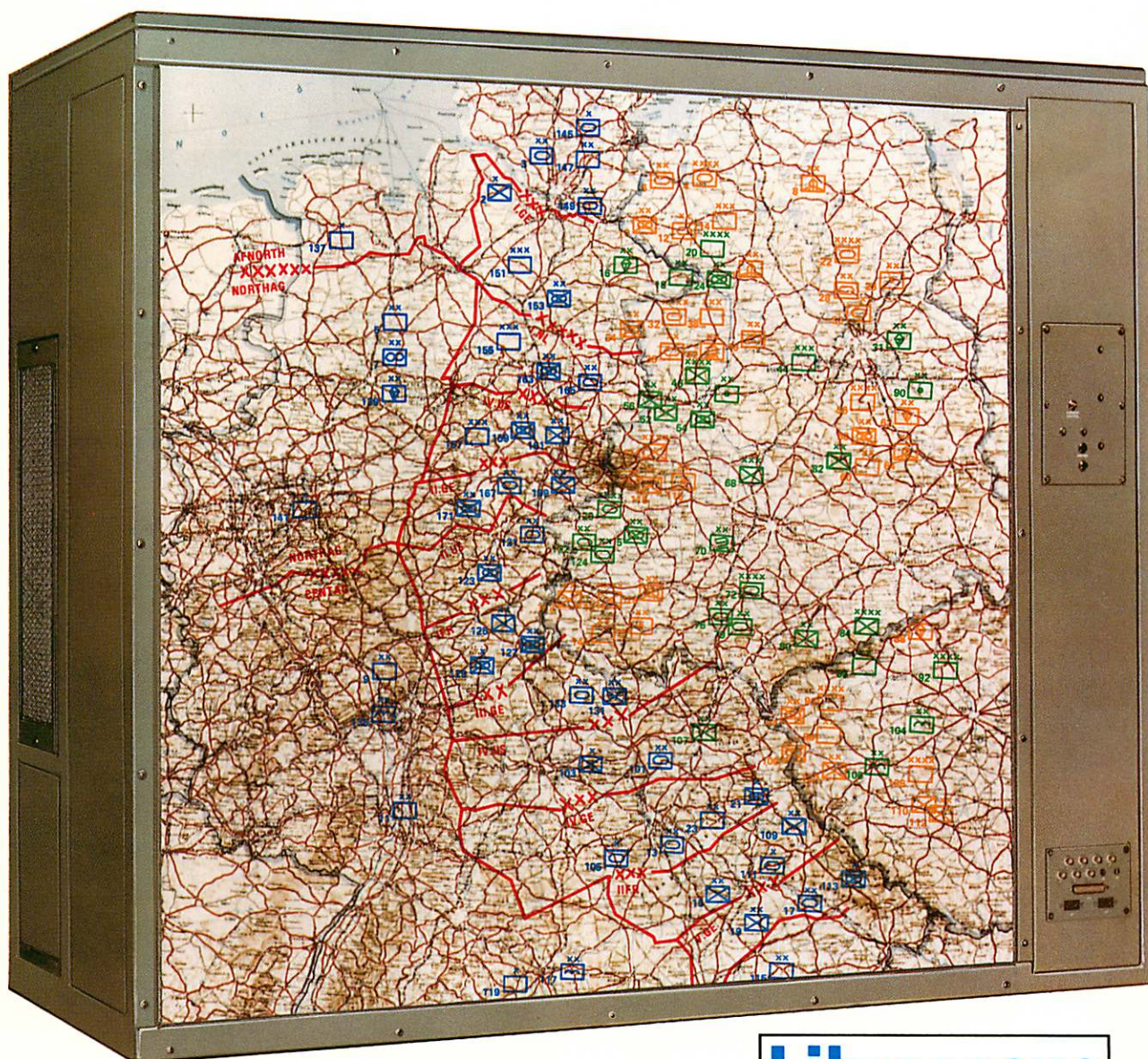


Laser Liquid Crystal Military Display Systems



Librascope

a division of The SINGER Company

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INTRODUCTION

As a result of Librascope's long-term research and development involvement in large screen display technology, a new type of Laser Liquid-Crystal Display Projector (LLCP) has been developed for military display systems. The LLCP has evolved out of our experience in producing laser-writing film projectors, coupled with recent advancements in the evolution of the smectic type liquid crystal light valve.

