

CARL A. SORENSON
(EARLY '70's)

Script

SINGER
AEROSPACE & MARINE SYSTEMS



**ORIGINAL
LIBRASCOPE
TRADEMARK**

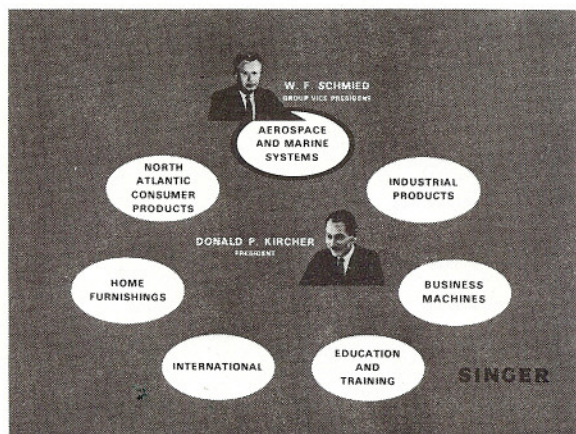
Librascope was founded in 1937. The first Company trademark was a variation of the constellation Libra. It and the name "Librascope" were inspired by the Company's first product. . .



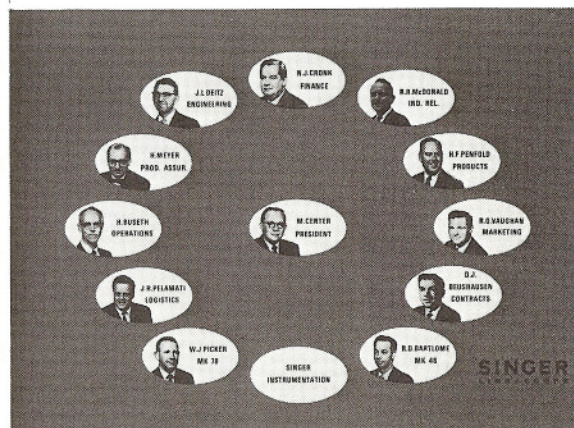
**ORIGINAL
LIBRASCOPE**

. . . . a weight-and-balance manual analog computer, used to determine proper loading distribution for aircraft. The device was called a "Librascope" - - a combination of the Greek work "Libra" for "balance" and "scope" for "indicator".

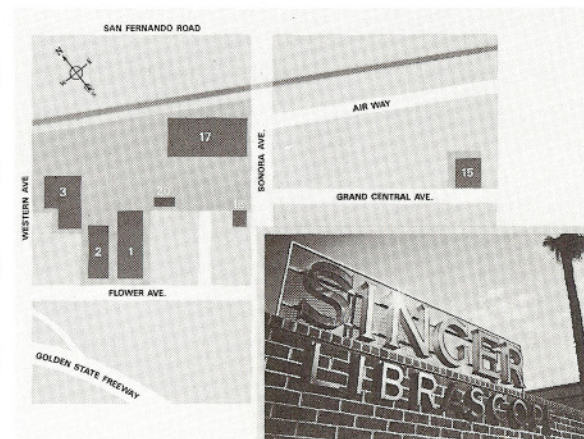
The capability developed in producing the balance computer enabled Librascope to bid on, and win, a Navy contract for a similar analog computer to determine the exact drop point for depth charges in defense against submarines. Since this first Navy contract, Librascope has concentrated in the field of antisubmarine warfare.



Librascope was acquired in 1941 by General Precision Equipment Corp. and GPE was acquired by The Singer Company in 1968. Singer, with sales exceeding \$2 billion per year, is organized into seven operating groups according to function. Only three of these groups are involved with sewing machines. Librascope belongs to the Aerospace and Marine Systems Group with Kearfott and HRB-Singer. Very horizontal structure (minimum of management levels) gives good visibility and fast response.



Librascope features conventional functional organization, with very horizontal structure to shorten communication lines. Large programs are headed up by Program Managers. Singer Instrumentation, recently added to Librascope, consists of two operations, Los Angeles and Palo Alto.



Present-day Librascope, with 400,000 square feet and approximately 1600 people, is located primarily in Glendale, California. The only facilities outside Glendale are Instrumentation plants -- in Los Angeles and Palo Alto.

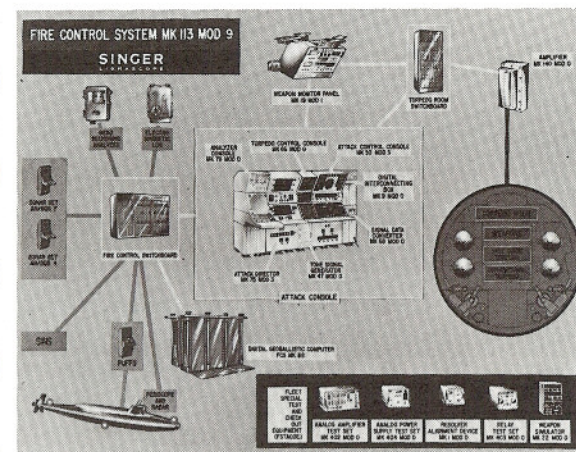
LIBRASCOPE AREAS OF BUSINESS

- NAVAL SYSTEMS
- OTHER MILITARY
- COMMERCIAL

Librascope's business volume consists of approximately 60% Military and 40% Commercial.

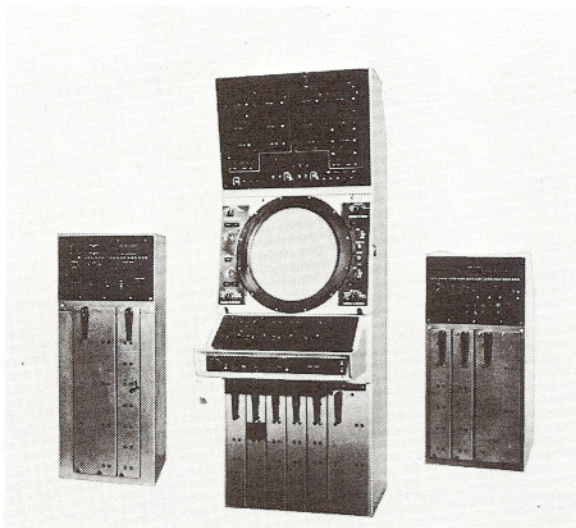


Here is a picture of a typical submarine weapon control system.



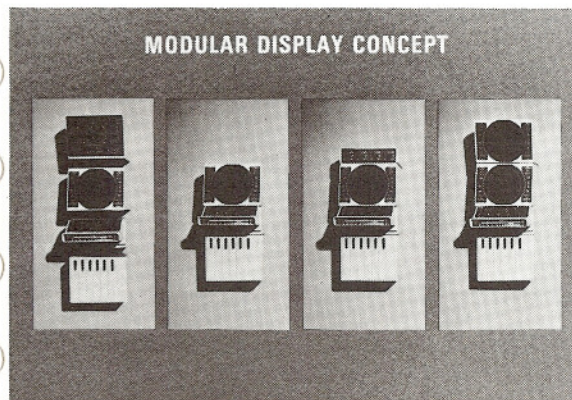
This system is presently deployed aboard most of the fleet ballistic missile submarines. We are now in production on a major modification which provides a computer-driven cathode ray tube display to the front end of the system.

