

FACT BOOK 1970

Editor's Comments

This "Factbook", giving details on the company from 1944 to 1969. was published by Ampex Corporation in 1970. It tells about the Corporation, the Divisions and Subsidiaries, the Principal Technologies, Historical Highlights and Product Development, Financial Record, Personnel Growth, Management, Facilities, and Field Offices. There was no author credit

This searchable PDF file is re-formatted from a scan of the "Ampex Factbook 1970". I have retained the original style of indentation and underlining, and the **original** page numbers, which now appear bolded, at the right margin, to facilitate reference back to the original document. The original layout had many double-spaced pages, which have been reduced to single spacing. There were also many single-sided pages, so many even-numbered pages were blank, and thus show here as a page number with no text following it.

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THE CORPORATION

Ampex Corporation is a diversified manufacturing and service company with worldwide production, service and marketing operations primarily in the fields of magnetic recording devices and magnetic tape, computer data storage equipment, photo-electric color sorting devices, geophysical exploration services and instruments, and television transmission equipment.

Founded as Ampex Electric and Manufacturing Company (a partnership), November 1, 1944, the company was incorporated in California, May 2, 1946, as Ampex Electric Corporation. The present title, Ampex Corporation, was adopted May 1, 1953. The name Ampex is derived from the initials of the company's founder, Alexander M. Poniatoff (AMP), plus "EX" for excellence.

In October, 1959, Orr Industries, Inc. , Opelika, Alabama, manufacturer of magnetic tape, was merged into Ampex. On December 30, 1960, Telemeter Magnetics, Inc. , Los Angeles, California, manufacturer of magnetic ferrite cores, core arrays and memories for computers, was merged into Ampex.

Ampex acquired the major assets of Allegri-Tech, Inc., Western Division, November 4, 1963, to form the Component Operations Department which produces printed circuit boards in Burlingame, California.

Mandrel Industries, Inc. , Houston, Texas, geophysical exploration company and manufacturer of photo-electric color sorting machinery, became a subsidiary of Ampex on March 3, 1964.

Geoscience, Inc., Cambridge, Massachusetts, an organization of research and applications scientists active in the field of digital seismic technology, was acquired by Ampex in July, 1966, and is operated as a subsidiary of Mandrel.

On November 6, 1967, Ampex and Townsend Associates, Inc., Feeding Hills, Massachusetts, reached an agreement whereby Ampex acquired all the outstanding shares of Townsend.

Townsend manufactures UHF klystron television signal transmitters, translators and power boost converters for UHF television stations, FM transmitters and transmission lines. The company became the RF Transmission Distribution Systems Department of Ampex.

In January, 1968, Ampex acquired the assets of Kauke and Company, a Culver City, California, firm which manufactures instrumentation recording products. Kauke and Company became the Industrial Products Department of the Instrumentation Division, which is responsible for the design and manufacture of portable instrumentation recorders to serve the medical and industrial markets.

In March, 1969, Ampex concluded negotiations for the acquisition of all outstanding stock of Bogner Antenna Systems Corporation, New York, and Electromagnetic Radiation Laboratories (ERL), Inc. , Massachusetts. Bogner manufactures UHF, VHF and ITV television antennas and translator antennas. ERL produces a full line of coaxial products for RF transmission systems including transmission lines, diplexes, harmonic filters and other accessories. The manufacturing operations of both firms became part of the Ampex RF Systems Department.

DIVISIONS AND SUBSIDIARIES

Ampex products are developed and manufactured domestically by individual divisions, departments and subsidiaries. Many of these products are also manufactured and marketed abroad by subsidiaries under the company's International Division or by those of Mandrel Industries, Inc. Geophysical services are provided worldwide by the Ray Geophysical Division of Mandrel.

a. AMPEX SERVICE COMPANY

Headquarters: 5422 W. Touhy Avenue, Skokie, Illinois 60076.

The Ampex Service Company operates as a division of Ampex Corporation. More than 11 Ampex-operated service centers are located in major U. S. cities. More than 250 independent dealers have been franchised by the company to handle the repair and maintenance of Ampex products.

The service centers handle after-the-sale service on all Ampex products with the exception of Videofile systems and most computer peripheral equipment. The franchised servicing agencies handle after-the-sale service on all Ampex consumer tape recorders.

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b. AMPEX STEREO TAPE DIVISION

Headquarters: 2201 Lunt Avenue, Elk Grove Village, Illinois

Marketing headquarters: 555 Madison Avenue, New York, New York

Manufacturing operations: Elk Grove Village, Illinois; Nivelles, Belgium; Toronto, Canada

Products, applications and markets:

Ampex manufactures and markets the largest library of recorded stereo tapes in the world. The Ampex Stereo Tapes division (AST) offers more than 6,500 selections from its own and more than 100 recording labels. Selections are marketed on all popular formats for home, auto, marine and airborne listening. These include cassette, 4-track and 8-track cartridges, and open reel formats. In addition to musical selections, AST markets language instruction tapes, tapes of historical speeches, dramatic readings and humor. Ampex Record Company, a subsidiary of AST manufactures and markets single and LP discs in a variety of styles.

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c. COMPUTER PRODUCTS DIVISION

Headquarters: 9937 West Jefferson, Culver City, California

Manufacturing operations: Culver City, California

2245 South Pontius, West Los Angeles, California;

46 Hsing Pang Road, Ta Lin Li, Taoyuan, Taiwan, R. O. C.

603 Tai Nam Street, Kowloon, Hong Kong, B. C. C.

Products, applications, and markets:

Core memories. The Computer Products Division, which offers lines of cores, arrays and stacks and complete memory systems covering the spectrum of configurations, is a leader in the core memory field. Core memories are sold to end users, computer manufacturers, and commercial and government

system developers. Cores, arrays and stacks are manufactured in a variety of sizes and capacities for incorporation in Ampex memories and for sale to other companies as standard memory components.

Ampex offers a series of memories embodying a modular packaging concept which covers the full range of market requirements for high speed core memories in various sizes. In addition, the division continues to develop and produce large capacity, high speed core memories for specialized applications.

Digital magnetic tape drives. The Computer Products Division developed the industry's first successful digital tape transport to employ a single capstan. This innovation eliminated traditional pinch rollers, substantially reducing the number of moving parts in a system, and providing excellent reliability and low cost operation. The division now offers the most complete line of single capstan tape drives in the industry, available for every data processing and systems requirement. These tape drives are offered in a variety of performance

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specifications and tape speeds ranging from 10 to 150 inches per second. These recorders are sold to end users, computer manufacturers and systems developers.

Ampex digital tape drives are also available in ruggedized models designed for airborne, shipboard and land mobile data acquisition in a variety of applications which will produce tapes compatible with all computers which use the industry standard tape format.

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d. CONSUMER EQUIPMENT DIVISION

Headquarters: 2201 Landmeier Avenue, Elk Grove Village, Illinois

Manufacturing operations: Elk Grove Village, Illinois

Products, applications, and markets:

Ampex pioneered the home stereo tape recorder, and now the Consumer Equipment Division manufactures and markets quality audio tape recorders in various open reel and cassette configurations for home and automobile entertainment. Various stereo recorders offer such features as automatic reversing of tape, automatic threading, combination recorder and AM-FM tuner, bi-directional record and pause control.

Ampex also offers accessories for its recorders, including speakers, microphones, earphones, and recorder maintenance kits.

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e. EDUCATIONAL AND INDUSTRIAL PRODUCTS DIVISION

Headquarters: 2201 Estes Avenue, Elk Grove Village, Illinois

Manufacturing operations: Elk Grove Village, Illinois

Products, applications, and markets:

The Educational and Industrial Products Division manufactures and markets a broad line of compact closed circuit videotape recorders and players for industry, education, government, medicine, sports, the performing arts and an almost endless variety of fields. Recorders are offered with the capability to record, edit, and play back both color and monochrome television pictures and sound. Special purpose recorders include time lapse, x-ray, and dial access machines. Tapes made on any recorder in the division's series are playable on any other unit in any of these series. The Ampex 1-inch tape format has become widely accepted among major educational and industrial users.

The division produces television cameras, lenses, receiver/monitors and other accessories to complement its videotape recorder line. Cameras range from small vidicon units for less demanding applications to complete studio-type cameras.

Ampex Video Institute. A fully developed school of instruction in closed circuit television for the education of customers, employees, dealers, sales people and others interested in the production of video tapes, maintenance of recorders and other aspects of closed circuit television.

Videotape Duplication Center. This center provides quantity duplication of tapes made on Ampex broadcast and closed circuit recorders. The center will make transfers from one type of recorder to another and from film to tape. Major users of the center's services are educational, commercial, and industrial videotape recording installations.

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f. INSTRUMENTATION DIVISION

Headquarters: 401 Broadway, Redwood City, California

Manufacturing operations: Redwood City, California;

600 Wooten Road, Colorado Springs, Colorado;

865 Hinckley Road, Burlingame, California

Products, applications, and markets:

Instrumentation magnetic tape recorders. These recorders are produced by Ampex for military, commercial, scientific and medical applications. Instrumentation recording was the first major offshoot of Ampex work in audio magnetic recording. Instrumentation recorders are used to record vast amounts of information - - vibrations, stresses, temperature and velocity changes, heart beats, brain waves, radar signals and television pictures - - with great precision at high electrical frequencies and to minute electrical tolerances.

There are three types of Ampex instrumentation recorders, longitudinal, rotary and electron beam. The longitudinal recorders are used in laboratory, portable and airborne configurations, for aerospace telemetry, reconnaissance and laboratory requirements. The company produces a variety of recorders in a range of prices, sizes and sophistication to meet wide market needs. Rotary-head instrumentation recorders are the result of a combination of Ampex video technology and instrumentation recording requirements. They are capable of recording at higher frequencies than any other magnetic recorders in production and are used in specialized government programs including radar recording, reconnaissance and recording of pictures and data from space probes and orbiting lunar and terrestrial satellites. Electron beam analog recorder/reproducers, still in prototype models, are constructed in the Research and Advanced Technology Division.

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g. AMPEX INTERNATIONAL

Headquarters: 401 Broadway, Redwood City, California

Manufacturing operations: Redwood City, California;

2832 Slough Street, Malton, Ontario, Canada;

100 Skyway Avenue, Rexdale, Ontario, Canada;

Rue de l'Industrie, Nivelles, Belgium;

72 Berkeley Avenue, Reading, Berkshire, England;

100 Suehiro, Kawasaki, Kanagawa-Ken, Japan

International Division. From the beginning of the company, Ampex products have been sold throughout the world. Ampex International was formed to market, service and manufacture Ampex products outside the United States, and the first production was begun at Ampex Great Britain, Ltd. , England, in 1959.

Three International Division areas - - Europe, Africa and Middle East Area, Far East Area, Western Hemisphere - - and several subsidiary companies, formed to facilitate doing business in the 77 countries where this division presently operates, sell and service virtually every type of Ampex equipment abroad. Products from almost every Ampex domestic division are manufactured or assembled at plants in five countries. Operations in Japan are conducted by a joint venture company, Toshiba Ampex Co. , Ltd.

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h. MAGNETIC TAPE DIVISION

Headquarters: 401 Broadway, Redwood City, California

Manufacturing operations: Marvyn Highway, Opelika, Alabama

Ampex S. A. Battice, Belgium, c/o Maison Communale, de et A' Battice, Prov. Liege, Belgium,
Products, applications, and markets:

Magnetic Tape Division. Ampex is the only company in the world producing both recording equipment and magnetic tape for every major application in sound recording, computer data storage, and video and instrumentation recording. As a result, developments in tape take place in close coordination with parallel developments in recording equipment. Advanced process and product development in the division are accomplished in the magnetic tape laboratory in Redwood City.

Today, there is an Ampex tape for every Ampex recording device and for many others. Among the more than 500 configurations of computer tape Ampex markets covering every major computer tape requirement, is a line of error-free tapes of great precision. Lubricated tapes for stereo cartridges and polyester and acetate based tapes for open reels are produced for the company's Ampex Stereo Tapes Division and for other suppliers of recorded and unrecorded audio tapes. Video tapes for broadcast and closed circuit television and precision instrumentation tapes are also important products of the division.

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i. MANDREL INDUSTRIES, INC.

Headquarters: 6909 Southwest Freeway, Houston, Texas

Manufacturing operations : Houston, Texas

303 Forge Road, Calgary, Alberta, Canada;

Products, applications, and markets:

Mandrel. A subsidiary of Ampex Corporation, Mandrel is a diversified company in its own right with four divisions. Largest in size is the Ray Geophysical Division, a leading firm in the field of contract geophysical exploration. The division provides crews to locate subsurface geologic structures favorable to the accumulation of petroleum and other mineral deposits for oil and mining companies.

These crews, working on land and offshore, use conventional dynamite and "surface" seismic energy sources to produce energy that is fed into the earth's crust and reflected back to the surface by the various strata. The reflected energy is detected by seismometers, or geophones, amplified and recorded on magnetic tape. Digital computers then process the data to remove the effects of

interference of various kinds to enhance the reflections. The final data are used by the geophysicist to prepare a report in the form of a map, contoured to show the depths of subsurface formations. From this information, promising drilling sites are chosen. Gravimetric and magnetic methods also are employed. The Ray Division maintains major data processing centers in Houston, London, and Tripoli to provide rapid processing of information obtained by field crews.

