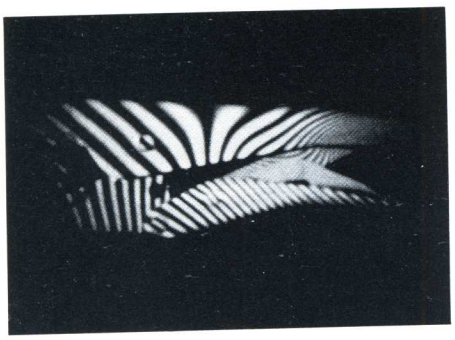
The modal pattern and vibration amplitude are clearly seen in this video image of the stator vibrating at a frequency of 10,047 hz. The hologram is a permanent record of the test. The image may be photographed, video taped or stored, as is, for future reference. A connector on the video console is available as an output for digitizing the video signal. In addition, with the real time capability of the HOLOMATIC 6000, a hologram may be made with the part unexcited. When the hologram appears on the video monitor, the part may be excited and scanned through a range of frequencies. The modal patterns move in real time over the video image, providing a wealth of detailed information about the deformation and flutter of the test object as it responds to the input vibration.

HOLOMATIC 2400 Modular Holographic Camera System

Applications

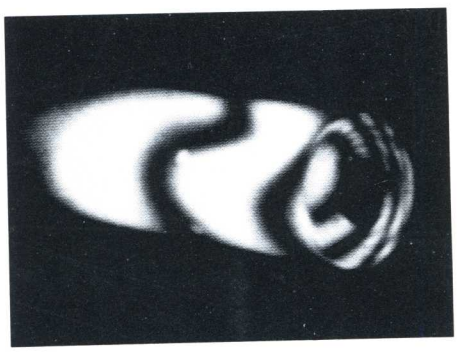
Equipment	Applications
HOLOMATIC 2400 + Model 10 Hologram Viewer • Single and Double Exposure Holograms • Manual Processing • Digital Beam Ratio Meter • Push-Button Control of Beam Ratio • Digital Exposure Meter	• Thermal Deformation Analysis • Mechanical Deformation Analysis • Fracture Mechanics Studies • Plastic/Composite Creep Analysis • Biological Growth Studies • Modal Analysis of Self-Excited Objects • Nondestructive Evaluation by Thermal, Pressure, or Mechanical Loading of pressure vessels, mechanical parts, rubber bonded and composite components
HOLOMATIC 2400 + H6000 • Instant REAL TIME, DOUBLE EXPOSURE and TIME AVERAGE Holograms • PERMANENT Holograms processed in 10-15 seconds. • Video Viewing of Holograms	All of the above, with Video Viewing of REAL TIME, DOUBLE EXPOSURE, and TIME AVERAGE HOLOGRAMS
HOLOMATIC 2400 + H6000 + PS-4 Exciter • Instant Holograms with Video Viewing • Vibration Excitation to 135 Khz • Digital Frequency Display	All of the above in addition to: • Modal Analysis • Nondestructive Evaluation by sweep frequency excitation of composite, diffusion bonded, honeycomb, filament wound, or ceramic components
HOLOMATIC 2400 + H6000 + PS-4 Exciter + MICROSCAN™ • Instant Holograms with Video Viewing • Vibration Excitation to 135 Khz • Full Video Screen Viewing of Target size .025 inch (.635mm) to 1.5 inches (38mm)	• Thermal, mechanical deformation of small components such as silicon chips, electronic components and leadless chip carriers. • Modal analysis of small components such as disk drive pick-ups, microcircuits and accelerometers • NDE of small bonded structures

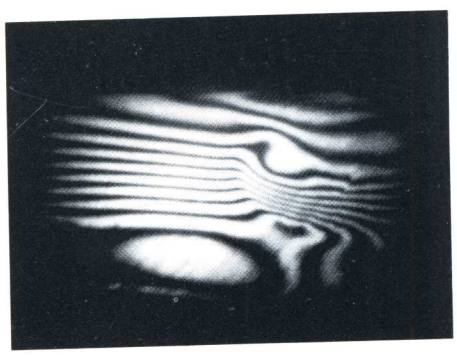
Examples of HOLOMATIC Nondestructive Holographic Testing



The mechanical deformation of many structures may easily be revealed by double exposure holography if a small load is applied to the object between two exposures. The handle on this wrench was tightened between the two holographic exposures, resulting in a clear indication of the deformation and location of strain concentrations.