The original system provided weapon control for Polaris submarines. The display modification is part of the Poseidon retrofit.

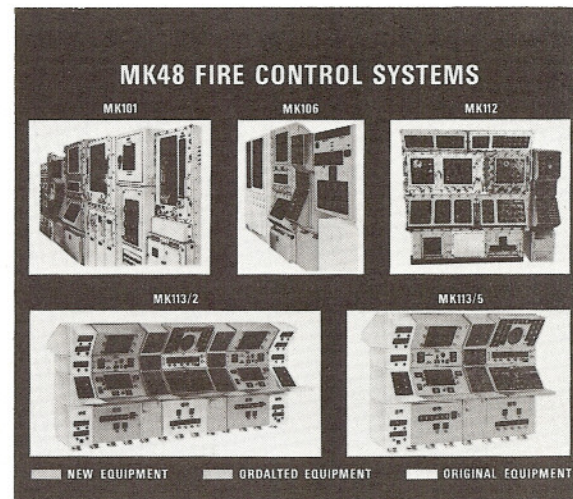


These new equipments are now being added to the fleet ballistic missile submarine fire control systems. They represent the latest state-of-the-art in computer driven CRT displays and digital circuit design.

The Mk 78 program has been most successful. It is currently in full production and deployment of production equipment is expected as part of the Poseidon retrofit. Features include high reliability (2700 hours calculated MTBF) and self diagnosis (8 minutes MTTR).



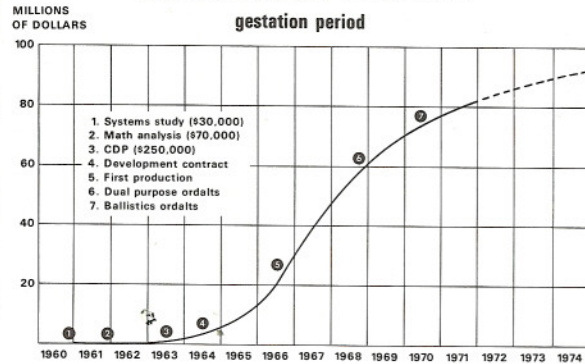
The modular design of the Mk 78, to meet a requirement that the equipment pass through a submarine hatch, permits it to be assembled in different configurations to satisfy many different display requirements without loss of standardization and at reasonable cost.



In 1964 Librascope received a prime contract from the Navy to modify the entire submarine fleet to incorporate the new Mk 48 torpedo. This required the design of new equipments and heavy modification to five different systems. We have deployed these modifications throughout more than half the submarine fleet. Items in yellow represent the new equipment that had to be added, and parts in blue are those portions of existing equipment that had to be modified.

Teething troubles of the Mk 48 torpedo were in no way associated with Librascope's contract. Librascope was direct prime to the Navy for interface equipment and this portion has been most successful, not only from Librascope's point of view but from that of the Navy. The program is on schedule, one half of this massive OrdAlt program being complete.

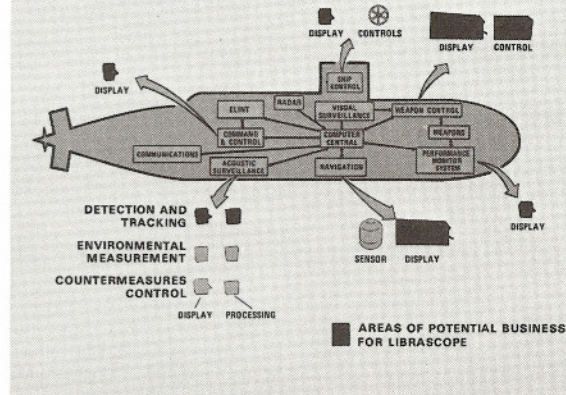
TORPEDO MK48 FIRE CONTROL AND ASSOCIATED PROGRAMS



This chart shows the long gestation period typical of our Naval Systems programs. The Mk 48 program started in 1961 when we received a small systems study contract, went on through the year with more analytical studies, and in 1963 we, along with Sperry, were awarded CDP contracts to develop the concept. In 1964 we won the development contract over Sperry and the program has grown to \$80 million worth of business for Librascope.

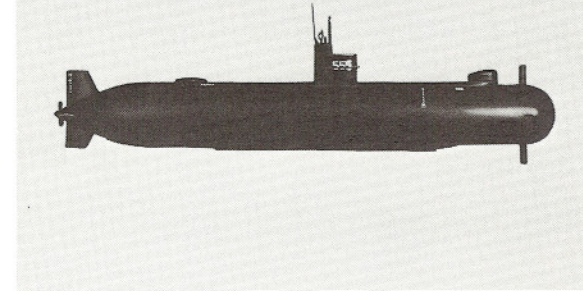
The projected curves which go on through the next several years are probably conservative. The Navy seems to be seriously interested in deploying the Mk 48 aboard surface ships. If this program is funded we can expect the projected curve to rise substantially.

ATTACK SUBMARINE, 1975 ERA

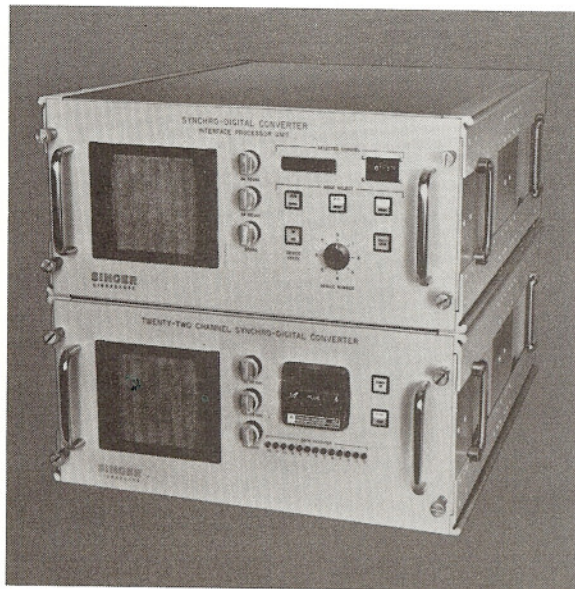


Our present strategy for enhancing our position aboard submarines of the future includes an expansion into the sensor area of the Weapon Control System. Several years of study have been spent in the generic area of acoustic signal processing. Results are encouraging and we intend to grow within the signal processing area.