The Electro-Technical Labs Division. This division develops and manufactures recording equipment and other instruments used in geophysical exploration. The equipment is supplied to the Ray Division and to outside petroleum, mining and contract geophysical companies. The division's pro-

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ducts include seismic plotters, field recorders for seismic data, oscillographs and control systems.

The Cable and Sensor Division. In 1969 Mandrel combined its cable manufacture with the design and manufacture of all geophones, or geophysical detectors. The division already manufactured a complete line of geophysical cables--land, marine, portable and leader. By this move, these closely associated tools of the geophysical industry are made available from a single coordinating source.

The Electric Sorting Machine Division. This division is the world leader in the development and manufacture of photo-electric sorting machinery which grades and separates foodstuffs by color variations at extremely high speeds. (Coffee beans are sorted at 450 to 500 pounds per hour and rice is sorted at 200 pounds per hour.) The division produces machines for sorting dry products such as seeds, peas, coffee beans and rice; and others for sorting wet products such as potatoes, carrots, cherries and olives. Still other machines sort lemons and products of similar size, and foodstuffs already in cans.

The sorting machines distinguish either one color from another or separate according to the brightness of a single color, ejecting uncanned foods that are spotted or otherwise blemished and separating color-keyed cans as they emerge from cookers.

Geoscience Incorporated. Located at 199 Bent Street, Cambridge, Massachusetts, this is an independent operating subsidiary of Ampex, an organization of research and application scientists active in the field of digital seismic technology. Geoscience works closely with the Ray Division and provides equipment and survey crews for the mining industry and carries out research and development projects in the earth sciences for industry and government agencies.

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j. PROFESSIONAL AUDIO DIVISION

Headquarters: 401 Broadway, Redwood City, California

Manufacturing Operations: Redwood City, California;

600 Wooten Road, Colorado Springs, Colorado

Products, applications and markets:

Professional Audio Tape Recorders. These range from the highest performance studio recorders and duplicating systems for master recording and radio station use to heavy duty portable models for field use in broadcasting, industry, education, government and other fields. Various accessories, including mixers, speaker systems and microphones are also produced. Ampex professional audio recorders were the first available and have long set standards for radio station use and the production of high fidelity master recordings for the phonograph record and prerecorded tape industries.

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k. RESEARCH DIVISION

Headquarters: 401 Broadway, Redwood City, California

Corporate Research and Advanced Technology Division. The Research and Advanced Technology Division enhances the technical efforts of all Ampex product divisions with its staff of outstanding scientists and engineers in the various disciplines significant to the company – electronics, physics, chemistry and mechanics. The efforts of the division are primarily in applied research -- developing techniques which will contribute to or become the Ampex products of tomorrow. Other programs are aimed at increasing the sophistication of present recording techniques and improving and simplifying existing mechanisms.

The Division has corporate responsibility for not only research, but also technical information services, industrial design, standards, and quality audit. The Division is also evolving two new product areas: ferrites, and the Terabit Memory System.

Some Research projects are supported by outside funding mostly from the Federal government and industrial clients. These projects like those internally funded, are undertaken selectively to advance the company's knowledge of fields pertinent to Ampex growth plans, expecting that significant new products may result from the effort.

Current areas of interest are:

1. Application of electron beam and laser beam technology to recording and reproducing devices.
2. Magnetic film memory systems for computers.
3. Digital filtering of geophysical exploration data.
4. Improved ferrite materials for magnetic recording heads.
5. Monolithic ferrite sheet digital memories.
6. All-ferrite logic devices.
7. New magnetic media for magnetic tapes.
8. Better methods of duplicating audio and video tapes.
9. Increased bandwidth for instrumentation recorders.
10. Superior tape movement on all types of recorder transports.

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L. SPECIAL PRODUCTS DIVISION

Headquarters: 401 Broadway, Redwood City, California

Manufacturing operations: Redwood City, California

Products, applications, and markets.

Communications systems. The Special Products Division develops and installs complete communications systems for a wide range of fields, including broadcasting, education, industry and government. Systems may incorporate various products of the division and other Ampex divisions, as well as those of other manufacturers. Illustrating the variety of systems undertaken are complete UHF television station installations, customized television production vans for educational and commercial broadcasters and special audio and video teaching and training systems for schools and business firms.

The Special Products Division develops and installs the Ampex Pyramid random access educational resource system.

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m. VIDEOFILE INFORMATION SYSTEMS DIVISION

Headquarters: 1020 Kifer Road, Sunnyvale, California

Manufacturing operations: Sunnyvale, California

Videofile* document filing and retrieval system. Ampex has combined several recording technologies employed in its video and computer products to evolve a group of system elements that may be combined in a Videofile system to satisfy various document storage and retrieval requirements.

The Videofile system stores conventional file documents as television recordings on magnetic tape. Compact storage plus rapid access to filed documents and unrivaled flexibility for instant updating are its principal capabilities. More than 250,000 standard document pages may be stored on one 14" reel of 2" wide video tape in this system, and each may be retrieved at the push of a button either as an electrostatic hard copy or an image on a television monitor.

The Videofile system is standardized in a series of system elements known as the VF-100 Series. The series includes television cameras, tape transports, buffers, monitors and printers. The system may be fed information in the form of hard copies, microfilm (16 mm or 35 mm roll or strip), or microfiche.

The first commercial Videofile system was installed at the Southern Pacific Company in 1968 to speed handling of railroad freight waybills. Others are under construction for various government and business customers, including insurance companies, technical firms, and government agencies.

* TM Ampex Corporation

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n. VIDEO PRODUCTS DIVISION

Headquarters: 401 Broadway, Redwood City, California

Manufacturing Operations: Redwood City, California

600 Wooten Road, Colorado Springs, Colorado

RF Systems, Owen District Road, Westfield, Massachusetts

Products, applications and markets:

Professional videotape recorders. Ampex developed the first practical videotape recording device for recording moving television pictures and sound on magnetic tape for immediate playback with quality undistinguishable from live telecasts. The Ampex broadcast video recording standard has been adopted for use throughout the world. The product line today represents the broadest in the field, ranging from the highest quality color and monochrome studio and portable models, through a variety of specialized configurations for location and mobile recording applications to compact simplified models for either broadcasting or closed circuit use in education, industry, medicine and various other training and communications applications.

Ampex accessories for these recorders include various devices to enhance the performance and flexibility of the basic recorder for specific applications. Included are electronic editing devices and color accessories.

During the last few years, the division has expanded the range of products to include virtually all technical equipment required by television stations. In addition to videotape recorders, the division is a

major supplier of portable and studio color television cameras, color disc recorders and UHF television transmitters, translators and RF equipment for the broadcast industry.

Television cameras. Ampex developed the first hand-held portable color camera successfully used on-the-air. The company's portable camera and

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companion color studio model both use just two television pick-up tubes, as against three and four-tubes used in previous color cameras. The Ampex design results in reduced camera size and weight, lower cost, faster camera set-up time, and easier operation and maintenance than previous cameras.

Portable cameras can be used with microwave transmission capability or with a miniature cable one-tenth the weight of conventional cable. The small cable used with portable and studio models greatly improves mobility of the cameraman.

Disc recorders. Newly developed color disc recording systems are in use throughout the world for "instant replay" recording and playback of sports action. Ampex disc systems also are used by television production companies to produce commercials and other programs where slow motion and animation effects are important. Disc recorders record 30 seconds of action on highly polished plated magnetic discs for variable speed replay in fast motion or slow motion down to stop action.

Transmitters, Antennas and Coaxial products--Ampex manufacturers UHF klystron television signal transmitters, translators and power boost converters for UHF television stations, FM transmitters and transmissions lines, UHF, VHF and ITV television antennas and translator antennas, and a full line of coaxial products for RF transmission systems including transmission lines, diplexes, harmonic filter and other accessories.

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o. MAGNETIC DISC DEPARTMENT

Headquarters: 728 San Aleso Road, Sunnyvale, California

Manufacturing Operations: Sunnyvale, California

Products, applications and markets:

Magnetic discs. Magnetic discs are used instead of conventional magnetic tape in video recording applications where fast access and variable speed playback are more important than long playing time. Precision magnetic discs are used for storage of document images in the company's Videofile information systems and for "instant replay" recording of television sports and commercials with Ampex slow motion disc recorders.

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PRINCIPAL TECHNOLOGIES

a. PRINCIPLES OF MAGNETIC TAPE RECORDING

Magnetic tape recording is the process of storing and retrieving information of many types that has been converted to electrical signals. Modern electronic equipment allows almost every type of information to be so reduced with a minimum of distortion and over a wide range of electrical frequencies.

Consequently, pictures, sound, vibration, acceleration, temperature, numerical and alphabetical information may all be recorded on magnetic tape for instantaneous replay without processing.

In the recording process itself, a transducer is used to convert picture, sound or other physical phenomena to an electrical current. A microphone is one form of transducer, a television camera another. Magnetic tape, composed of a plastic base coated with minute particles of metallic oxide, is moved past heads which create fields around the tape and so align the magnetic fields of the particles in specific patterns. For replay, the tape again passes a head and the previously aligned patterns disturb the field of the head to cause electrical signals to be generated which result in the production of pictures, sound or whatever was recorded.

Magnetic heads are electrically energized magnets. A picture to be recorded, for instance, is transmitted to the head in the form of electric signals from a television camera. Variations in the signals cause the head magnet to vary the field it produces and align the iron oxide particles on the tape.

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Magnetic tape recordings can be used many times or stored for long periods without significant degradation of the quality of the recording. Unwanted information can be erased by demagnetizing, and the tape can be reused repeatedly.

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b. PRINCIPLES OF FERRITE CORE MEMORIES

Core memories are used to store units of information for extremely rapid access in electronic computers and data processing systems. Most modern computers employ ferrite cores as basic memory elements. The cores, tiny ceramic rings made of iron oxide and other compounds, are magnetically bistable and can, when electrically charged, "remember" or hold signals in binary code form ("0" or "1").

These cores, measuring as little as 18 thousandths of an inch in diameter, are wired into arrays which may contain up to several thousand cores. The wires, which run through the centers of these rings, act as input or output links. Stacks of arrays are then connected to form a storage area for digital "words" for the computer memory.

The stacks provide memory capacity of up to several thousand words. For the ferrite elements to act as a memory system within a computer system, they must be associated with electronic circuits used for switching logic and electronic reading and writing. The information to be processed, including the instructions for the processing, is expressed in "words" fed into the memory stacks as electrical signals from magnetic tape, punched cards or other input devices. The information and instructions are retained as long as they are needed and are then erased or transferred to storage on magnetic tape or punched cards for future use.

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c. GEOPHYSICAL EXPLORATION

Geophysical exploration for petroleum is the search for subsurface geologic structures favorable to the accumulation of oil. Certain structures - - anticlines, stratigraphic traps, regions where dipping strata are sealed by faulting - - are known to be the most common collecting places for oil.

The commonest method of mapping subsurface formations is to feed sound energy (from a dynamite, weight-drop, vibratory or contained explosive source) into the ground in a checkerboard pattern over the area being worked. Part of the energy is reflected back to the surface by the various substrata. This energy is detected by seismometers, or geophones, which consist of a moving coil in a magnetic field. The time of the round trip allows the depth of the reflecting layer to be computed.

The geophones convert the movements of the ground to electrical energy, which is amplified and recorded for further processing and interpretation. Eventually, after the data are processed to enhance the reflections and minimize disturbing effects, it is given to the geophysicist as a seismic cross section. He translates this information into a contoured map which shows the depths of subsurface formation. From this information, promising drilling sites are chosen.

Gravimetric and magnetic methods also are offered by Ray Geophysical. In the former, subsurface strata are delineated by variations in the pull of the earth's gravity; in the latter, by variations in magnetic lines of force from the earth's poles.

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d. PRINCIPLES OF PHOTO-ELECTRIC COLOR SORTING

Using electro optical techniques Mandrel color sorting equipment separates/ foodstuffs such as lemons, coffee beans, rice, seeds, potatoes, cherries and olives by color acceptability. Some machines separate one color from another, some separate according to brightness of a single color. They all reject pieces that are spotted or otherwise blemished. Sorting is accomplished at very high speeds--coffee beans are processed at the rate of 450 to 500 pounds per hour, rice at 200 pounds per hour.

Product is fed from overhead bins into a chute that empties into a rotating bowl. Centrifugal force positions the individual pieces in rows at the rim of the bowl. A revolving ferrule drum dips in the outer row and vacuums a piece onto each ferrule. As the drum revolves through a viewing chamber, the product pieces are individually judged by photo electric cameras or "eyes" from both sides according to preselected standards. Rejects are ejected from the system by air blasts.

One type of machine separates objects of different colors, viewing each product piece through two different color filters and phototubes. The phototube outputs are displayed on a cathode ray oscilloscope, one color on each of two axes. Masks, tailored for each product, allow a sentinel phototube to "see" only that scope readout that indicates substandard product. The sentinel device tells the ejector circuit to reject bad pieces.