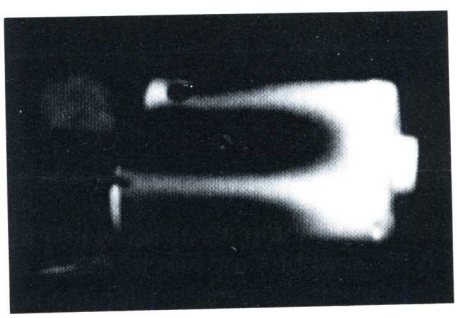
A double exposure hologram made with an object at two different temperatures will show a set of fringe lines indicating the thermal deformation. The first exposure of this aluminum-cased laser was made at room temperature. It was then turned on. The second exposure was made after a temperature rise of 2.5°C.

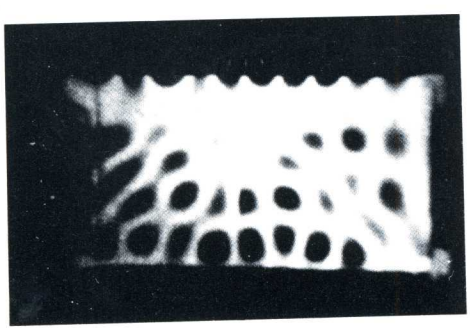




HNDT is a very useful tool for determining the area of damage in composite structures. Here a 6 inch diameter fiberglass tube is examined by thermal loading to reveal a larger area of damage, invisible both to the eye and to other inspection techniques.

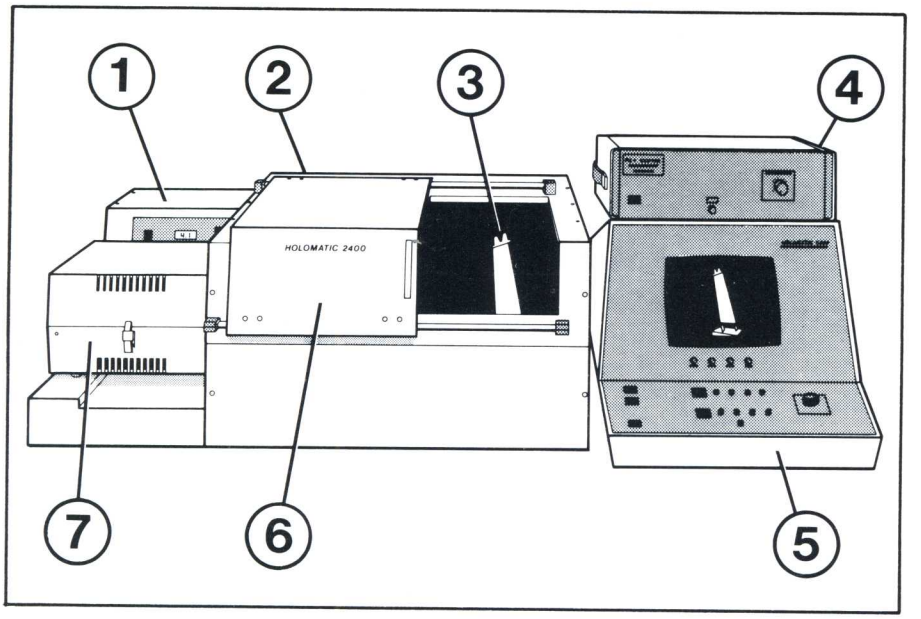
Mechanical objects deform under load in operation. This electric motor is running at 2200 rpm. The fringe lines show areas of deformation due to bearing eccentricity and an imbalance in the rotor.





Using the HOLOMATIC 2400 and H6000 in combination with the PS-4 Exciter, it is possible to study the frequency response of a wide variety of objects. This hollow stator blade from a JT8D aircraft engine is vibrating at 53,197 Hz. The black areas in the stator are those areas that are deforming.