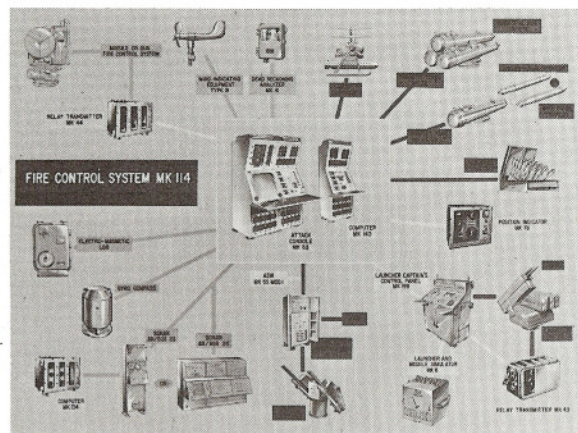
DOLPHIN PROGRAM



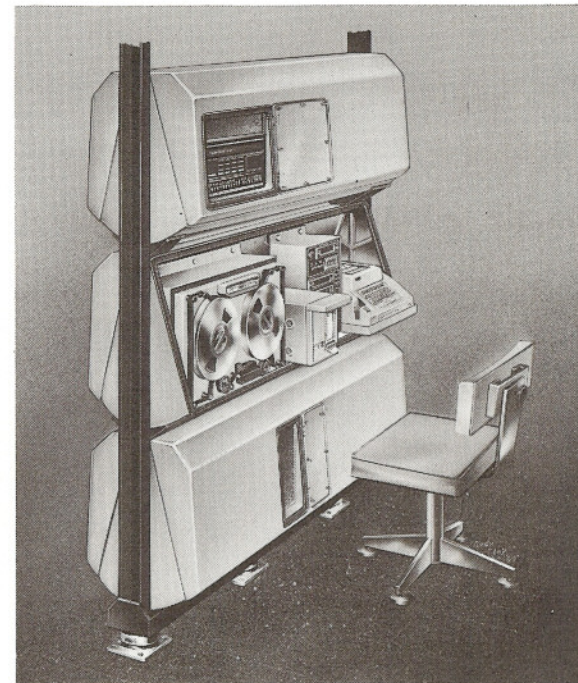
Librascope has supplied equipment for "Dolphin", an experimental submarine used as a test bed for systems of the future. Participation will enhance Librascope's competitive position in future submarine programs.



Among the equipments provided to the Dolphin program on a fast-reaction basis is this converter. It was conceived, developed, produced, and delivered within 60 days.

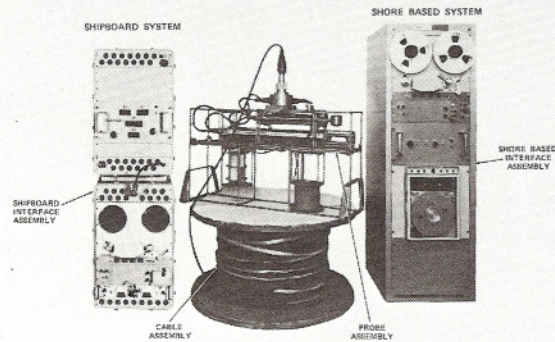


Librascope designed and manufactured this ASW Weapon Control System for surface ships. One of the Company's primary new business goals is to re-establish our position in surface ships through the new, smaller destroyer program presently being considered by the Navy.

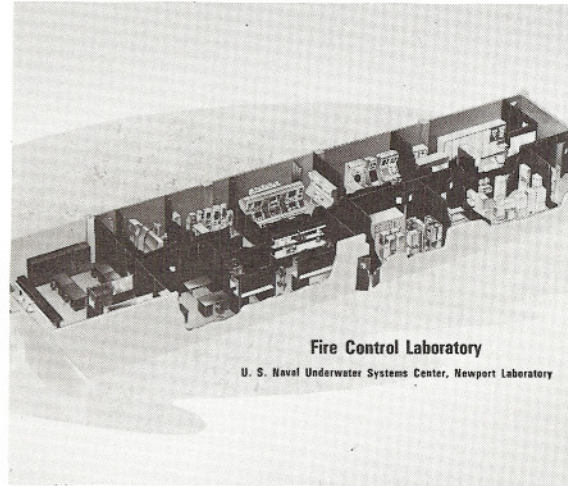


Librascope provides various types of support equipment in addition to prime systems. This data collection system provides a means of rapidly collecting data from multiple sources during weapon systems acceptance trials - - WSAT. The system was designed for use on both surface ships and submarines.

DIGITAL OCEANOGRAPHIC DATA ACQUISITION SYSTEM

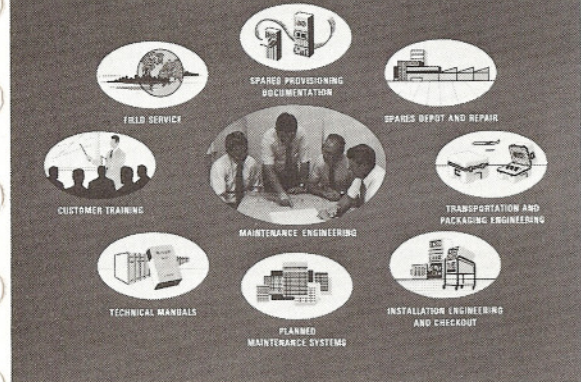


This is typical of our Oceanographic Instrumentation work. This system measures and records characteristics of the water: salinity, temperature, and other parameters. The information is continuously transmitted by wire to a shipboard data collection system, then by radio to a shore based facility for processing.



An example of our expertise in designing land-based installations for the Navy, this lab in Newport, RI, was developed and put in operation by Librascope under a contract to the Naval Underwater Systems Center. Total shipboard environment on board a submarine can be simulated. It is the first facility of its type within the Navy.

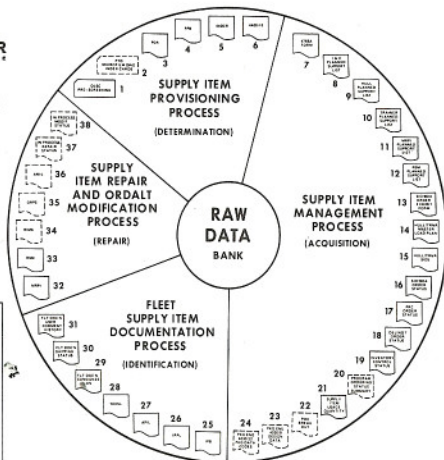
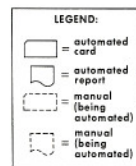
INTEGRATED LOGISTICS SUPPORT



The Librascope Logistics Department employs more than 200 people. The efficient manner in which we support our equipment in the field is one of the Company's main strengths in the Naval Systems business.