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e. OTHER TECHNOLOGIES

1. Electron Beam Recording: Electron beam recording on photographic film allows large amounts of information to be recorded in a small area at bandwidths in excess of 100 MHz. The film is exposed by a thin stream of electrons whose intensity is modulated by the signal to be recorded. The processed film provides a permanent record of the recorded signal. During playback, this processed film is exposed to an electron beam of constant intensity, the beam energy is converted to light and the modulation of the light detected. The film must remain in a vacuum chamber during both recording and playback. The first model of an analog electron beam recorder was successfully demonstrated in September, 1969.

2. Laser Beam Recording: While electron beam recording requires the use of a vacuum chamber during recording and playback, the same type of recording on photographic film can be achieved by using a finely focused laser beam in place of the electron beam. This eliminates the need for a vacuum chamber but introduces new problems in light beam modulation and deflection. Laser beam systems are still in the early stages of development. A prototype record-only system has been delivered and is functioning well.

3. Magnetic Films: Magnetic films for computer memories are plated onto glass, metal, or epoxy substrates. Tiny areas of the plated surface are used for storage and retrieval of digital information. Possible production economies and fast switching speeds possible with the films may lead to their widespread use in computer memories. If so, they will complement cores and integrated circuits in many areas.

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4. Ferrite Materials: Evolving out of the Ferrite research effort of the Research Department, the Ferrite Materials Department was formed in May 1969. The Department produces high-grade ferrite materials for internal uses thereby assuring product availability, and providing cost reduction. The Department also produces high-grade ferrites and garnets for the commercial market, principally for microwave application.

HISTORICAL HIGHLIGHTS AND PRODUCT DEVELOPMENT

- 1944 - November 1, Ampex Electric and Manufacturing Company was formed by Alexander M. Poniatoff at 1155 Howard St., San Carlos, California.
- 1946 - May 2, Ampex Electric Corporation was formed.
- 1947 - October 1, Ampex demonstrated the Model 200, first production magnetic tape recorder of acceptable professional quality for the radio broadcasting and commercial recording industries at Radio Center, Hollywood, California.
- 1948 - April 24, the first production Model 200 audio recorders were delivered to American Broadcasting Company and placed in service April 25 across the country. This was the first regular professional use of magnetic recording and proved the practicality of the technique.
- May, the Model 300 tape recorder was introduced, establishing new standards of quality for the radio broadcast and professional music recording industries. It provided improvements in head design, drive system and tape path.
- 1950 - Fall, the Model 400, a lower priced audio tape recorder of professional quality, was developed specifically for independent broadcast stations.
- 1951 - August, Ampex headquarters moved from San Carlos, California, to 934 Charter Street, Redwood City, California.
- Ampex introduced the Model 302 Series of multitrack instrumentation recorders capable of precision recordings of data with frequencies as high as one hundred thousand cycles per second, providing the first practical way of acquiring, storing and processing data in a wide range of scientific, military and industrial applications.
- 1953 - April, Model 350 professional audio recorder replaced the Model 400. The Model 350's simplicity, improved tape drive system, durability and performance established a new standard of excellence for the broadcast industry.
- July 2, company name changed from Ampex Electric Corporation to Ampex Corporation.
 - September, Ampex entered the motion picture field with multidirectional sound equipment for Cinemascope theater installations.
- 1954 - May, Ampex introduced the first portable professional recorder for field use. The Model 600 retained full master quality in a highly compact form. The Model 600 retained full master quality in a highly compact form. The company also introduced the first commercially available high-speed tape duplicators, Models 3200-3300, permitting rapid duplications of recordings.
- 1955 - March, George Long became President of Ampex Corporation; Alexander M. Poniatoff became Chairman of the Board.

1955 (continued)

- June, Ampex introduced the Model 800 airborne instrumentation recorder designed to stand severe environmental conditions while obtaining inflight measurements.
- July 27, Ampex introduced the first stereophonic home music systems, Model 612 with Model 620 speakers, establishing the standard in the industry.
- October, the corporation's line of theater sound equipment designed for Cinemascope reproductions of 4-track magnetic film was expanded to cover the entire field of theater sounds, including the 6-track magnetic film employed in Todd-AO production.
- November, the corporation introduced its first line of digital magnetic tape handlers, the FR-200 Models, for use in electronic computers.

1956 - April, Ampex demonstrated the first videotape television recorder, the Model VR-1000, at the National Association of Broadcasters Convention in Chicago. The VR-1000 established a precedence comparable to that established by the Model 200 in radio broadcasting.

- November 30, the first coast-to-coast network television broadcast prerecorded on tape using Ampex videotape recorder, "Doug Edwards and the News", Columbia Broadcasting System.

1957 - March, Ampex Corporation was awarded an "Emmy" by the Academy of Television Arts and Sciences for the development of the VR-1000.

- May 1, Ampex Audio, Inc. , was established in Sunnyvale, California, to perform the engineering, manufacturing and marketing functions for all consumer products.
- May 24, Ampex entered into an arrangement with ORRadio Industries, Inc. , Opelika, Alabama, a manufacturer of magnetic tape. Ampex acquired approximately 25 percent of the outstanding common shares of ORRadio and was appointed exclusive distributor, under its own label, of computer and instrumentation tapes.
- Ampex introduced the miniaturized MR-100 missile recorder for use in the nose cone of a missile, to record and store flight information during rocket firing, ionospheric transit or other periods when telemetering systems may be inoperative or unreliable.
- July, Ampex announced a new line of home music systems incorporating a new stereophonic recorder with a universal head assembly which made possible the playback of all single track, 2-track and 4-track prerecorded tapes on a single machine.

1958 - April, the Ampex color videotape recorder, employing an electronic accessory to the basic recorder, was introduced. Complete interchangeability of tapes from machine to machine and a simple editing procedure for recorded tapes were also demonstrated for the first time.

1959 - January 19, Ampex Corporation listed on the New York and Pacific Stock Exchanges.

- May, Ampex International, a subsidiary, was formed to market, service, and conduct manufacturing operations of the corporation outside the United States.
- May, Ampex introduced a fully transistorized and miniaturized airborne and mobile instrumentation recorder, Model AR-200, a complete 7-track recording system occupying only 1.6 cubic feet of space.
- June, Ampex formed United Stereo Tapes (now Ampex Stereo Tapes) to record, manufacture and distribute stereo music tapes for home listening. Masters were obtained by arrangement with several leading sources of high quality recorded music.
- July, Ampex received an order from the National Educational Television and Radio Center for videotape recorders which ultimately led to installations in educational television stations throughout the United States.
- August, the corporation announced the Model FR-600, first instrumentation recorder capable of recording frequencies as high as 250,000 cycles per second.
- August, the first Ampex products assembled outside the United States were produced at Reading, England (Model FR-100 instrumentation recorders).
- October, the shareholders of Ampex and Orr Industries, Inc.. approved the merger of Orr into Ampex Corporation. This was the formation of the Ampex Magnetic Tape Division.

1960 - January, Ampex introduced its first self-contained portable stereo recorder, Model 970, using a built-in stereo amplifier-speaker system for monitoring purposes.

- April, the company introduced the Model 354 professional audio recorder, a smaller, lower priced model, designed specifically for recording and reproducing stereophonic sound. The 354 was subsequently used by the National Stereo Radio Committee for tests on which the FCC based its multiplex stereo standards.
- April, Ampex introduced the VR-1001A videotape recorder, an upright model especially suited for mobile use.
- April, Intersync* television picture synchronizer which improves horizontal phase stability for videotape recorders, was introduced at SMPTE.
- May, Ampex introduced a new wideband recording system, including an airborne unit, the AR-300, and a companion ground unit, the FR-700. Capable of frequencies up to 4 megacycles, the system opened new applications for magnetic recording in reconnaissance, electronic countermeasures, radar recording, signal intelligence and space communications.

1960 (continued)

- July, Ampex introduced the CP-100 portable multichannel magnetic tape recorder for instrumentation or general laboratory applications.
- December, to strengthen the corporation's position in the data processing industry, a merger with Telemeter Magnetics, Inc., Culver City, California, was affected. Following the merger, manufacture of computer tape memory units was transferred from Redwood City to Culver City and combined with operations of Telemeter Magnetics, Inc., as the corporation's Computer Products Company (now Computer Products Division). Telemeter Magnetics, Inc., brought to the merger a history of achievement, including:

The first commercial core memory - 1954
 The first all magnetic core pulse source - 1955
 The first solid state core memory - 1956
 The first core buffer - 1956
 The first line of memories as catalog items - 1957
 The first line of 6 microsecond memories - 1958
 The first small capacity microsecond core memory - 1958
 The first line of word select core memories - 1960

1961 - January, VR-8000, a closed circuit videotape recorder for applications in education and training.

- March, Ampex announced Amtec* time element compensator, which instantly corrects distortion in spliced tapes used with Ampex videotape recorders.
- April, Ampex received a technical "Oscar" from the Academy of Motion Picture Arts and Sciences for the development of an advanced multipurpose theater sound system.
- May, Ampex announced Colortec* direct color recovery equipment, which allows videotape recorders to record and reproduce color to FCC-NTSC standards.
- August 1, William E. Roberts was elected President and Chief Executive Officer of Ampex Corporation.
- September, Ampex received a \$ 2,000,000 contract to provide magnetic memory systems for the Dyna-Soar glider project.
- October, Ampex introduced the first commercially available large capacity ferrite core memory with a 1.5 microsecond cycle time, the Model LQ.
- November, the company introduced the Fine-Line 1200 Series 4-track stereo and monaural recorder for home and semi-professional use.
- December, President Roberts announced purchase of 40 acres of land and plans for construction of new research and engineering and corporate headquarters building complex in Redwood City, Ampex Corporation's first company-owned property in California.

1961 (continued)

- December, Ampex developed an experimental 35-pound television recorder occupying a cubic foot of space and capable of recording and reproducing up to one-half hour of satellite television pictures or the equivalent amount of scientific data. Delivered to the National Aeronautics and Space Administration, the prototype recorder represents a significant advance in electronic miniaturization.

1962 - July 26, ground broken for new research and engineering and corporate headquarters building totaling 150,000 square feet.

A record number of Ampex products were introduced in clendar 1962, including:

- March, specialized test equipment was developed to enable Air Force scientists to evaluate the performance of thermoplastic and other recording materials proposed for electron beam recording - an advanced technique for the recording of information. This important step in the development of future high performance recording systems permits establishment of standards on which continuing development of electron beam systems can be based.
- March, a new low-cost digital tape handler, the Model TM-4, was introduced. It is a modernized version of the FR-400.
- March, a new version of the Intersync control system, a picture synchronizer which improves horizontal phase stability for videotape recorders, was demonstrated at SMPTE.
- March, Ampex Electronic Editor, a device to edit video tapes without cutting and splicing, was introduced.
- April, Ampex received its first order (270,000) from the United States Navy to install closed circuit television recording systems aboard aircraft carriers under a new program known as Pilot Landing Aid Television (PLAT). Each PLAT system consists of a television tape recorder, four television cameras and related equipment and has since proven effective in increasing safety and improving pilot proficiency aboard carriers. This order was increased in December, 1962. Today (1969), almost every Navy carrier is equipped with PLAT.
- May, RVQ, a new ferrite core memory designed for computers requiring small to medium capacity rapid access storage, was introduced.
- May, the TM-2100 and TM-4100 tape memory systems incorporating solid state data and logical control electronics were introduced.
- August, SP-300, the first portable low-cost instrumentation tape recorder designed for medical, educational and industrial uses. This machine is onesixth the size and half the cost of previous recorders with comparable performance.

1962 (Continued)

- October, FR-1400, first true 1.5 megacycle instrumentation recorder capable of recording 14 tracks of data. The unit, completely transistorized, significantly extends capabilities in research instrumentation recording, particularly in the collection and processing of information radioed to earth from missiles and rockets.
- November, FR-1300, Portable instrumentation recorder, smallest high performance 14-track machine on the market, meets the most exacting requirements of space telemetry and research, yet its simplicity of operation qualifies it for standard use in medical, industrial and educational applications.
- December, the VR-1500 portable videotape television recorder for closed circuit applications in education, training, industry, medicine and sports, was introduced.
- December, VR-660 videotape recorder, weighing 130 pounds and priced at one-fourth the cost of previous videotape recorders, the VR-660 features operational simplicity, minimum maintenance requirements, tape compatibility with other recorders.

1963 - Ampex 2, Ampex formed the new Consumer and Educational Products Division, which occupied a 75,000 square-foot building in Elk Grove Village, Illinois early in 1964. This division increased Ampex participation in consumer and educational fields and combined all Ampex consumer products in one marketing organization for the first time.

- August 12, the company occupied its new 150,000 square-foot research and engineering and corporate headquarters building at 401 Broadway in Redwood City, California.
- October, Ampex announced plans for a new 22,000 square-foot plant at Nivelles (near Brussels), Belgium, for completion early in 1965, to manufacture Ampex instrumentation and computer tape recording equipment for Common Market customers. In addition, the company began construction of a new 44,000 square-foot plant to expand present Ampex facilities at Reading, England. Scheduled for completion in 1964, the new plant would double manufacturing capacity in the United Kingdom for magnetic recording and ferrite core memory devices.
- October 18, Ampex and Mandrel Industries, Inc., of Houston, Texas, announced a proposal for Ampex to acquire 80% or more of the outstanding shares of Mandrel stock, subject to the approval of Ampex shareholders. Mandrel is one of the world's largest geophysical service organizations; another of its divisions is a leading producer of precision photo-electric color sorting machines for food processing. Mandrel employed approximately 2,000 people at that time.
- November 4, Ampex acquired the major assets of Allegri-Tech, Inc., Western Division, to form the new Component Operations Department. Alegri-Tech, Inc. was the largest supplier of printed circuit boards for electronic circuitry in the Bay Area.