General Features



1 Digital Beam Ratio Meter and control

2 HOLOMATIC 2400 Cabinet containing laser, optics and vibration isolation system.

3 Test Object

4 PS-4 Exciter Controller

5 HOLOMATIC 6000 Control Console

6 Access door

7 HOLOMATIC 6000 Camera

Additional Accessories

- Model 10 Hologram Viewer (70 mm only)
- Model 160 Hologram Viewer (35 mm only)
- Holographic NDT Demonstration Sample Kit

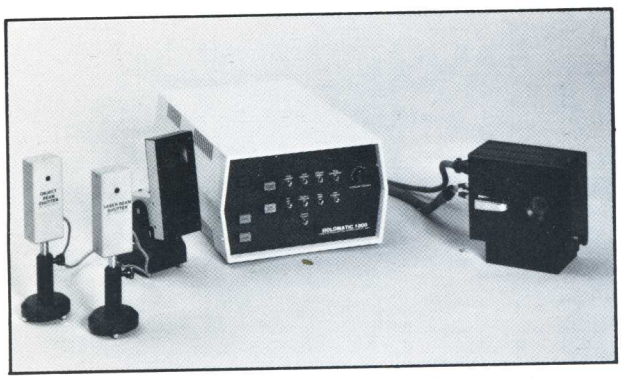
HOLOMATIC 2400 Specifications

Laser	Polarized, 5 mw HeNe
Shutter	Electromagnetic .08 sec. min. exposure time
Mirrors	First Surface, ¼ Wavelength
Vibration Isolation System	Pneumatic, 10psi operating pressure, 1 Hz min. damping
Maximum Test Object Size	12 X 12 X 6 inches (308 X 308 X 154mm)
Electrical Connectors into Test State Area	1 BNC, 10 watts max.; 1 coax, 1000 watts max.
Holograms Size	Manual Operation . . . 70 mm, visual reconstruction
	Automatic Operation with HOLOMATIC 6000 . . . 30 mm, video reconstruction
Power Requirements	HOLOMATIC 2400 only . . . 110 VAC, 60 cycle 2 amps (Other voltages and frequencies available upon request.)

Performance With HOLOMATIC 6000

Film Sensitivity	8 ergs/cm^2
Film Processing Time	10-15 seconds, temperature compensated
Total Cycle Time, exclusive of Exposure Time	12-17 seconds
Typical Cost per Hologram	25¢

Holographic Systems from Laser Technology, Inc.

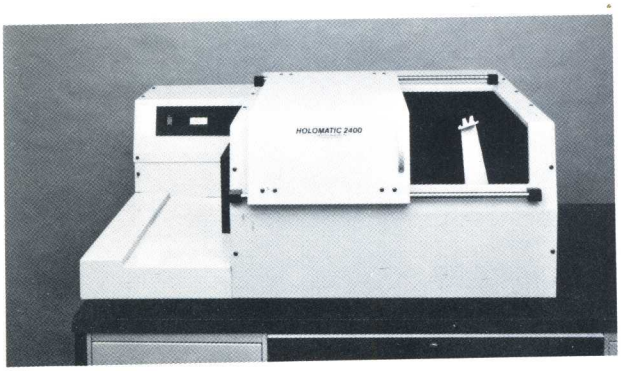


HOLOMATIC 1800 Instant Hologram Recorder

Compact and light weight, this high speed holographic film processor will process holograms in 10-15 seconds. Capable of operating in any orientation and in a vacuum, the HOLOMATIC 1800 can be used for holography, character recognition by fourier transform and speckle interferrometry.

HOLOMATIC 6000 Instant Hologram Recorder/ Controller

Using our same high speed film processor, the H6000 makes holograms in 10-15 seconds and reconstructs the hologram onto a high resolution Video Monitor for immediate evaluation. Microprocessor controls operate shutters on laser and object beam to automatically produce REAL TIME, TIME AVERAGE or DOUBLE EXPOSURE holograms for only 25¢ per hologram.



HOLOMATIC 2400 Modular Holographic Camera

Designed as a table-top holographic laboratory, the HOLOMATIC 2400 is expandable, with many optional accessories such as the H6000, MICROSCAN™ HOLOGRAPHIC MICROSCOPE and our PS-4 Vibration Exciter. Holograms can be made easily almost anywhere with very little preparation.