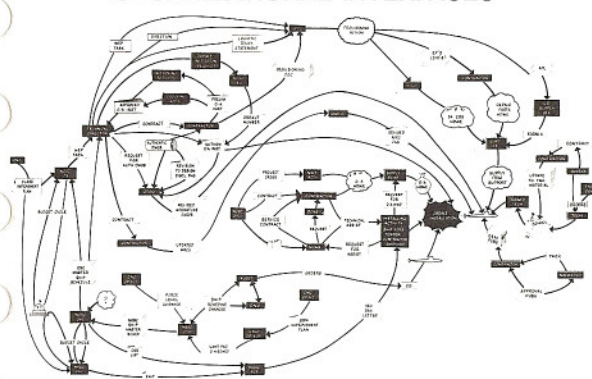
SPCC/SINGER
LIBRASCOPE

AUTOMATED FLEET SUPPORT SYSTEM (AFSS)



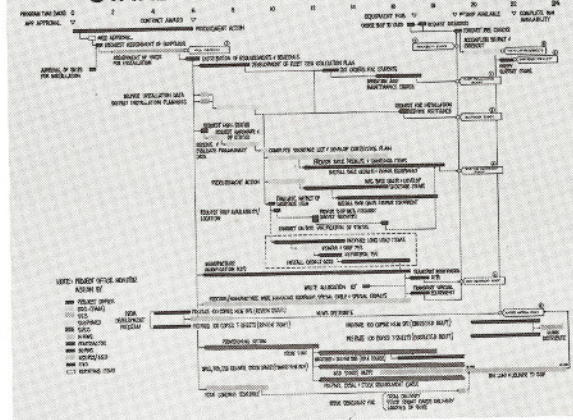
Automated Fleet Support Systems (AFSS) is a unique technique developed for the Navy by Librascope. It is a computerized system for the management of spares. The heart of the system is a large data bank that is maintained in our Computer Center at Glendale. Good progress has been made toward total computerization and AFSS is expected to serve as a pilot model for other computerized inventory control systems throughout the Navy.

ORDAIT IMPLEMENTATION ORGANIZATIONAL INTERFACES



An example of management services supplied to the Navy by Librascope, the chart shown here is a road map of work flow in a major OrdAlt program from original funding through spares and provisioning, documentation, and training of technicians. It is not related to time as is a PERT chart, but shows the necessary interaction between various Government Agencies.

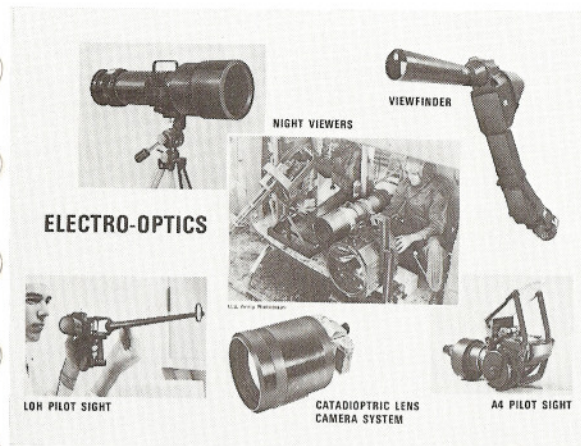
STANDARD INSTALLATION PLAN



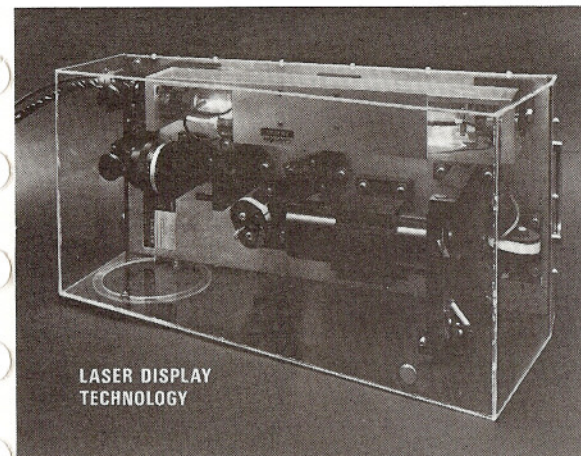
This Librascope-developed standard installation plan, depicting decision points within the Navy on a large-scale OrdAlt program such as the Mk 48, allows us to supply a most useful tool to Navy Program Managers.

OTHER MILITARY

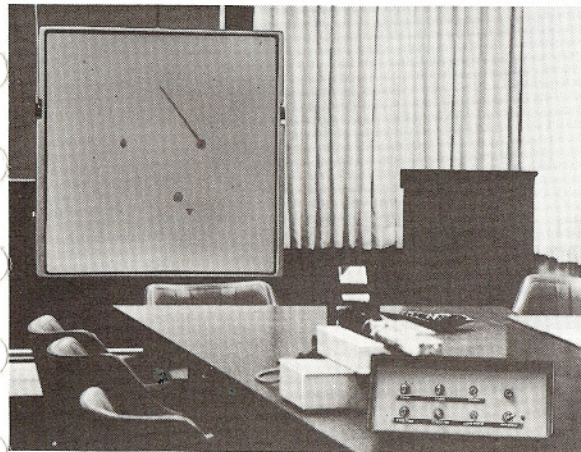
Even though the major portion of Librascope's business is with the Navy, we sell to other areas of the military where we have a strong technology base.



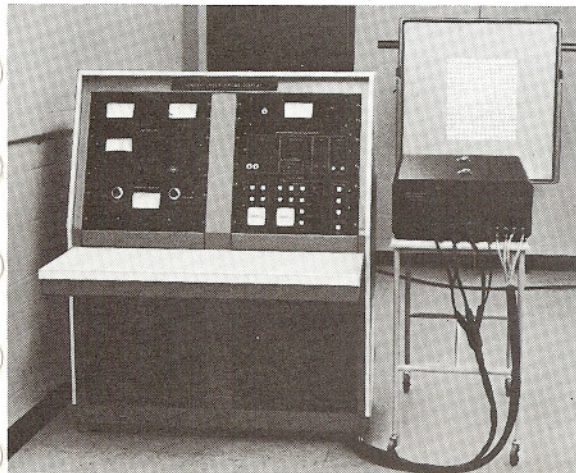
The Company designs and builds various types of optical systems for all three Services. We are capable of designing and building optical elements on a fast-reaction basis.



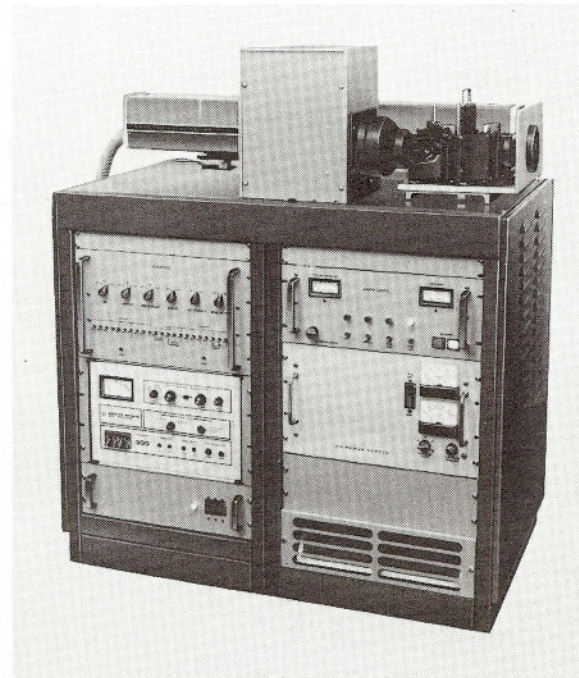
Librascope is one of the pioneers in the application of lasers for large-screen displays. We presently have development contracts with all three Services.