1963 (continued)

- March, Editec* time element control system, programming unit for the previously introduced Electronic Editor, which permits precise and automatic editing of video taped down to a single frame.
- September, Signature V, a complete home entertainment center including a compact videotape recorder, camera and video receivers together with complete home music center. The nine foot long center permits the owner to record one program for later viewing while watching another, and video camera takes home movies for immediate playback. This \$30,000 unit sold initially only through Neiman-Marcus of Dallas.
- September, "A" and "B" oxide instrumentation tapes, two new heavy duty tapes offering higher performance and longer life than previously available Ampex tapes, offered at standard prices.
- July, F-44, a complete line of high quality stereo tape recorders, including four different models for home, industry and education.
- October, AR-200R, the first longitudinal instrumentation recorder for mobile and airborne reconnaissance use with up to 750 kc frequency response.
- October 23, UST-4, a moderately priced stereo tape recorder for the home. Priced at \$299, the new UST-4 was manufactured under contract for the United Stereo Tapes department by a domestic contractor to provide an interim in this price class pending introduction of new Ampex models.
- October, the TM-3, a moderately priced high speed tape transport for a wide range of computer and systems applications.
- November, the TM-7 tape transport, embodying a revolutionary new tape drive with 80% fewer parts than previous tape drives. It offered new low maintenance and down time, improved tape wear.

1964 - January, Ampex entered into a joint venture manufacturing agreement with Toshiba (Tokyo - Shibaura Electric Company) to serve the Japanese market. The joint venture company is called Toamco (Toshiba-Ampex K. K.) and manufactures and markets video, computer memory and instrumentation products in Japan. (Approved September 21, 1964).

- March 3, Mandrel Industries, Inc. became a subsidiary when Ampex acquired 80% of the outstanding Mandrel shares.
- April 10, Ampex broke ground for an 85,000-square-foot plant on a 35-acre site in Colorado Springs, Colorado, to house production facilities for professional audio and video recorders. A pilot facility began operations in a leased building there.
- July, Ampex changed the name of United Stereo Tapes (UST) to Ampex Stereo Tapes (AST).
- August 1, the company received a \$875,000 contract to develop a Videofile document filing and retrieval system for the National Aeronautics and Space Administration, Huntsville, Alabama.

1964 (continued)

The company brought a total of 37 products to market in calendar 1964, including:

- January, Model MC-8A, a blaster for firing dynamite charges (ETL - Mandrel).
- March, Model MFR-11A, a 28-channel FM recorder for field seismic use (ETL - Mandrel).
- March, Model CSC-4, cross-section plotter for plotting seismic records (ETL - Mandrel).
- March, Model PGS-1, analog field recorder for vertical stacking of seismic data (ETL - Mandrel).
- April, Model PBA-400, amplifier system for use in processing equipment (ETL - Mandrel).
- April, Model SPA-1, long period amplifier for use in crustal studies (ETL - Mandrel).
- April, VR-2000 high band color and monochrome videotape recorder for broadcasting, capable of producing higher quality recordings and copies than any previous machine.
- April, MR-70 two-speed mastering recorder for the recording industry.
- May, Model "A" analog recording unit for transcribing various tape formats (ETL - Mandrel).
- May, Model EVP-9, miniature hydrophone for use in marine surveys (ETL - Mandrel).
- June, LVL-2, chart recorder for mapping the low velocity or weathered layer (ETL - Mandrel).
- June, two new families of consumer audio recorders, the 1000 and 2000 series. The 2000 series introduced simplified threading and automatic reverse features, which stimulates growth of the consumer tape recorder market.
- June, Travelvision, a combination of audio and videotape recorders to provide entertainment systems for airlines and other forms of mass transport.

1964 (continued)

- June, Model RCF-1, a system for remote control firing of a blaster (ETL - Mandrel).
- June, Model PNM-1, a noise monitor that is a field test unit for checking a geophone patch prior to use (ETL - Mandrel).
- June, Model EVP-10, a hydrophone for use to 600¹water depth (ETL - Mandrel).
- July, Z-5 Sorting Machine, a refined version of Z-350 sorting machine utilizing an internal air rejector (ESM -Mandrel).
- July, Ampex 145 tape specially formulated for VR-660/1500 videotape recorders with self-cleaning binder to enhance still-frame capability of recorders.
- October, Ampex 144 tape for transverse scan broadcast videotape recorder.
- October, mass computer memory with greatest combination of direct access speed and storage capacity of any comparable core memory.
- October, RS large-capacity coincident current computer memory.
- October, TM-7 series of computer tape transports.
- October, TM-11 high speed digital tape transport with new servo-driven single capstan drive for lower tape wear and higher reliability.
- October, Model FS-4 notch filter for rejection of 60 Hz (ETL - Mandrel).
- October, Model EV-21 borehole 1 Hz geophone (ETL - Mandrel).
- October, Model HPC-1 hydrophone compensator system for correcting the natural crystal response of a hydrophone (ETL - Mandrel).
- October, Selexso-5 Sorting Machine, a new, faster slim-line version of the original Z series. Solid state electronics were incorporated in the model (ESM - Mandrel).
- October, Model CFD-1 cable fault detector system for locating breaks or shorts in a cable (ETL - Mandrel).
- November, Model SA-400 24-channel seismic amplifier system for truck mounted use (ETL - Mandrel).
- December, Model MRA-3 analog (FM Magnetic) compositing system for office use (ETL - Mandrel).
- December, Selexso-10 Sorting Machine, repackage of the original "B" series machines utilizing essentially the same changes as the Selexso-5. The repackaging in the new series incorporated an increase in speed of from 350 to 450 rpm (ESM - Mandrel).

1965 - January 4, Ampex occupied Colorado Springs facility.

- January, a new plant was occupied in Hackensack, New Jersey, to permit expanded production of prerecorded stereo tapes for the consumer market.
- May, modernized and expanded Hong Kong ferrite core production plant.
- May, new construction doubled capacity of manufacturing plant at Reading, England.
- July, Ampex received an order for \$ 206,080 from NASA for additional Videofile system components, bringing total contract for the first system to \$1,081,080.
- October, Southern Pacific Company ordered the first Videofile document filing and retrieval system for commercial use to speed handling of waybills.
- October, Mandrel Industries, Inc., an Ampex subsidiary, occupied 245,000 square feet of new construction to house all Mandrel operations in Houston, Texas.
- Magnetic tape manufacturing facilities in Opelika, Alabama, were enlarged and plans announced for additional new construction.

Ampex introduced 40 new products in calendar 1965. Among them were:

- January, Model 332 automatic, solid-state, self-contained vidicon television camera for broadcast or closed circuit use.
- January, Model 322V viewfinder version of 322 television camera with 7-inch high-intensity monitor, 4-lens turret and provision for 2-way communications and remote control.
- February, VR-303 closed circuit videotape recorder priced at half the cost of comparable equipment. Also offered a mobile cart including camera and monitor called the Videotrainer. (Removed from the market the same year in view of VR-7000 development.)
- February, UV-3 Sorting Machine, a new version of the UVD-2 sorting machine which was originally developed to sort almonds utilizing optical scanners and ultra-violet. UV-3 version adds capability of being able to separate pecan worms from pecan pieces (ESM - Mandrel).
- March, AG-100 Cue-Matic* mat recorder which makes use of circular magnetic mats rather than tape reels or cartridges for playback of recorded announcements and other program material by radio stations.

*TM, Ampex Corporation

1965 (continued)

- March, MK V transistorized 4-1/2" image orthicon monochrome studio television camera.
- March, Model PGS-2, a three drum analog computer/stacker (ETL - Mandrel).
- May, industry's first three-year warranty on computer tapes for 832 and 838 long wear, heavy duty tapes.
- May, RF-1 low cost coincident current core memory complete in one modular unit, expandable by addition of modules.
- May, TM-12 high speed digital tape transport with single capstan drive for computer memory use.
- May, TM-9, a new digital tape transport more reliable and compact than any previous unit of comparable speed and capacity.
- May, AG-350, first all-transistorized, solid state professional audio recorder for broadcast studio use to be offered by Ampex.
- June, Model 770 AV, a complete audio teaching system designed for educational use, includes student headsets and a separate teacher's headset and microphone.
- June, 740 LD, an audio tape transport with automatic threading and dualcapstan drive to be used as a component for school language and study carrels.
- June, Card/Tape System, which converts computer data from punched paper tape to magnetic tape faster and at lower cost than previous methods.
- June, Model EVS-11, a "digital grade" 8 Hz geophone for land use (ETL - Mandrel).
- July, Model AC-3, a modified AC-1 product counter redesigned specifically for Campbell Soup Company to count oysters into oyster stew (ESM - Mandrel).
- July, VR-660B, advanced version of the VR-660 videotape recorder incorporating additional features. Replaces VR-660/1500 videotape recorders.
- July, FR-1600 series of wideband instrumentation tape recorders with 100 times the time base accuracy of previous instrumentation recorders. Includes portable and airborne models.
- July, FR-1800 instrumentation recorder offers higher reliability and lower cost operation than previous wideband recorders.

1965 (continued)

- July, Ampex 770 series tapes for extended bandwidth instrumentation recording.
- September, P/T-1000 converts computer data from punched paper tape faster and at lower cost than previous methods.
- October, Edicon,* an electronic editing accessory, gives increased versatility to the VR-660B series of compact portables.
- November, VR-7000 compact portable closed circuit videotape recorder, intended for heavy duty applications. And the VR-7100 Videotrainer mobile cart which includes camera, monitor and storage space.
- November, ATM-13 mobile and airborne compact digital tape transport, first of its size to generate computer-compatible data.
- November, Ampex 147 series professional quality videotape for VR-7000.
- November, Ampex 836 heavy duty computer tape for phase modulation recording.
- December, MK VII transistorized four-tube color studio television camera.
- December, Model CSC-6 seismic section plotter with a CRT plotting head (ETL - Mandrel).
- December, Model "E" analog input transcriber for A-D D-A systems (ETL - Mandrel).
- December, analog recorder for the Vibroseis geophysical exploration method (ETL - Mandrel).

1966 - February, Ampex Video and Instrumentation Division was split into two divisions, the Audio/Video Communications Division and the Instrumentation Division, to permit more specialized attention to the needs of the company's growing and diversified markets.

- February, Ampex occupied manufacturing plant at Nivelles, Belgium, to aid in serving the Common Market.
- July 18, Ampex acquired Geoscience, Incorporated, Cambridge, Massachusetts, an organization of research and applications scientists active in the field of digital seismic technology. Geoscience became an independent operating subsidiary of Mandrel Industries, Inc., Houston, Texas, an Ampex subsidiary.
- August, Ampex went to market with an issue of convertible debentures in the amount of \$30,000,000. The issuance of these debentures permits a reduction of short term debt and significantly strengthens the capital structure of the corporation for further growth.

1966 (continued)

- August, the company's Consumer and Educational Products Division established a videotape duplicating center at Elk Grove Village, Illinois to provide complete television tape copying services for users of Ampex videotape recorders. Tapes from any Ampex recorder and films May be duplicated for playback on any other Ampex recorder.
- September, Ampex stereo tape duplicating facilities were transferred from Hackensack, New Jersey, to Consumer and Educational Products Headquarters in Elk Grove to permit an increase in capacity and consolidation of stereo tape manufacturing and marketing in one location. Mastering facility remains at Hackensack.
- November, Ampex, originator and leading producer of high band videotape recorders, delivered its 500th high band color videotape recorder.
- December, Ampex received a contract for approximately \$ 2,000,000 from Bell Telephone Laboratories to develop a videotape system, an outgrowth of the Videofile document filing and retrieval system.

The 36 new products Ampex introduced during calendar 1966 included:

- January, AG-300 series solid state professional audio recorder for broadcast use.
- January, AC-2 product counter, a modified AC-1 for the counting of cherry halves and pineapple into fruit cocktail containers. Modification incorporates can feeding and take-away system to insure accuracy of count during line surges (ESM - Mandrel).
- February, FB-400 bin loop instrumentation recorder. Records and plays back on a continuous loop of magnetic tape.
- February, SDW-100 oscillograph for field or office. Uses dry or wet paper (ETL -Mandrel).
- February, analog correlator for Vibroseis field recordings (ETL - Mandrel).
- March, VR-1200 high band broadcast color and monochrome videotape recorder for medium and small television stations.
- March, VR-1100E, a modification of the VR-1100 broadcast television recorder designed for mobile use, two-thirds the size of the studio model. VR-1100.
- March, a variety of important accessories to enhance the versatility of both broadcast and closed circuit videotape recorders including an automatic velocity compensator, a low band switchable standards unit and a head alignment unit.