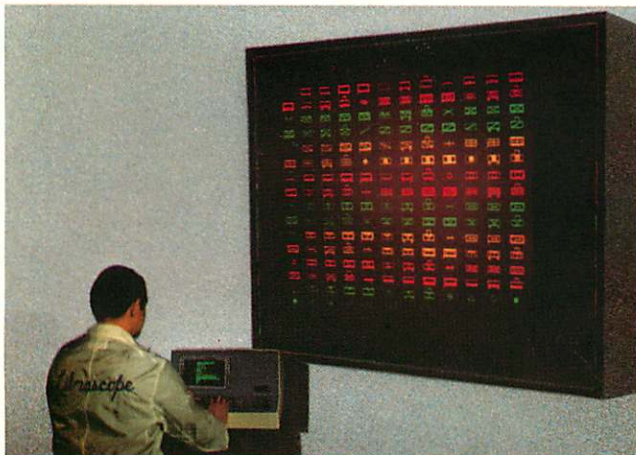
Displays generated by the LLCP represent: high data density, use of multiple colors, very high resolution of the image, real time generation of projected data, high illumination intensity, and a variable-size projection area of up to twenty five square meters.

Use of the liquid crystal light valve, which itself is produced by Librascope, permits a selective-erase feature not heretofore available with film systems. This new feature renders the already proven concept of laser-generated displays particularly suitable for tactical applications where operator interaction with the display is crucial. Use of the

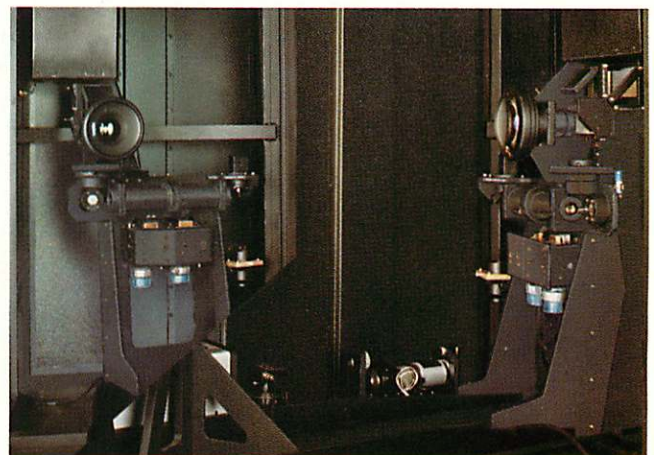
liquid crystal light valve reduces operating costs by eliminating film consumables, and by assuring a long, low-maintenance life cycle of the projector. The LLCP is thus a candidate for any large screen, high performance display application.

KEY FEATURES

- High Resolution: 2000 to 8000 lines
- Contrast Ratio of up to 60:1
- Three Colors Plus Black and White
- High Speed Selective Erase
- Display Size to 269 Ft² (25M²)
- Small, Easily Installed Low-Profile Packaging
- Rugged, Vibration Free Construction
- Vertical or Horizontal Mounting with Rear Projection



Display control and interactive interfacing can be accomplished by a keyboard or trackball device. The operator here is viewing a projected array of U.S. Army map symbols. Symbols can be rear-projected brightly enough to show through a military map or chart.



Packaging of the laser deflection system and wide angle optics is small enough to provide for a low profile flat panel with distortion of less than .1%. (The image at left is a reflection of the deflection system and optics in the projector mirror.)

OPERATION

The projector makes use of a pair of liquid crystal light valves, illuminated by a xenon lamp source through a set of color filters.

Images written onto the liquid crystal light valves by the laser writing system can be projected onto the rear of a transparent screen onto which a paper map or chart has been affixed—as shown in the cover illustration. Or the projector can be operated in a large-screen front projection mode, using a long throw projection lens.

The laser writing subsystem consists of the laser itself, a modulator which enables the formation of discrete dot elements on the surface of the liquid crystals, a two-axis deflection unit, and beam splitting optics to drive each liquid crystal light valve. Analog signals drive the deflection unit. These signals originate in a D/A converter in the projector interface with an external computer.

The display is readily interfaced to existing remote computers, to a dedicated minicomputer used for computation and local storage, and to devices for interaction with the operator. Operator input control and interaction can be accomplished by means of keyboard and track ball devices operating through the software of an associated optional minicomputer.

SYSTEM APPLICATIONS

Digital signals, input through a system interface, can be controlled by an operator or associated computer for applications such as these:

- Rapid updating of a battle situation display, underlaying a paper map of the region of interest.
- Navigational plotting when the display is used interactively with a computer.
- Display of combatant logistic and tactical data, alone or in conjunction with a regional map or chart.
- Display of a ship's heading along with a current display of sounding data.
- Interactive automatic location of features in map or chart coordinates, and creation and movement of individual symbols.
- Storage of complete arrays of map or chart data for recall.