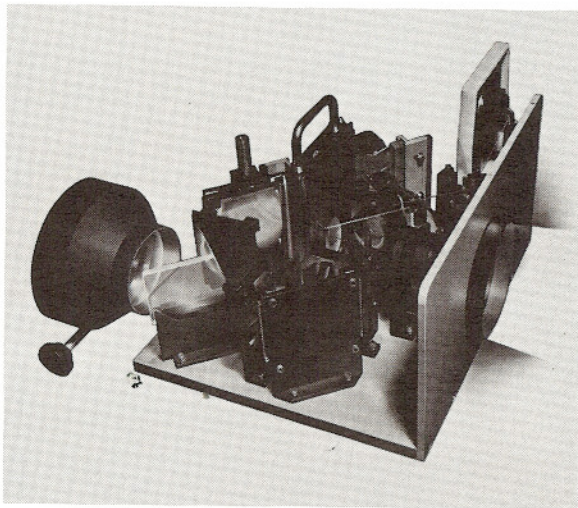
The laser can be used to write directly on a large screen or . . .



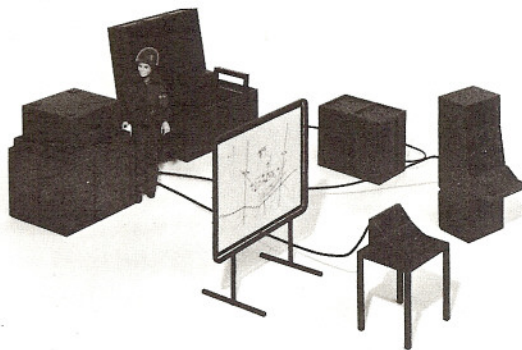
. . . write information on photochromic material.
The information is then projected on a large screen.
Advantages of both systems: high resolution and
brightness of image.



Here is the latest version of a laser photochromic display, just delivered to the military.

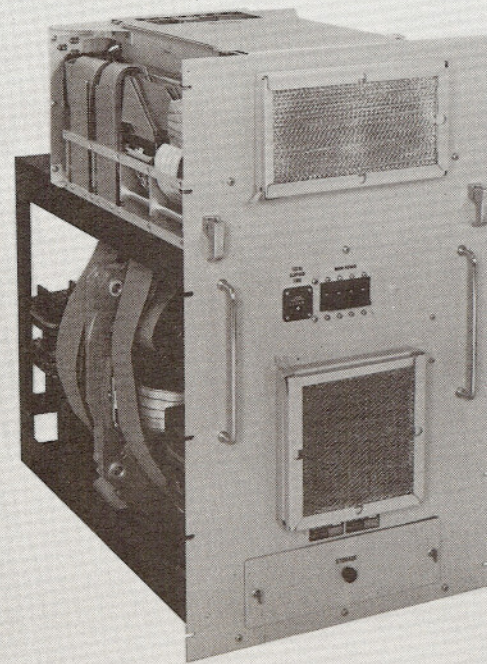


This picture shows the optical head for a laser photochromic display.



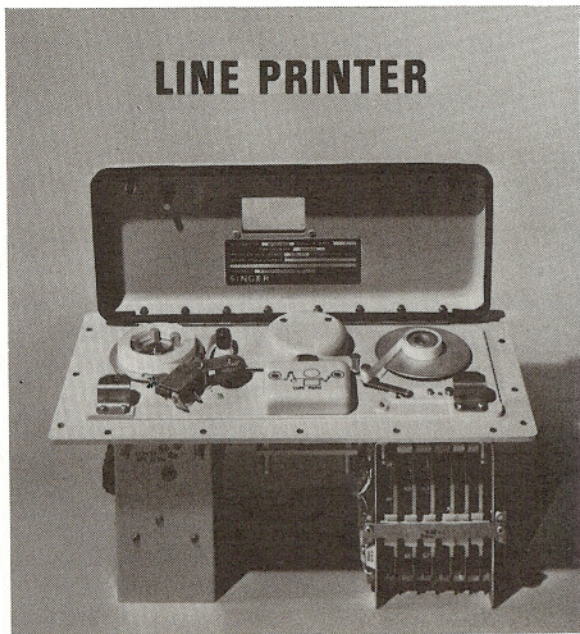
Two types of laser displays are currently being developed for the Army as part of a Battalion Display Center. One is a large screen photochromic display, and the other is a map overlay reproducer.

L-516 DISC FILE



One of Librascope's latest militarized disc memory systems is used in intelligence processing applications. The Company is a pioneer in the head-per-track disc memory field.

LINE PRINTER



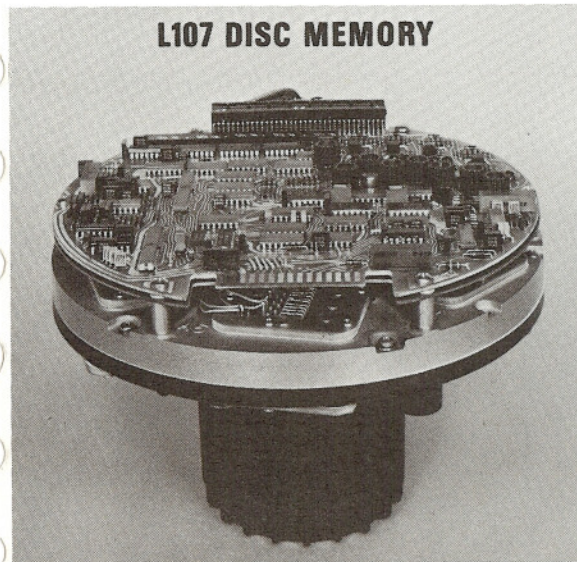
This is a line printer we have designed and manufactured for Boeing on the SRAM program. The line printer is deployed in a ground installation and provides profile printouts of weapon performance during tests.

COMMERCIAL



Many Librascope commercial products have been spinoffs of military technology. All military devices are carefully reviewed for commercial potential.

L107 DISC MEMORY



A small disc memory specifically designed for mini-computer applications, the L107 offers capacities from 1/2 Mbit to 7 Mbit in the same 9" diameter by 6" size. The 18 Mbit version, slightly larger, retains the identical electronics interface.

A large collection of vintage electronic equipment, including various radio receivers, amplifiers, and a large speaker, arranged in a dense, overlapping display. The equipment is primarily in shades of grey and black, with some lighter-colored components. The arrangement is dense and overlapping, showcasing a variety of models and sizes. A large, prominent speaker is visible on the left side, and a smaller, more complex unit is on the right. The background is plain white, highlighting the equipment.

Los Angeles produces radio frequency interference and communications test sets and AC instrumentation.