1966 (continued)

- March, Ampex doubled the line of consumer furniture-style hi-fi speaker systems, including models 915, 1115, 2115, 4010, and added several microphones to the line.
- April, RF-2 and 3, in addition to earlier introduced RF-1, provide a new series of economical core memories expandable by modules and easier to maintain than previous memories of comparable capacity.
- April, SA-500 binary gain amplifier system.
- May, VR-6000 series low-cost, compact portable closed circuit videotape recorder for many applications in industry, business, medicine, sports, the performing arts and government.
- May, MCS-2500 media conversion system' converts computer data from punched paper tape and punched cards to magnetic tape.
- June, Model FMZ-100 sorting machine sorts whole peeled potatoes or any other product that can be conveyed in water (ESM - Mandrel).
- July, new series of consumer stereo recorders, Models 960, 985 and 2100. One, the 985, combines a stereo AM/FM receiver and a stereo tape recorder in a single cabinet.
- September, EVP-23 hydrophone for use in streamer cables (ETL - Mandrel).
- October, SHV-100, a servo-hydraulic vibrator control system for Vibroseis operation (ETL - Mandrel).
- October, three professional quality closed circuit television monitors.
- October, AC-911 compact, high performance processing amplifier for closed circuit and 2500 MHz transmission for VR-6000 and VR-7000 videotape recorders.
- October, EF-100 special effects generator for four-channel split screen operation for broadcast and closed circuit television use.
- November, Selexso-2000 sorting machine sorts products such as rice, plastic pellets and sesame seeds at high speed. Product capacity is 600 rpm. It utilizes a magnetic memory system and incorporates solid state electronics (ESM - Mandrel).

1966 (continued)

- November, VR-6175 closed circuit videotape recorder/television receiver combination permits recording of television broadcasts for instant replay. Companion camera, Model CC-6450, allows user to make own live recordings.
- November, SUM IT*, a digital summing field recorder for seismic research. The recorder will record individual pops or can sum up to 32 sequential seismic recorders, each of which may have 24 data channels (ETL - Mandrel).

1967 - February, Ampex received a \$358,000 contract to manufacture and install the first true random access audio teaching system in the United States for the Oak Park and River Forest High School, Oak Park, Illinois.

- February, American National Insurance Co. awarded Ampex a contract for a Videofile document filing and retrieval system to automate the handling of more than 23,000,000 documents pertaining to insurance policies stored on video tape.
- April, Ampex of Canada, Ltd. , began manufacturing operations in Canada with initial production of three lines of audio tape recorders for home and educational use at a new plant in Malton, Ontario.
- April, Ampex Stereo Tapes, announced it will begin producing music on cassettes.
- June, Ampex received its second "Emmy" award from the National Academy of Television Arts and Sciences for the company's development of high band color videotape recording.
- July, Ampex of Canada Ltd. began fabrication and marketing of prerecorded stereo music tapes for home entertainment.
- July, Contracts totaling more than \$ 3.7 million for closed circuit television equipment were received by Ampex from the U. S. Continental Army Command (CONARC).
- September, Sandia Laboratory awarded Ampex two contracts for development, with Sandia Systems and Procedures engineers, of a Videofile document filing and retrieval system with new features adapted to the automation of various Sandia filing operations.
- October, Marine Analog Plotter (MAP) which provides an instantaneous profile of the submerged shallow sediments along the line of progress of a seismograph crew (ETL - Mandrel).
- November, Ampex and Townsend Associates, Inc., Feeding Hills, Massachusetts, jointly announced agreement whereby Ampex will acquire all the outstanding shares of Townsend.

*TM, Mandrel Industries, Inc. Patent applied for.

1967 (continued)

- November, It was announced that Ampex would more than double its manufacturing facilities in Colorado Springs over the coming 15 months. Site preparation was begun for new construction that will add 116,000 square feet of plant space to the 100,000 square feet existing.
- December, the 1000th high band videotape recorder manufactured by Ampex since the company introduced high band recording in 1964 was delivered to WCIA-TV (channel 3), Champaign, Illinois.

Ampex introduced 44 new products in calendar 1967. Among them were:

- January, SDA-1 binary gain amplifier system (miniature) (ETL - Mandrel).
- January, ACS-1, a cannery system to code filled cans by product prior to cooking and to reclassify by product after cooking. Allows various products to be intermingled during the cooking process, which substantially increases cooker capacity (ESM - Mandrel).
- January, AG-440 Series audio recorders for various professional recording uses. It is a new generation of the 350 and 351 Series recorders, most widely used professional audio recorder/reproducers ever built. The AG-445 is a playback only version.
- February, AG-500 Series, a new series of compact portable professional audio recorders with solid state electronics, is an advanced generation of widely used PR-10 recorder/reproducers.
- February, VR-7003, first closed circuit videotape recorder capable of record/playback at both 525-line and 625-line television standards, is designed for use in international communications.
- March, Model CC-6007, compact, low-cost television camera for any closed circuit applications, has automatic electronic circuitry eliminating need for external controls.
- March, HS-100, high band high quality color recording system capable for the first time of providing color instant replays in slow motion and stop action.
- March, VR-3000, battery-powered portable videotape recorder and camera combination weighing less than 50 pounds, is smallest standard broadcast recorder ever built. VR-3000 is designed primarily for remote high speed taping of news events by a single operator.

1967 (continued)

- April, VR-7500C, first compact color videotape recorder available for less than \$50,000. Also available as VR-7500 monochrome recorder. Model TR-921, 20" color television receiver modified to make possible off-the-air recording and playback is also available.
- April, a series of accessories designed to enhance the operation of videotape recorders, including: Mark II electronic programmer to permit precise timing control of electronic tape editing and cueing; solid state video and pulse distribution amplifiers for closed circuit television and broadcasting; multilock system synchronizer to synchronize separately recorded sound with video picture; and a head alignment unit which permits adjustment of video head compensation in all VR-2000 videotape recorders without use of external test equipment.
- April, Ampex Stereo Tapes announced initial release of stereo music in cassette format.
- April, theater sound system featuring solid state electronics and occupying about half the rack space of previous sound systems.
- April, Model CC 326, the first electronic viewfinder television camera designed specifically for use with videotape recorders as well as general closed circuit television and broadcast applications and priced \$1, 100 below any other studio-type viewfinder camera.
- May, Universal Colortec*, new videotape recorder accessory designed to handle recording and playback of every color television standard in use in the world today.
- May, an international version of the Automatic Velocity Compensator which eliminates color hue banding from VR-1200 high band videotape recorders.
- May, AL-500, a new long play professional audio recorder/reproducer for logging applications which permits more than 34 hours of recording on a single 7-inch reel of tape.
- June, Micro Series, a new line of tape player/recorders for home and portable use priced from \$100 to \$ 200 - the lowest priced recorders ever offered by Ampex. Micro 20. A combination AC-DC battery powered portable monaural recorder in carrying case. Micro 50. A walnut encased stereo player/recorder deck designed for use with any stereo system. Micro 85. A complete system including a walnut encased player/recorder with dual power amplifiers, preamplifiers.

1967 (continued)

- July, EX+, a new stereo tape mastering and duplication process that substantially reduces background noise during tape playback.
- September, 404 Series, a new low noise mastering audio tape for use with professional and consumer recorders.
- September, GTM-14, compact digital tape transport which generates computer-compatible data and features tape speeds up to 105 inches per second.
- September, FR-950, a new magnetic instrumentation tape recorder that records two channels of signal data with bandwidths up to 6.0 Megahertz each and reproduces data with a peak time displacement error of only 25 nanoseconds between the two channels -an unprecedented performance combination.
- October, AG-440-8, an eight-channel version of the AG-440 Series of professional audio recorder/reproducers for use by master recording studios.
- October, AG-1000-24, AG-1000-16, two new solid-state multi-channel audio recorder/reproducers.
- October, Model ADM-500A Duplicator Master, and AD-150 Duplicator Slaves, a high speed system for duplicating cassette stereo tapes which permits recording 10 copies of an hour long program in two minutes.
- October, BTM-7, BTM-9, BTM-12, Ampex began delivery of the first line of buffered magnetic tape memories ever to be offered as standard products priced significantly lower than previous, custom-made buffered tape memories.
- October, FR-1260, Ampex began deliveries of a new instrumentation magnetic tape recorder with greater time base accuracy and less signalmasking flutter than previously available in low-speed, low-frequency record/reproduce applications.
- October, 404 Series Tape, a new low noise mastering audio tape for use with professional and consumer recorders.
- October, AG-600 Series, a new solid state generation of the portable 600 Series professional audio recorder/reproducers.
- October, AA-620, a solid-state, portable 20 watt amplifier/speaker system, for professional sound reproduction.
- October, AM-10, a professional quality portable 6-position, 2-channel stereo/mono mixer.

1967 (continued)

- October, ADD-IT* digital on-line summing system, enables conventional seismic recorders to be converted to digital summary recorders (ETL - Mandrel).
- November, Model VR-2000B and VR-1200B, two new high band color videotape recorders.
- November, BC-100, a color hand-held broadcast camera weighing approximately 35 pounds and designed for one-man coverage of news and sports events.
- November, HD-16, a new hand-held demagnetizer that demagnetizes complex record/reproduce head assemblies of high-frequency instrumentation tape recorders to a greater degree than previous units of its type.
- November, Model 750, a compact stereo tape deck offering monitoring, sound-on-sound, sound-with-sound, echo and duet effects, at a price of \$199.95.
- November, VR-5000 and VR-7800, the VR-5000 is the smallest, lowestpriced portable the company has ever offered, the VR-7800 is a closed circuit studio production model with monochrome electronic editing and other advanced features for color or monochrome recording.
- November, RF-4, an 80,000-bit core memory with data access time of 400 nanoseconds and full cycle time of 1 microsecond.
- November, EF-200 and VSF-100, two new television production accessories for broadcast and closed circuit use. The Model VSF-100 video switcher/fader is a vertical interval switcher which allows smooth transition from one scene to another with no picture disturbance.
- November, TM-16, a new, economical digital tape transport that is pluginterchangeable with IBM units and offers straight-line tape loading, semi-automatic threading and greater reliability than previous comparable transports.
- November, RM Memory, a new mass core memory for computers which offers data access time of 1.5 microseconds and capacity of up to 20 million bits -the highest speed/capacity combination ever developed.
- November, Model RG, a new modular-expandable core memory with cycle time of 900 nanoseconds, data access time of 350 nanoseconds and capacities up to 5 million bits.
- November, 18-mil. cores, a new line of ferrite cores for memory stacks, which makes the Ampex line of cores one of the broadest in the industry.

* TM Mandrel Industries, Inc. Patent applied for.

- 1968 - January, Production began in the new 35,000 square foot addition to the Magnetic Tape Division Manufacturing facility in Opelika, Alabama. The new modern facility provides substantial efficiencies for the manufacture of high quality magnetic tape.
- February, a new operating division -the Videofile Information Systems Division-was formed to handle the company's growing activity in information storage and retrieval devices.
 - February, more than \$1 million in Ampex high band color equipment was used to record the 1968 Winter Olympics in Grenoble, France.
 - April, Ampex delivered its 1,000th Model TM-7 digital tape transport, the computer industry's most widely used single capstan unit, just four years after the product's introduction.
 - April, the first true random access audio information retrieval system in the United States was installed by Ampex at the Oak Park and River Forest High School, Oak Park, Illinois.
 - May, The Instrumentation Division formed an industrial products department to handle the division's growing sales for instrumentation recorders to industrial and medical markets.
 - May, Ampex delivered the 500th unit of its Model RF core memory, one of the most extensively used core memories in the computer industry, less than three years after the product's introduction.
 - May, the Audio/Video Communications Division -the company's largest-was divided into three separate divisions. They are: the Video Products Division, the Professional Audio Products Division and the Special Products Division.
 - June, Ampex established a new department to develop and manufacture precision magnetic discs for recording and information storage requirements. Located in Sunnyvale, California, the new activity is named the Ampex Magnetic Disc Department.
 - June, the Videofile Information System Division occupies new quarters at 1020 Kifer Road, Sunnyvale, California.
 - July, Ampex began construction of a new two story 32,000 square feet corporate financial center in Redwood City.
 - August, Ampex received a \$1.3 million contract from American Republic Insurance Company for a Videofile information system.

1968 (continued)

- September, the Ampex Consumer and Educational Products Division headquartered in Elk Grove Village, Illinois, was divided into four separate divisions: Ampex Stereo Tapes Division, Consumer Equipment Division, Industrial and Educational Products Division, and Ampex Service Company. Collectively they are known as the Consumer and Educational Products Group.
- October, more than \$ 5 million worth of Ampex color and monochrome videotape recorders are used at the 1968 Summer Olympic Games in Mexico City.
- October, the largest domestic contract for closed circuit videotape recording systems in the history of Ampex was received from National Cash Register Company. The initial order consisted of 248 Model VR-5000 videotape recorders and a similar number of Model CC-6455 television cameras.
- November, Ampex received a \$425,000 contract to design and install the second phase of a scheduled three-phase instructional center (called PYRAMID) at Oak Park and River Forest High School, Oak Park, Illinois. The second phase of the project included installing 50 more student positions and adding a basic video capability to the system.
- November, Ampex received an order from American National Insurance Company for additional Videofile information system equipment to automate the handling of insurance policy documents. The new contract enlarged an earlier order by the Galveston, Texas, insurance company.
- December, Ampex announced the adaptation of videotape recording techniques to computer systems which have the potential of increasing the capacity of bulk random access computer memories a thousandfold. An experimental system developed in the research laboratories at Redwood City stores up to 50 billion units (bits) of coded information on single 10-1/2 inch reels of magnetic tape; approximately 1,000 times the capacity of typical tape reels presently used with computers. The information can be accessed and transferred, on the average, in less than ten seconds.
- December, Ampex announces it will undertake an \$ 8, 250,000 building program at its Redwood City headquarters site if arrangements can be worked out with the city to develop the area into a better integrated industrial complex. The proposed program included a new 100,000square-foot corporate headquarters building, a 25,000-square-foot administration center for the company's instrumentation division and a 54,000-square-foot magnetic tape laboratory.