HOLOMATIC 6200 Inspection System

The HOLOMATIC 6200 is designed for heavy duty production inspection. With a bulk load of 100 ft. (30 meters) of film for 500 holograms, a built-in vibration isolation system and a computer control system, the HOLOMATIC 6200 may be used almost anywhere. Applications include aircraft turbojet engine parts, castings, forgings, composites and honeycomb parts.

Your Local Representative Is:

LTI T.M.

LASER TECHNOLOGY, INC.

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MODEL HV-160

HOLOGRAM VIEWER

FOR USE WITH HOLOGRAMS MADE WITH HOLOMATIC 2000, 6000, 6100 AND 6200 SYSTEMS

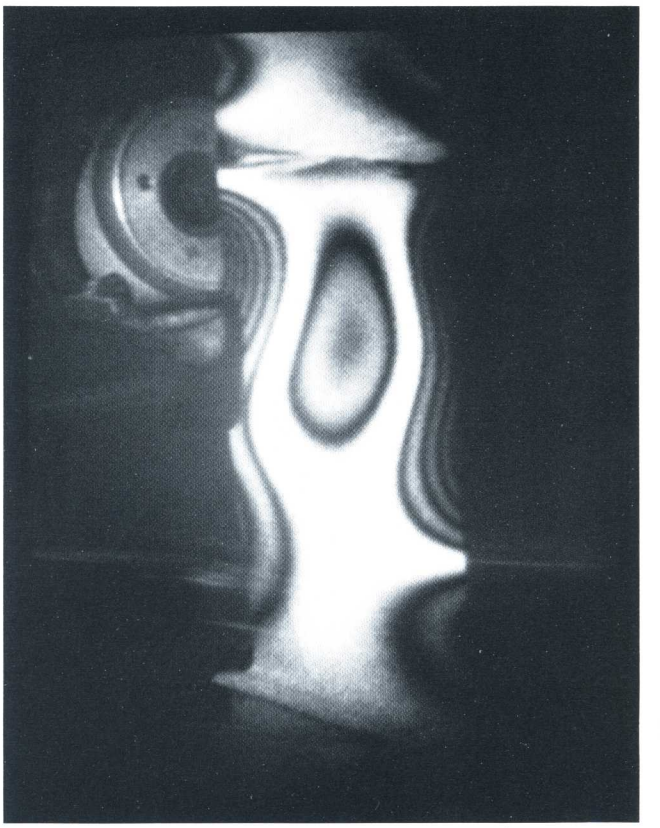
- **High resolution video reconstruction of holograms for easy viewing and photographic recording.**
- **Eliminates all possibility of laser injury to the eye while viewing holograms.**
- **View holograms from archival storage anywhere.**

LTI™ LASER TECHNOLOGY, INC.

MODEL HV-160

HOLOGRAM VIEWER

The Laser Technology HOLOGRAM VIEWER is the perfect companion to any of our HOLOMATIC Camera Systems. Using a ¾ mw. laser, the reconstructed image of the hologram is detected by a high resolution vidicon and displayed on a 9-inch TV monitor. In this format, the hologram may be video taped or photographed easily. It may also be viewed by a group of people simultaneously for easy discussion of interesting features in the hologram. The HOLOGRAM VIEWER has an adjustable reconstruction beam to allow the reconstruction of holograms made with different reference beam angles. Now holograms may be analyzed in the laboratory, shop, or in the office, with convenience and safety, even years after they were made.



Modal vibrations of an aircraft engine blade seen in a hologram, reconstructed with an HV-160 Hologram Viewer.

Additional Accessories

Polaroid Camera and Hood
Model PC-5

Video Tape Recorder with Connectors
Model VR-5

Specifications

Height	16 inches
Width	19 inches
Depth	21¼ inches
Weight	22 lbs.
Power Requirements	250 watts, 110 VAC/ 60 hz. 240 VAC/50 hz. is also available
Video	620 Lines, 9-inch diagonal screen

For full information, write or phone:

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Phone 215/631-5043 Telex: 846134