EQUIPMENT	FEATURES	MODEL	FREQUENCY
SWEEP OSCILLATORS COMPLETE AND FLEXIBLE SWEEP COVERAGE BETWEEN 10 MHz AND 6.5 GHz	SOLID STATE % CONTROL PULSE TUNING HIGH RESOLUTION COORDINATION MARKER INDEPENDENT SLOWS INTERCHANGEABLE	880-1 880-2 880-WRF 880-3 880-4	10 MHz-6.5 GHz 650 MHz-GHz 50 MHz-6 GHz 10 MHz-6.5 GHz
			Model 880-1
			Model 880-2
MICROWAVE AMPLIFIERS AMPLIFY SIGNAL OUTPUTS	HIGH GAIN FAST RESPONSE RUGGED RELIABLE TOTAL PROTECTION	160A TO 163A S10 TO S041 S110 TO S130	1 BATT 1 GHz-12 GHz 10 BATT 1 GHz-12 GHz 30 BATT 1 GHz-12 GHz
			Model 160A
			Model S10
SWEEP NETWORK ANALYZERS MEASURE INSERTION LOSS OR GAIN AND RETURN LOSS	160B DYNAMIC RANGE Sensitivity 1.5 dB 100 Hz SINGLE CHANNEL	8000T9730	100 kHz-40 GHz
			Model 8000T9730
SPECTRUM ANALYZERS DISPLAYS A SIGNAL DIVIDED INTO ITS COMPONENTS - FUNDAMENTAL, HARMONICS, AND RANDOM NOISE	SELF CHECKING TUNING DYNAMIC RANGE 100 Hz TO 100 MHz HIGHLY STABLE	S28-001 S28-00 2PA-300 2PA-300 2PA-300 2PA-300 2PA-100A	10 MHz-40 MHz 10 Hz-40 MHz 5 Hz-40 MHz 5 Hz-40 MHz 0.01 GHz-40 GHz 0.01 GHz-40 GHz 0.01 GHz-40 GHz
			Model S28-001
			Model 2PA-100A
SIGNAL GENERATORS USE TO CALIBRATE NATION BORN EQUIPMENTS	SENSITIVITY TO -120 dBm -3.5 GHz SSB TIMES SETTER RESOLUTION	SG-1000	61 KHz-100 MHz
			Model SG-1000
MARKER GENERATOR	SPEED ACCURACY REGULATION	7300	5 MHz-18 GHz
			Model 7300
			Model SG-1000

COMPONENTS		CRYSTAL DETECTORS				MODEL FREQUENCY		SAMPLER ATTENUATORS
	MODEL	FREQUENCY	TYPE	IMPED.	1151	1 GHz-2 GHz		
	1001	10 MHz-12.4 GHz	N		1151-1	3.4 GHz-6 GHz		
	1002	10 MHz-12.4 GHz	CDS	/	1151-2	3.4 GHz-6 GHz		
	1003	10 MHz-12.4 GHz	APG-I		1151-3	20 GHz-30 GHz		
Accuracy Devices	1400	350 kHz-1000 MHz	BVC	50 OHMS	FUNCTIONAL GROUP			
	1401	350 kHz-1000 MHz	BVC	75 OHMS	1170-10	10 MHz-1000 MHz		
	1402	350 kHz-1000 MHz	BVC	50 OHMS	1170-15	10 MHz-1000 MHz		
	1403	350 kHz-1000 MHz	BVC	75 OHMS	1170-20	10 MHz-1000 MHz		
	1407	350 kHz-1000 MHz	BVC	75 OHMS	1170-30	10 MHz-1000 MHz		
ATTENUATORS								
	E101	0 Hz-2 GHz						
	E102	2 GHz-2.5 GHz						
	E103	2 GHz-3 GHz						
	E104	3 GHz-4 GHz						
	E105	4 GHz-6 GHz						

EQUIPMENT	MODEL	FREQUENCY			
RFI INSTRUMENTATION					
RADIO INTERFERENCE AND FIELD INTENSITY ANALYZERS	NM-12AT	10 KHz-250 KHz			
	NM-23T	150 KHz-250 KHz			
	NM-65T	1 GHz-10GHz			
	RF-105A	15 KHz-1500 MHz			
	EMA-910	1500 KHz-26.5 GHz			
	3757	New Product!			
AC INSTRUMENTATION					
PHASE ANGLE VOLTMETERS	PAV-4A	30 Hz-300 KHz			
	PAV-4B	200 Hz-200 KHz			
	PAV-4C	57 Hz-20 KHz			
COMPLEX RATIO BRIDGES	CRB-8	250 Hz-5100 Hz			
	CRB-12M1	800 Hz $\pm$ 5%			
	CRB-4	380 Hz-620 Hz			
SYNCHROSCOPE TEST INSTRUMENTATION					
Bridges (resistive)	DSB-6CD	400 or 800 Hz			
	SB-AC	Accurate to 2 seconds of arc			
	RB-AC				
	D58				
Standards (transmittal)	DSB-50	400 KHz or 800 KHz			
	BS-5	400 KHz or 800 KHz			
	RS-4	400 Hz or 800 Hz			
	PCN-6	New Product!			
A to D Converters	ADC-1	400 Hz			
	ADC-2	Programmable			
COMMUNICATIONS INSTRUMENTATION					
FREQUENCY SELF CALIBRATED TEST SETS	FM-9	50 KHz-1 GHz			
	FM-10				
	FM-10A				
	FM-10B	New Products			
	FM-10C				
HIGH VOLTAGE MEASUREMENT INSTRUMENTATION					
ELECTROSTATIC VOLTMETERS					
Model	KV	Model	KV	Model	KV
ESM-1	7.5	ESM-14	5/15	ESM-27	10/20-30/40
ESM-2	15	ESM-15	10/15	ESM-28	25/50
ESM-3	15	ESM-16	10/20	ESD-1	1/20
ESM-4	25	ESM-17	15/20	ESD-2	1/10
ESM-5	25	ESM-18	15/30	ESD-3	2/50
ESM-6	40	ESM-19	20/15	ESD-4	3/10
ESM-7	40	ESM-20	5/15/15	ESD-5	3/50
ESM-8	60	ESM-21	5/10/20	ESD-6	4/50
ESM-9	60	ESM-22	10/20/25	ESD-7	5/50
ESM-10	60	ESM-23	15/20/30	ESD-8	2/50
ESM-11	100	ESM-24	3/15/10/20	ESD-9	5/50
ESM-12	140	ESM-25	5/10/15/15	ESD-10	6/50
ESM-13	5/10	ESM-26	5/10-20/30	ESD-11	6/50-11
HIGH VOLTAGE DIVIDERS		PARK	150		

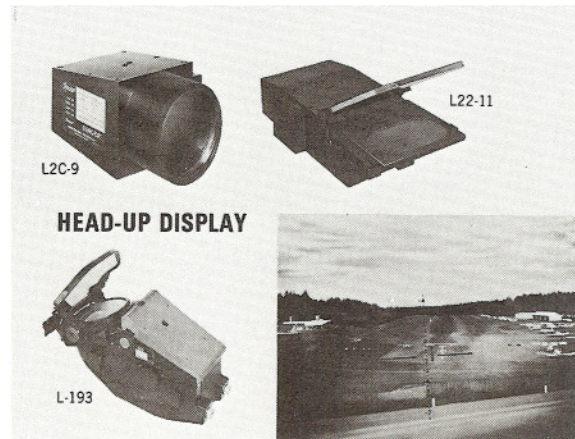
Los Angeles produces radio frequency interference and communications test sets, and AC instrumentation.