1968 (continued)

Forty-nine new products were introduced to the Ampex line during 1968.

- January, 304 and 301 Series Tape, two new series of consumer audio tapes -the new low noise Ampex 304 Series which offers minimal background noise and improved high frequency response at standard slow recording speeds and the Ampex 301 Series, a multi-purpose tape for recording at all popular tape speeds.
- January, Hydro-Sort, the first machine in food-processing history to color-sort whole peeled potatoes, french fries and certain varieties of whole peeled onion successfully and economically was placed on the market by Mandrel Industries, Inc.
- March, TU-40, a new flutter meter that measures speed variations in instrumentation tape recorders with twice the accuracy and 20 times the speed of conventional, multi-equipment methods.
- March, 301 Series Tape, a new blank cassette audio tape for consumer recording playback.
- March, SP-700, a new magnetic tape recording system which can simultaneously record or reproduce up to 33 channels of low-frequency signal information.
- April, VR-3000 and BC-300, Ampex began deliveries in May of the first production units of its battery-powered portable broadcast VR-3000 high band color videotape recorder and BC-3000 monochrome camera combination.
- April, HS-200, a new high band color disc recording and editing system designed to produce color commercials and other television programs with greater speed and flexibility than ever before possible. The Model HS-200 is a computer controlled disc system that records frame-by-frame color animation and permits the operator precise and almost immediate access to any recorded frame from a push-button editing console.
- April, BC-200 a color broadcast television camera approximately onethird the weight and two-thirds the cost of conventional models designed for both studio and remote use.
- April, Model 1450, a compact audio tape deck featuring automatic reversing and replay, simplified threading, sound-with-sound and tape monitoring, and selling for \$ 299.95.
- April, 3DM-750, a new core memory that offers data access time of 300 nanoseconds, stores up to 5 million bits and offers greater reliability than any memory of its speed and capacity range.
- April, MM-1000, a new series of multi-channel audio recorder/ reproducers for use by master recording studios, television production companies, and motion picture production companies.

1968 (continued)

- May, SE-20, an automatic tape degausser designed to errase reels of magnetic tape faster and more thoroughly than previous degaussers.
- May, 661 Series Tape, a new cassette duplicating tape for use by manufacturers of recorded consumer audio tapes.
- May, TA-100-BT, the first Ampex 100 kw UHF klyston television transmitter is installed at station WHCT-TV (Channel 18), Hartford, Connecticut.
- May, Vedeo Head Optimizer that reduces the time needed to optimize video heads on Ampex VR-2000 and VR-1200 Series high band color videotape recorders from approximately 15 minutes to less than 15 seconds.
- May, 870 Series Tape, a new IBM-compatible computer tape featuring an improved binder formula.
- May, SDW-200 electrostatic monitor camera, that produces seismic records economically and efficiently (ETL - Mandrel).
- June, Micro Series, four new models were added to the Ampex Micro Series of cassette recorders and players. Micro 1 -a portable, monaural cassette tape player designed for music listening anywhere. Micro 5 -a walnut-encased, solid-state stereo cassette playback deck that connects to virtually any stereo system. Micro 12 -a solid state, portable monaural cassette player/recorder with microphone and carrying case. Micro 30 -a portable AM/FM radio and cassette monaural player/recorder combination. The Micro 30 is battery powered or may be plugged into any AC outlet.
- June, VR-5003, an international version of the smallest portable closed circuit videotape recorder.
- June, Model CC-327, a new closed-circuit studio television camera designed for local or remote control in multi-camera operations.
- June, Model 761 and 1461, two portable stereo tape recorder systems, featuring a new concept in speaker use and storage. Model 761 and 1461 tape recorder systems feature new cube-shaped speakers that nest in the recorder cabinet for carrying or playing.
- June, Micro cassettes, a new low-cost (\$1. 98 each) series of cassette stereo tapes featuring popular music.
- June, Model 715, a high-performance consumer speaker system.
- July, Electronic Timer, an electronic video tape timer that permits precise timing of recordings on Ampex VR-2000 and VR-1200 Series high band color videotape recorders and makes possible remote control of other studio television equipment.

1968 (continued)

- August, Model VR-4900 and VR-5100, two new additions to the Ampex line of compatible closed circuit videotape recorders/reproducers.
- September, FR-1900, a new high performance instrumentation tape recorder more flexible and easier to operate than any previous comparable system.
- September, TM-16200, a high performance, single-capstan tape transport designed for third-generation computer manufacturers and system developers which is an expansion of the TM-16 single-capstan product line.
- October, Micro 12, a new version of the Micro 12 portable cassette tape recorder/player, featuring a leatherette carrying case with built-in speaker.
- October, 161 Series Video Tape, a one-inch-wide video tape offering improved dropout performance and reduced recorder head wear.
- October, SDW-300 electrostatic monitor camera for production of dry permanent seismic records. The SDW-300 is a more sophisticated version of the previously introduced SDW-200 (ETL - Mandrel).
- October, DC-100, digital data correlator for eventual analog display. The DC-100 on line correlator is used for filter functions with any data gathering or pulse recognition equipment (ETL - Mandrel).
- November, Micro Series, three stereo additions to the Micro Series of cassette tape recorders and players. Micro 90 -The Micro 90 playback deck has an automatic changer that plays one side of up to six cassettes automatically. Micro 95 -The record/playback system version of the Micro 90 also permits automatic playback of one side of up to six cassettes. Micro 88 -The Micro 88 portable cassette recorder/player reproduces taped music with 20 watts of power through two slide-on speakers.
- November, Model 755 and 1455, two stereo tape decks, which include pause control. The 755 deck also offers tape monitoring, sound-with-sound, sound-on-sound, echo and duet effects. The 1455 features tape monitoring, sound-with-sound, automatic reversing and replay, and simplified threading.
- November, Model RGX, a compact core memory occupying approximately one-third the space of previous memories with comparable speed/capacity characteristics.
- November, Model TM-7, a complete IBM-compatible tape memory system priced at approximately half the cost of previous complete systems of its size and performance.

1968 (continued)

- November, 25DM-500, a new core memory with a cycle time of 500 nanoseconds and capacities of from 323,000 to five million bits.
- November, Model 100BT, a 100 watt UHF translator designed to improve and extend television reception in remote areas..
- November, VR-5103, an international version of the Ampex VR-5100 closed-circuit videotape recorder.
- November, Model CC-328 and CC-330, two closed circuit, studio-type television cameras -the 330 for use with a Plumbicon* pickup tube and the CC-328 for use with a separate mesh vidicon tube.
- November, two new options for the Ampex Model VR-7800 videotape recorder -a color dropout compensator and a RF Monitor, provide the VR-7800 with a level of sophisticated operation not previously possible.
- November, BC-110, VR-3000 System, a portable broadcast color camera/recorder system which, for the first time, permits color videotape recording of news, sports and other remote events for immediate playback on the air.
- November, VR-7400, a time lapse closed circuit videotape recorder that records up to 76 hours of video information on a single reel of tape.
- November, ROBRAY I, a new geophysical exploration vessel able to operate in remote, unexplored ocean areas longer and more accurately than previous commercial ships of its type.
- December, 3DM-650, a core memory with faster access time (275 nanoseconds) and cycle time (650 nanoseconds) than previous memories of its type.

*TM, NV Philips' Gloeilampenfabrieken

1969

- February, the Computer Products Division began delivery of the Model TMZ low-cost digital tape memory system against a backlog of orders totalling more than \$1.5 million.
- February, the Magnetic Tape Division began construction of a 25,000 square-foot addition to its tape accessories plant in Opelika, Alabama, to house additional manufacturing facilities for tape reels, cartridges, cassette cases, plastic tape boxes and assorted metal components used in the packaging of magnetic tape.
- March, Ampex announced purchase of the audio and video switcher line of AMP Inc. , a manufacturer of various electronics components. Under terms of the cash purchase agreement, Ampex received inventory, manufacturing, design and patent license rights to AMP switchers, which range from manual to computer-controlled models.
- March, Ampex announced it concluded negotiations for the acquisition of all of the outstanding stock of Bogner Antenna Systems Corporation, New York, and Electromagnetic Radiation Laboratories (ERL), Inc., Massachusetts. Bogner manufactures UHF, VHF, and ITV television antennas and translator antennas. ERL produces a full line of coaxial products for RF transmission systems including transmission lines, diplexers, harmonic filters and other accessories. Manufacturing operations of both firms were transferred to the Ampex RF systems department, Feeding Hills, Massachusetts.
- April, Ampex received a contract from Los Angeles County for a \$5.6 million Videofile information system, the largest single order in Ampex history, to automate and speed handling of law enforcement records for the County Sheriff's Department.
- April, the first seismic survey on the continental shelf of South Vietnam began, conducted by the Ray Geophysical Division of Mandrel Industries, Inc.
- May Ampex received a \$400,000 contract to design and install the world's first true random access video system as the third part of a scheduled three-phase instructional resource center at Oak Park and River Forest High School, Oak Park, Illinois.
- June, the RF systems department of Ampex relocated to a 45,000 square foot building in Westfield, Massachusetts. Located about five miles from the original location, the new facility provides four times more space than the old site.
- June, Ampex delivered its 1,000th Model VR-2000 high band color videotape recorder to the CBS Television Network studios in New York City.
- June, Ampex announced plans to construct a magnetic tape manufacturing plant in Battice, Belgium, to furnish the Common Market, Scandinavian, North African and Middle East markets with tape for all magnetic recording applications.
- June, Mandrel Industries, Inc., consolidated the manufacture of geophysical cables and geophones in its newly expanded Cable and Sensor Division which was formed early in the year.

1969 (Continued)

- June, Ampex began negotiations to acquire a 20-acre site in the Marina del Rey area of Los Angeles to build a new 260,000 square foot plant to house the Computer Products Division. The building is scheduled for completion in spring, 1971.
- July, Ampex received a \$4.1 million order from the United States government to design, build and deliver an on-line random access bulk computer memory system with a storage capacity of two trillion bits of information. The storage capacity of the system is approximately 1,000 times greater than that of the largest random access erasable and updatable memory system available. The new system, called the terabit memory (TBM*) system, adapts videotape recording techniques to computer technology for the first time.
- July, Ampex received a contract totaling \$1.5 million to design and install a complete random access audio/video instructional system for Pima College, Tucson, Arizona.
- July, construction began on a \$3.5 million research and development laboratory for the Magnetic Tape Division in Redwood City, California. The two-story, 54,000-square-foot facility will house administrative offices, research and testing laboratories, process development and pilot line facilities for producing experimental magnetic tapes, and is scheduled for completion in May, 1970.
- August, the Model TM Z digital tape memory system received an "Award of Excellence" in an industrial design competition conducted by the Western Electronic Show and Convention (WESCON). The Ampex TMZ was among seven products to win "Award of Excellence" rating. The seven winners were selected from among approximately 90 entries.
- August, Ampex entered the record business. Headquartered in New York City, the Ampex Record Company will produce and market single and LP discs in a variety of styles, primarily popular music.
- August, The Terabit Memory Systems department was formed as part of the Research and Advanced Technology Division. The department will manufacture the new Ampex Terabit Memory System.
- September, a laboratory model of a new analog electron beam recorder/ reproducer with a useful signal band width of 100 MHz--more than 10 times that of previous instrumentation recorders was demonstrated for the first time.
- September, Ampex began manufacturing recorded tapes in Nivelles, Belgium, for marketing in Great Britain, Europe, Africa and the Middle East. The Nivelles plant began producing recorded cassette tapes and will begin production of 8-track cartridge tapes early in 1970.
- October, Charles P. Ginsburg, Ampex Corporation vice president - advanced development, received the Franklin Institute's Howard N. Potts Medal for his leadership role in the development of the first practical videotape recorder.

*TM Ampex Corporation

1969 (Continued)

- November 1, 1969, Ampex celebrated 25 years in business.
- November, Ampex established a ferrite materials department to manufacture and market high quality microwave ferrite products. The department offers ferrite materials in standard or custom design for microwave communication and radar applications. The department also offers a series of lithium ferrites, which will be the first microwave lithium ferrite material on the market. Lithium ferrites provide stable performance at a wider range of temperatures than other ferrite materials.