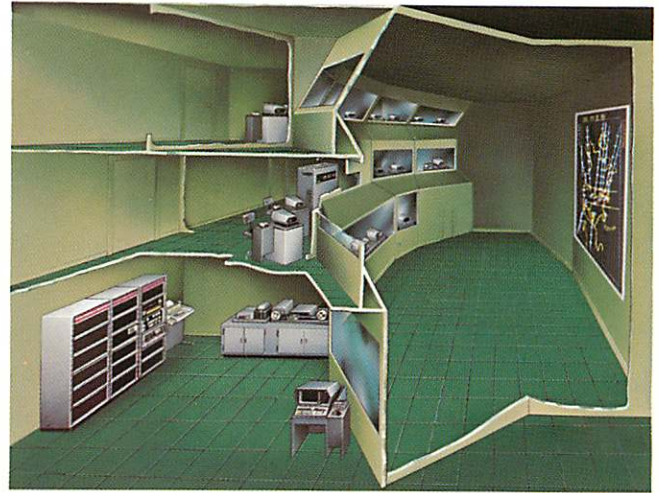
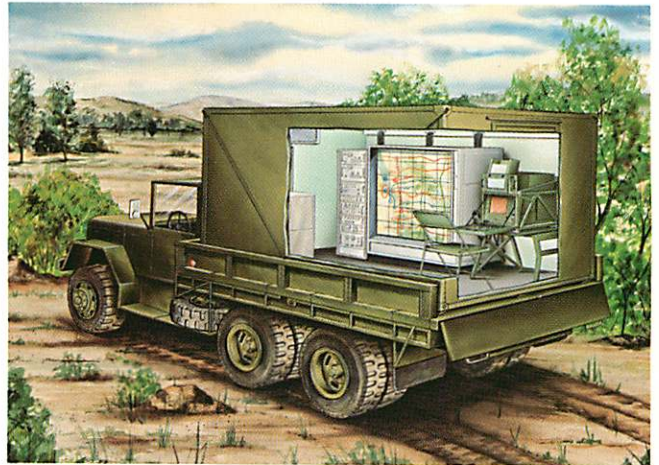


Image size can be 269 Ft² (25M²) when used in large real time command centers.



The display is ideal for use in mobile command centers, where space and reliability constraints are severe. Operation is vibration-free, making it suitable for general use in harsh military environments.



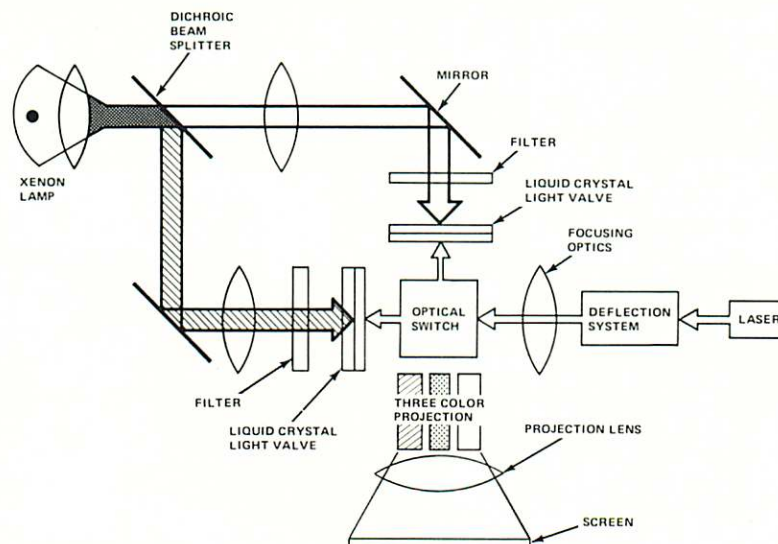
Displays can be vertical or horizontal, as shown in this depiction of a submarine combat systems center. Both graphic and alphanumeric data can be displayed simultaneously, in multiple colors.

SPECIFICATIONS

Packaging and Mounting:	Modular construction is used in front or rear projection and self-contained display configuration. The electronic support unit may be integral or located to suit space availability.
Screen Size:	All display aspect ratios up to 5M x 5M
Multi Color:	Colors by customer filter selection
Light Output:	Up to 2000 lumens per channel white light
Resolution:	2048 x 2048 addressable points
Contrast:	Up to 50:1 per channel
Data Capacity:	Random address - 2048 x 2048 pixels, Raster - 2048 lines
Data Rates:	Display Mode - Storage Writing Mode - Random address: write or erase, at the rate of 40 characters per second and 10 milliseconds per long vector. Raster: frame update in 10 seconds.
Electrical:	Power input voltage, frequency, and phase as selected from 2.5 kw depending on number of color channels, display screen size, and ambient background conditions.

These specifications are typical to this type of laser writing, liquid crystal light valve display. Specific display applications may be addressed, which would include military and special purpose requirements.

The Librascope display system is readily adapted to any viewing or facility requirement. In all configurations it is capable of presenting selectively erasable dynamic data correlated with superimposed static imagery and interactive cursor.



The functional diagram of a multicolor liquid crystal large screen projection system.

Light from the xenon arc lamp is split into two separate paths and transmitted through each liquid crystal light valve. The display data through which the projection light passes is generated by the deflected laser beam in conjunction with the light valve. The light transmitted through the light valves is imaged on the screen by the projection lens.

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