Librascope's in-house Automatic Test Equipment capability developed for the Company's own use has assumed a new importance with the addition of Singer Instrumentation. We plan to productize some advanced digital techniques and market the products through Singer Instrumentation. The photograph shows an example of computer-controlled test equipment sold for commercial use.



The encoder, one of the Company's earliest product lines, originated about 1956. A complete line of contact and magnetic shaft-to-digital encoders is available.

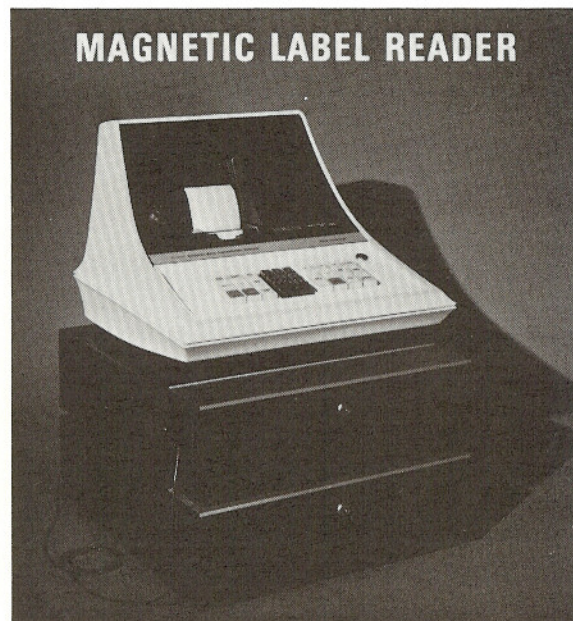


As an outgrowth of airborne weapon-delivery sights for military use, Librascope has designed head-up displays for use in commercial aircraft. Pertinent flight information is superimposed on the pilot's view of the outside world, sharply focused at infinity. The L-22-11 is presently being evaluated in the No. 1 Boeing 747.

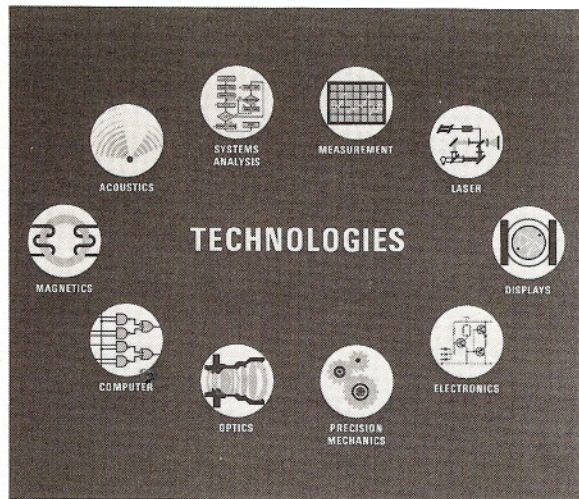


**35mm
LOW LIGHT LEVEL
CAMERA SYSTEM**

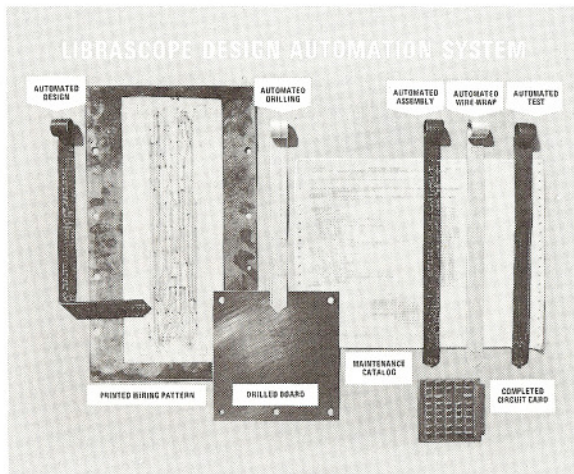
This night camera was designed for the law enforcement market. A development of Company military work in electro-optics, the Librascope 35mm Low-Light-Level Camera System allows surveillance photography during the hours between sunset and sunrise. Available light is electronically boosted to permit visual focusing and normal daylight exposures. The photos shown here were taken after dark without additional illumination.



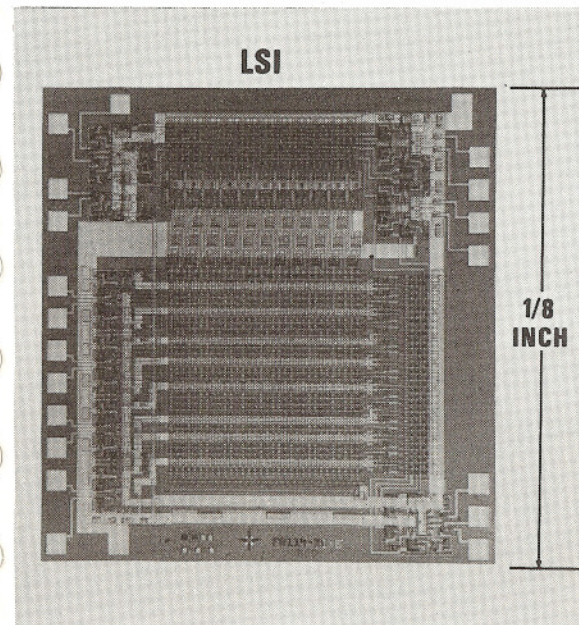
Librascope developed the magnetic label reader for Friden's Modular Data Transaction System.



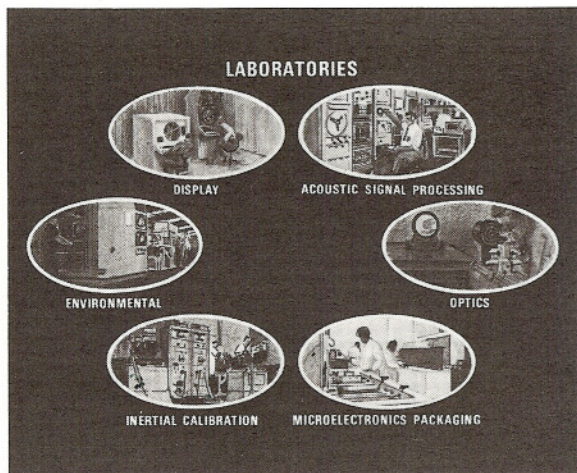
To do our business, Librascope maintains competence in a broad spectrum of technologies.