1969 - 39 New products were introduced in 1969:

- January, ACM-100, new automatic can marker/sorter system capable of substantially reducing canning costs and increasing cookroom utilization introduced by Mandrel Industries, Inc.
- January, HSS-100, Hydro-Sort, high volume system that automatically sorts raw french-fry cuts of potatoes by color (ESM - Mandrel).
- January, 1000BT, a 1000 watt translator designed to improve reception for UHF stations in areas where signal reception is of low quality. The new translator consists of a solid state 2.5 watt UHF translator and a 1000 watt UHF linear amplifier with an air-cooled Klystron having typical service life of more than 15,000 hours.
- January, DC-100, the first device to correlate digital data for eventual analog display. The Model DC-100 on-line digital correlator is suitable for filter functions with any data gathering or pulse recognition equipment, such as receiving systems or recorders used in radar, sonar, and other echo-sounding applications. Previous correlators handle only analog data. (ETL - Mandrel).
- January, a new generation of the AG-440 Series professional audio recorder/reproducer. The new AG-440B Series is designed for master recording studios, radio stations and professional recording studios, radio stations and professional recording uses in education, industry and government. It is an advanced version of the company's 350 and 351 Series recorders.
- January, 163 Series, a new one-half-inch wide video tape for use with closed circuit videotape recorders offering improved dropout performance and increased recorder head life.
- January, SDW-300, a new electrostatic monitor camera that produces permanent seismic records more economically and efficiently than previous cameras (ETL - Mandrel)
- March, TA-8000, a transmitter for VHF television stations which is the first to employ solid-state RF circuits up to 75 watt level with a solid-state modulator. The TA-8000 Series is the first entry by Ampex into the VHF transmitter field.
- March, TD-7020, 10/20 watt FM transmitter designed for college and university radio stations and other education uses.
- March, Micro 86, the most powerful cassette stereo system on the market, boasting 20 watts of peak music power, added to the Ampex Micro series of cassette player/recorders.

- March, RA-4000, new random access tape controller which for the first time automatically permits synchronized search, cue and playback of one or more broadcast videotape recorders.

1969 (Continued)

- March, 404 Series, low noise mastering audio tape for use with professional recorders.
- March, color electronic editing capability added to the Ampex Model VR-7800 videotape recorder, enabling users to assembler segments of a video tape or insert audio or video material into previously recorded tape.
- March, AST-1 Tune Tripper, a portable, monaural cassette player for music listening anywhere.
- March, 3DM-3000, new low-cost magnetic core memory that is smaller and simpler to incorporate into systems than previous core memories of its performance and price range.
- April, PR-500, a low-cost portable scientific and industrial magnetic tape recording system convertible for use with 1/4 inch or 1/2 inch tape.
- April, Micro 7, a compact monaural cassette recorder, the smallest addition to the Ampex Micro Series of cassette player/recorders.
- April, 361 Series Tape, two new blank cassette audio tapes allowing 90 and 120 minutes of recording and playback added to the 361 Series of cassette tape.
- May, 3DM-2000, a new core memory which offers up to 20 percent more data storage per inch of rack space than previous core memories of its type. The new memory is modular-expandable up to 5 million bits. That capacity can be accommodated in a standard 19-inch relay rack 27 inches high. The memory has an access time of 800 nanoseconds and a full cycle time of 2 microseconds.
- May, Micro 40 and Micro 42, two new automobile stereo cassette systems, one a recorder/player, the other a playback-only unit. The new Micro 42 provides monaural recording and stereo playback. The Micro 40, a stereo playback-only unit. They are the first recorder/players offered by Ampex for automobile use.
- June, Model 1467 and 767, two new portable stereo tape recorder systems with a variety of special features for the recording hobbyist.
- June, three new portable cassette player/recorders which operate on household current, on batteries for portable use, or can be adapted to automobile current. The new models are: Micro 32, featuring an AM/ FM receiver with a built-in antenna and a telescopic FM antenna. The Micro 24, a deluxe portable recorder/player. The Micro 14, featuring a plug-in dynamic microphone that can be attached to an extension cord for remote operation.

1969 (Continued)

- June, three new stereo cassette player/recorders - two units which deliver an unprecedented 50 watts of peak music power, and a recorder/ player deck with built-in stereo mixer were added to the Micro series of cassette music systems. The Micro 87 player/recorder and the Micro 87R, a player/recorder with an AM/FM stereo receiver, with 50 watts of peak power, are designed to serve as control centers for component hi fi systems.
- June, Coaxial Products and Antennas, a complete line of coaxial products and UHF and VHF antennas following the acquisition of Bogner Antenna Systems Co. and Electromagnetic Radiation Laboratories.
- June, Ampex delivered one of the world's fastest brushless D. C. motors, capable of up to 90,000 revolutions per minute, to the Naval Ordnance Laboratory, Silver Springs, Maryland, under an order for four motors.
- June, VP-4900C, a new closed circuit color videotape player priced at \$1,950. The Model VP-4900C player is the first color videotape playback unit to use one-inch-wide tape.
- July, VR-7500X, a new closed circuit videotape recorder with higher resolution than any previously available.
- August, 661 Series, cassette duplicating tape for use by manufacturers of recorded consumer audio tapes was introduced in a new 10-1/2 inch reel carrying 6000 or 7200 feet of tape.
- September, SSW-300, Mandrel Industries, Inc., began deliveries of a new multi-channel recording oscillograph that produces permanent, immediately viewable chart recordings at one-third the cost of previous methods. (ETL - Mandrel)
- September, BC-210M, a new monochrome broadcast television camera which can be easily converted to meet future color requirements of educational, military and commercial television. Designed for studio and remote use, the BC-210 has a single plumbicon pickup tube and is a monochrome version of the Ampex BC-210. *
- September, MM-1005, a playback-only version of the MM-1000 Series multi-channel recorder.
- November, a phototype laser beam recorder with a potential bandwidth up to ten times greater than present wideband recorders was delivered to a branch of the United States government. The optical device, designed for precision transverse recording on 16 mm film, has a bandwidth of 5 MHz and uses a track 1/40 the width of the track of conventional magnetic videotape recorders.

*TM, Philips' Gloeilampenfabrieken.

1969 (Continued)

- November, the VR-1500E, the lowest priced videotape recorder that allows high quality assemble editing of any monochrome video signal was placed on the market. Assemble editing allows a user to add picture and sound information to the end of an existing recording without picture or sound disturbance at the transition.
- November, CC-450, a new compact viewfinder television camera for closed circuit production work offering exceptional performance for its price range. The new camera features crisp, high contrast pictures through the use of a 2/3-inch separate mesh vidicon picture tube with a 50 gauss focus field. Automatic light level control provides uniform picture output over wide variations in scene illumination.
- November, VS600, a new solid state video switcher system using digital control logic for faster, more efficient operation was placed on the market. The new switcher uses computer language communication in the form of serially coded digital logic between control panel and electronic rack matrix to greatly reduce interconnecting wires and increase reliability and performance.
- November, DR-10, a low cost television disc recording system for immediate and repeated analysis of recorded monochrome pictures. The DR-10 Series of video disc recorders is designed for industrial and research applications where slow or stop motion playback is required for close study of recorded television pictures. It can be used for time and motion studies, to analyze machines in operation and for various research activities.
- November, TMX, a complete digital tape memory system priced from \$2,000 that offers full computer compatibility and restriction-free programming. The Model TMX uses tape guides identical to those of IBM tape units to assure information interchange. The new tape memory features bidirectional programming and read-after-write operation.
- November, Complete, self-contained phase encoding capability (1,600 characters-per-inch) was added to five digital tape memory product lines. The new systems are the first independently-produced tape memories to incorporate such phase encoding features as error detection and correction, preamble and postamble generations and stripping, deskewing, and decoding to NRZI.
- November, Planar pluggable stacks, a new line of radically simplified core stacks that reduce the costs of manufacturing core memories. The new Ampex planar pluggable stacks eliminate all cabling, connectors, stack hardware and scores of other subassemblies necessary since the development of core memories.
- November, PC-800, the first precision digital cassette specifically designed for cassette tape drives used as computer peripheral devices.

TWENTY YEAR FINANCIAL SUMMARY

	1949	1950	1951	1952	1953
Net sales and operating revenues	\$366,000	\$ 388, 000	\$968,000	\$2,302,000	\$3,549,000
Research and development expense	31,000	23, 000	36,000	67,000	119,000
Federal and foreign income taxes			15, 000	91, 000	214, 000
Net earnings	(3,700)	(60, 600)	115, 000	77,000	89,000
Earnings per share*			.07	.05	.05
Working capital	92, 000	167, 000	288, 000	310, 000	803, 000
Current ratio	1.8 to 1	5.3 to 1	2.4 to 1	1.3 to 1	1.7 to 1
Long-term debt	26,000	175, 000	186,000	150,000	645,000
Shareowners' equity	131,000	58,000	184,000	248,000	365,000

*Based on common shares outstanding at each year-end, adjusted for stock splits, and on average shares outstanding beginning 1963.

	TWENTY YEAR FINANCIAL SUMMARY (continued)					
	1954	1955	1956	1957	1958	1959
Net sales and operating revenues	\$5,418,000	\$8,164,000	\$11,140,000	\$20,568,000	\$33,915,000	\$49,167,000
Research and development expense	369,000	503,000	927,000	1,469,000	2,439,000	3,857,000
Federal and foreign income taxes	44,000	397,000	381,000	1,247,000	1,810,000	2,847,000
Net earnings	26,000	366,000	373,000	993,000	1,655,000	2,914,000
Earnings per share*	.01	.09	.08	.16	.26	.39
Working capital	1,733,000	2,820,000	3,391,000	7,791,000	13,338,000	29,904,000
Current ratio	2.0 to 1	3.2 to 1	2.3 to 1	2.0 to 1	2.9 to 1	3.9 to 1
Long-term debt	635,000	1,500,000	1,400,000	_____	5,996,000	6,756,000
Shareowners' equity	1,443,000	1,981,000	2,845,000	8,849,000	11,313,000	26,951,000

*Based on common shares outstanding at each year-end, adjusted for stock splits, and on average shares outstanding beginning 1963.

	TWENTY YEAR FINANCIAL SUMMARY (continued)					
	1960	1961	1962	1963	1964	1965
Net sales and operating revenues	\$73,434,000	\$70,105,000	\$84,106,000	\$118,666,000	\$140,049,000	\$152,736,000
Research and development expense	6,797,000	6,308,000	7,541,000	8,450,000	10,100,000	9,398,000
Federal and foreign income taxes	2,700,000	(5,354,000)	1,845,000	5,045,000	4,604,000	4,633,000
Net earnings	3,959,000	(3,930,000)	3,764,000	5,968,000	6,951,000	7,671,000
Earnings per share*	.51	(.51)	.48	.65	.76	.83
Working capital	32,128,000	26,344,000	37,150,000	46,432,000	49,208,000	51,435,000
Current ratio	3.1 to 1	2.1 to 1	1	2.8 to 1	2.8 to 1	2.2 to 1
Long-term debt	5,827,000	5,355,000	14,750,000	29,601,000	30,015,000	33,132,000
Shareowners' equity	32,645,000	28,649,000	32,237,000	46,191,000	53,069,000	60,711,000

Including operations of Orr Industries, Inc., from 1956; Telemeter Magnetics, Inc., from 1957; Mandrel Industries, Inc., from 1963; and Geoscience Incorporated from 1966.

*Based on common shares outstanding at each year-end, adjusted for stock splits, and on average shares outstanding beginning 1963.

TWENTY YEAR FINANCIAL SUMMARY continued				
	1966	1967	1968	1969
Net sales and operating revenues	\$169,544, 000	\$214,746,000	\$233,433, 000	\$296,319,000
Research and development expense	10,410, 000	11, 868, 000	13, 842, 000	5,815,000
Federal and foreign income taxes	5,601, 000	7,294, 000	5,219, 000	11, 414, 000
Net earnings	8,516,000	10,321,000	7,665,000	13,702,000
Earnings per share*	. 91	1.09	.80	1.35
Working capital	62,574,000	85,717,000	90,904,000	124,038,000
Current ratio	2. 2 to 1	2. 2 to 1	2. 2 to 1	2.4 to 1
Long-term debt	46,592, 000	75, 301, 000	73, 551, 000	81, 454, 000
Shareowners' equity	70, 455, 000	81, 704, 000	90, 601, 000	134, 885, 000

Including operation of Orr Industries, Inc., from 1956; Telemeter Magnetics, Inc., from 1957; Mandrel Industries, Inc., from 1963; and Geoscience Incorporated from 1966.

*Based on common shares outstanding at each year-end, adjusted for stock splits, and on average shares outstanding beginning 1963.