All digital design has been automated through use of the computer. This provides very efficient and fast digital design capability. Input to the system is basic logic or the equations to be implemented. The system provides tapes and printouts for design, assembly, test, and maintenance.

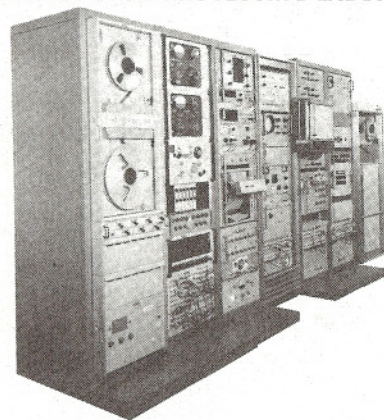


This is an example of large-scale integrated circuits used in Company production designs.



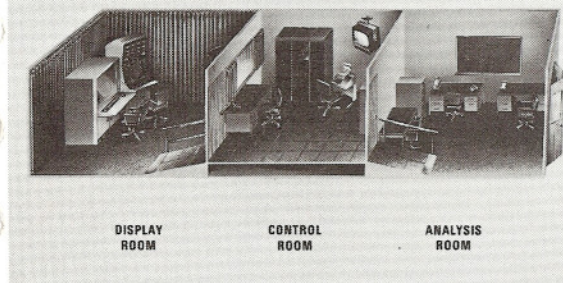
Several years ago Librascope recognized the desirability of expanding into related areas of Naval Systems. To provide the proper environment for meaningful work and study, two new laboratories - one for acoustic signal processing, the other for advanced display work - were added to the labs already in existence.

ACOUSTIC SIGNAL PROCESSING LABORATORY



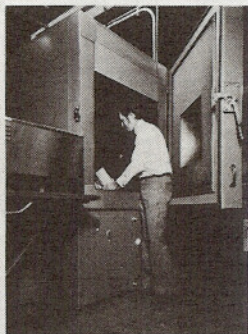
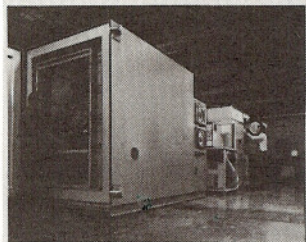
This is a very unique facility that permits us to process acoustic signals from recordings made at sea by sonars on real targets.

DISPLAY LABORATORY



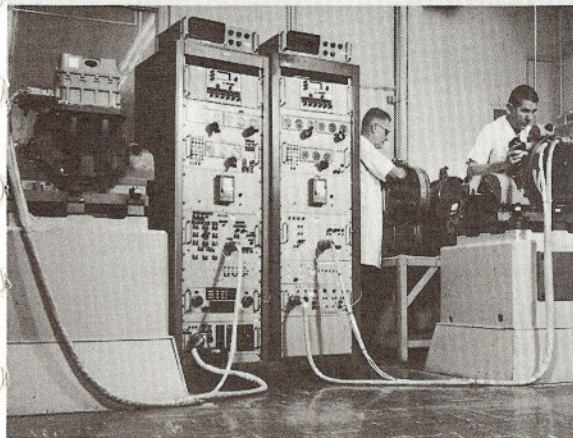
New display designs can be readily configured and tested for human factors and compliance with customers specifications. For sonar work, information processed in the acoustics laboratory is fed directly into the Display Laboratory.

ENVIRONMENTAL LABORATORY



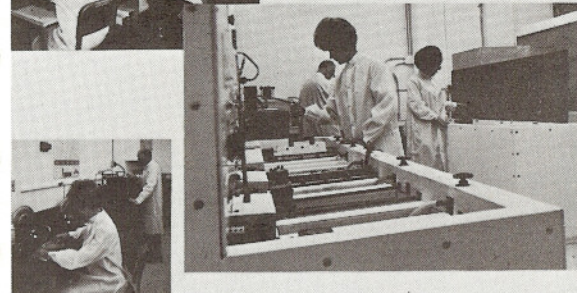
Here equipment is tested in the various types of environments encountered in military use.

INERTIAL CALIBRATION LABORATORY



In this laboratory we align inertial units that preset submarine-launched missiles.

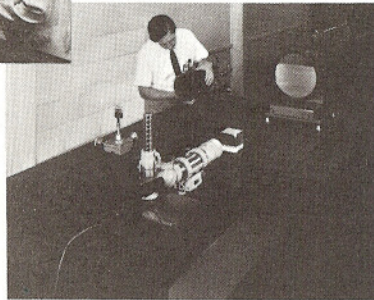
MICROELECTRONICS PACKAGING LABORATORY



The Microelectronics Packaging Laboratory develops new methods of interconnecting integrated circuits.



OPTICS LABORATORY



Librascope has the capability for design, fabrication, and test of all types of optical elements and systems.

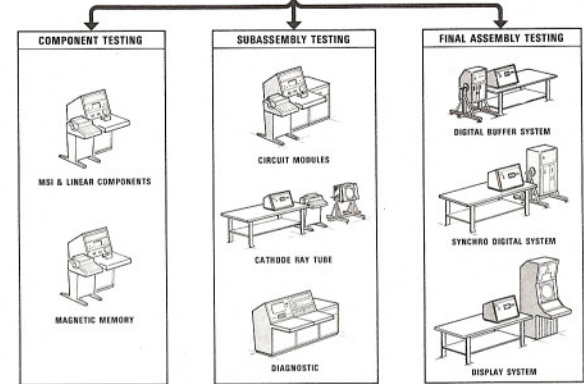


COMPUTER CENTER

Librascope's Computer Center (CDC-3300) is used extensively by Engineering, Manufacturing, Finance, and Logistics.



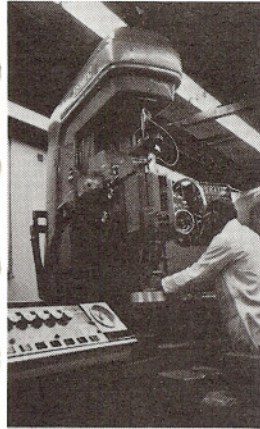
COMPUTER TEST FACILITY



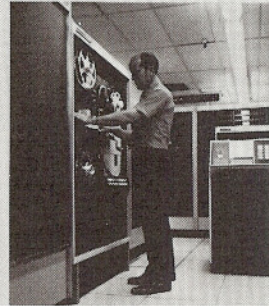
The Computer Controlled Automatic Test Facility has the capability to handle incoming components, sub-assembly, and final assembly tests with speed and economy. Flexibility of the system to accommodate current program changes and new programs is accomplished through simple software changes.



The Company has approximately 175,000 square feet of modern manufacturing facilities for machining, electronic assembly, optical fabrication and test.



Automatic Production Control System reports and measures the pulse of the factory . . .



All activities in the factory are reported through transactors to our Central Computer. This gives us real-time status on up to 10,000 job orders at one time.