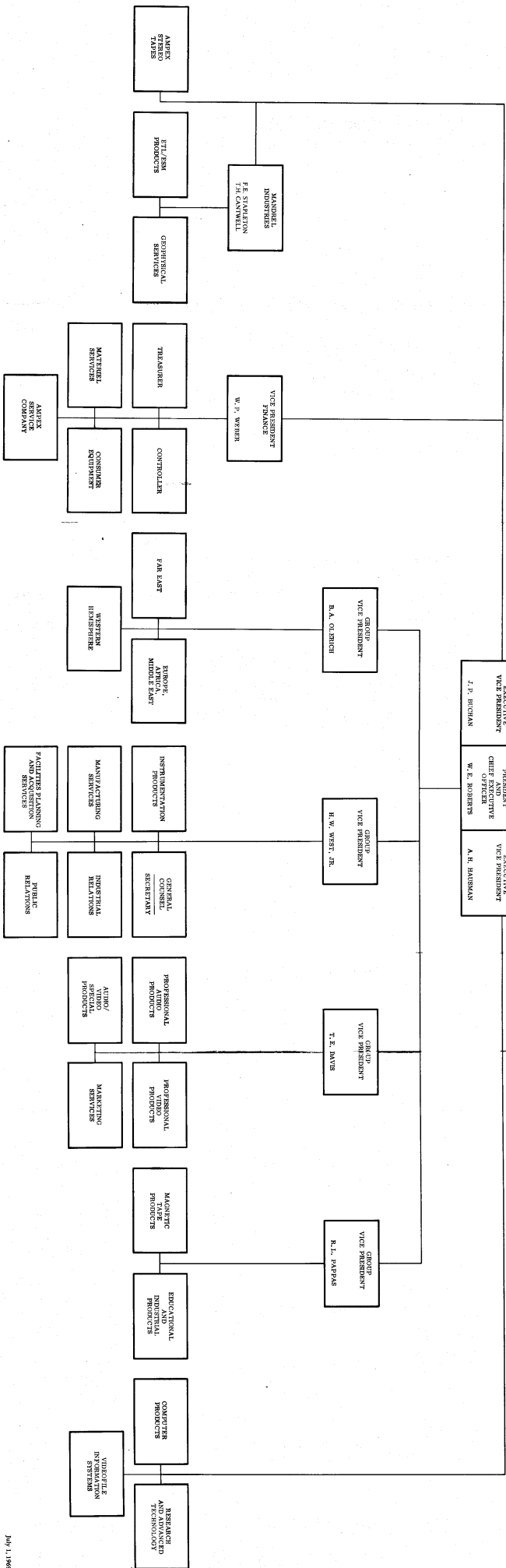
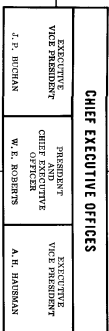
PERSONNEL GROWTH 1944 - 1968*

1944 -	20	1950 -	106	1960 -	4441
1945 -	28	1951 -	199	1961 -	4419
1946 -	42	1952 -	324	1962 -	5322
1947 -	14	1953 -	507	1963 -	6197
1948 -	29	1954 -	597	1964 -	7623
1949 -	29	1955 -	765	1965 -	8402
		1956 -	1515	1966 -	9905
		1957 -	1914	1967 -	11,687
		1958 -	2183	1968 -	12,000
		1959 -	3654	1969 -	13,235

*Figures from 1944 through 1956 are on a calendar year basis.
 Remaining figures are on a fiscal year basis (May 1 through April 29).

BOARD OF DIRECTORS

CHIEF EXECUTIVE OFFICES



MANAGEMENT

AMPEX BOARD OF DIRECTORS

- JOHN P. BUCHAN - (See Ampex Officers' listing.)
- H. S. M. BURNS - Formerly president and chairman of the executive committee, Shell Oil Company, retired 1960; life member of the board of directors of American Petroleum Institute; director of General Dynamics Corporation.
- WILLIAM BLACKIE - Chairman of the Board and Chief Executive officer of the Ralston Purina Company; director of First National Bank of Chicago and the Shell Oil Company.
- RICHARD J. ELKUS - Chairman of the board of U. S. Leasing Corporation, San Francisco; formerly vice president and director of Wells Fargo Bank.
- ARTHUR H. HAUSMAN - (See Ampex Officers' listing.)
- ROY G. LUCKS - Formerly chairman of the board, and former president of Del Monte Corporation (formerly California Packing Corporation), San Francisco; director of Bank of California, N. A. , and Standard Oil Company of California.
- HENRY A. MC MICKING - (See' Ampex Officers' listing.)
- NATHAN W. PEARSON - Vice president and member of the board of governors of T. Mellon & Sons, investment management.
- ALEXANDER M. PONIATOFF - (See Ampex Officers' listing.)
- A. E. PONTING - Chairman of the executive committee of Blyth & Company, Inc., investment bankers; director of Northrop Corporation, and Rheem Manufacturing Company.
- WILLIAM E. ROBERTS - (See Ampex Officers' listing.)
- DR. FREDERICK SEITZ - President of National Academy of Sciences, Washington, D. C., President of Rockefeller University.

AMPEX OFFICERS

WILLIAM E. ROBERTS

- Attended Lake Forest College and Northwestern University; 1936 Bell & Howell Company, Chicago, assistant treasurer, 1949 second vice president, 1953 executive vice president, 1960-1961 director; 1961 - present Ampex Corporation, president and chief executive officer and director; also director of Wells Fargo Bank, Raychem Corporation, Mandrel Industries, Inc., and R. R. Donnelley & Sons Company.

ALEXANDER M. PONIATOFF

- Prior 1944 Joshua Hendy Iron Works, Inc. , Sunnyvale, California; engineer, General Electric Company, Inc. , and Pacific Gas & Electric Company, Inc. ; associate, Dalmo-Victor Corporation, San Carlos, California; 1944 - present Ampex Corporation, founder of corporation, president, 1955 chairman of the board and director.

HENRY A. MC MICKING

- Partner in Ayala Associates, private investment company; director of Transamerica Corporation, Shasta Corporation, and American General Insurance Company; 1960 - present vice chairman of the board of directors, Ampex Corporation.

JOHN P. BUCHAN

- Graduate of Walton School of Commerce, Chicago, and University of Chicago; 1946-1961 Bell & Howell Company, latterly vice president and treasurer; 1961 - present Ampex Corporation, 1961 vice president, 1966 group vice president and director, 1967 executive vice president; 1967 chairman of the board of Mandrel Industries, Inc. ; member of Financial Executives Institute, Financial Officers of Northern California, Security Analysts of San Francisco. Ampex divisions/functions reporting directly to Buchan: Mandrel Industries, Inc., treasurer, controller.

ARTHUR H. HAUSMAN

- 1944 University of Texas MS, 1948 Harvard; 1948-1960 U.S. Government Department of Defense, Washington, D. C. ; 1960 - present Ampex Corporation, 1960 vice president, 1966 group vice president and director, 1967 executive vice president. Ampex divisions reporting directly to Hausman: research and advanced technology, computer products, Videofile.

AMPEX OFFICERS (continued)HENRY W. WEST, JR.

- Occidental College, graduate of Stanford University and Stanford Law School LLB; World War II U. S. Army; 1955 California Bar; 1955-1960 Convair Division of General Dynamics Corporation, San Diego, California, assistant general counsel; 1960 - present Ampex Corporation, 1962 secretary and general counsel, 1965 vice president, 1966 group vice president, general counsel and secretary. Ampex functions reporting directly to West: employee relations, labor relations, public relations, staff manufacturing operations, Ampex Service Company, compliance and facilities service, patent and legal.

THOMAS E. DAVIS

- Pacific State University and University of California BSEE; 1948-1956 Bing Crosby Enterprises, engineering sales manager; 1956-1960 Ampex Corporation, western regional manager, 1957 national sales manager, 1958 marketing manager, 1960 parts and service division manager; 1960-1962 Datanetics Products Company, president; 1962 - present Ampex Corporation, manager of corporate sales and service, 1963 marketing division manager, 1964 vice president of marketing, 1966 vice president - general manager of audio/video communications division, 1967 group vice president. Ampex divisions/functions reporting directly to Davis: professional audio division, video division, special products division, marketing services.

BYRON A. OLERICH

- 1930 Drake University; 1930-1947 General Electric Corporation, latterly as treasurer of General Electric Medical Products Company; 1947-1960 Abbott Labs International, Chicago, vice president and director, also member of parent company's finance committee; 1960 - present Ampex Corporation, 1962 vice president, 1967 group vice president, latterly president of Ampex international.

ROBERT L. PAPPAS

- 1950 graduate of Cleveland State University; 1950-1951 Minneapolis Honeywell Regulator Company; 1951-1953 U.S. Time Corporation, Waterbury, Connecticut; 1953-1955 Schaible Company, Cincinnati, Ohio; 1955 - present Ampex Corporation, 1960 vice president, 1967 group vice president. Ampex divisions/functions reporting directly to Pappas: magnetic tape division, instrumentation division, materiel.

AMPEX OFFICERS (continued)

ALLEN M. ADAMS

- 1927 Baltimore Polytechnic Institute, majored in chemical engineering; Baltimore College of Commerce 1928 - business administration; University of Wisconsin 1932 - business administration; formerly director of material control and procurement, Wagner Electric Corporation; previously assistant to executive vice president and director of foreign projects, Bendix Corporation; manager of purchases and production and president, T D C Division, Bell and Howell Company; director of purchases and production and director of body design and engineering, Crosley Motors; director of purchases and traffic, Massey-Ferguson; joined Ampex Corporation in 1967, vice president of materiel.

CHARLES V. ANDERSEN

- Attended San Jose State - Engineering: Business Administration - University of Santa Clara. 1945 - 1951 Pan American World Airways; 1951 - 1961 Manufacturing Manager, Ampex Data Products Divn. ; 1961 - 1963, Vice President of KRS Electronics; 1963 - 1965, General Manager, Ampex S.A., Nivelles; 1965 - 1966 EAME Manufacturing Director; 1966 - 1969, Operations Manager, Computer Products Divn. ; 1969 - present, Vice President, General Manager, EAME.

CHARLES P. GINSBURG

- Attended University of California, San Jose State College BA - mathematics and engineering; 1942 Columbia Broadcasting System, San Francisco; 1952 - present Ampex Corporation, 1960 vice president - advanced development.

DR. WILLIAM A. GROSS

- 1945 U.S. Coast Guard Academy BSME, 1951 University of California Phd - applied mechanics; prior 1961 University of California and Iowa State University, research work as assistant professor - applied mechanics and mechanical engineering, Bell Telephone Laboratories, research and transmission development department and IBM Corporation, San Jose, California, manager of applied mechanics department; 1961 - present Ampex Corporation, manager of research department, 1965 vice president of research and advanced technology.

DONALD V. HALL

- 1968 Masters, Business Administration, Northwestern University; 1956 to 1964 Manager Sales Forecasting Bell and Howell Company; 1964-1966 Ampex Manager of Consumer and Trade Relations Consumer and Educational Products Division; 1966-1968 General Manager Ampex Stereo Tapes; 1968 General Manager, Ampex Stereo Tapes Division; 1968-present, Ampex Vice President, General Manager, Ampex Stereo Tapes Division.

AMPEX OFFICERS (continued)RICHARD P. HOBERG

- Stanford University BA in Economics 1956 - MBA 1958. 1962-63 Thermatest Laboratories, assistant controller. 1963-present Ampex Corporation, financial analyst Video and Instrumentation Division; 1966 profit planning manager AVC Division; 1967 controller AVC Group; 1969 corporate controller.

E. PETER LARMER

- 1954 B. A. Stanford University, 1958 MBA Stanford University; 1959-1961 Ampex Marketing Analyst, 1961-1963 Marketing Research Manager, 1963 Professional Market Specialist, 1963 District Manager, 1963-1964 Marketing Services Manager, 1964-1966 National Sales Manager, Tape Products; 1966-68 Director of Marketing for McCulloch Corporation; 1968 Ampex Consumer Products Division Vice President Marketing; 1969-Present Ampex Vice President, General Manager, Consumer Equipment Division.

ROBERT R. OWEN

- Graduate of Purdue University; 1949-1957 Chance Vought Aircraft, Dallas; 1957-1958 Arnold Barnes Company, Dallas; 1959-1961 Consolidated Electrodynamics Corporation, Dallas 1961-1963 Jamieson Industries, Los Angeles; 1963 - present Ampex Corporation, 1963 regional manager, 1964, national sales manager, 1966 general manager of marketing, vice president-assistant general manager of instrumentation division, 1967 vice president - general manager of instrumentation division.

JOHN L. PORTER

- Graduate of Stanford University BA in economics; 1950-1952 California Packing Corporation, San Francisco; 1952 - present Ampex Corporation, 1952 accountant, 1955 international administrative manager, 1956 inventory coordinator, 1959 manager data processing central services, 1961 cost department manager, 1961 international finance manager, 1967 controller, 1969 Vice President, Magnetic Tape Division.

EUGENE E. PRINCE

- Graduate of Los Angeles State College BS in business administration; 1955-1957 William Miller Instruments, Pasadena; 1958-1963 Consolidated Electrodynamics Corporation, Pasadena; 1963 - present Ampex Corporation, finance manager/controller computer products, 1965 finance manager/controller instrumentation, 1966 general manager of computer products division, 1967 vice president - general manager of computer products division.

AMPEX OFFICERS (continued)RONALD A. POLSTER

- Graduate of University of California BS in business administration 1956; 1956-1959 Sunkist Growers, Inc., Los Angeles; 1959-1967 Ampex marketing administrative positions; 1967-1968 Ampex marketing services manager; 1968-1969 general manager, Ampex special products division; 1969-present vice president-general manager, special products division.

FELIX B. PROBANDT

- Graduate of Texas A and M, University of Houston, BS, LLB; member of the American Bar Association, Chicago, and American Institute of CPAs, New York; 1955-1960 Peat, Marwick, Mitchell and Company, Houston; 1960-1962 Fisher Interests, Houston; 1962-1964 Touche, Ross, Bailey and Smart, New York; 1964-present Ampex Corporation, 1964 tax manager, assistant treasurer, 1966 treasurer.

A. A. SROKA

- 1944 BS University of Illinois; 1952-1954 Sales Engineer, R. J. Magnuson Associates; 1954-1956 Sales Engineer, Assistant Sales Manager Sound, Inc; 1956-1958 Ampex District Manager Los Angeles; 1958-1959 Ampex District Manager, Washington D. C. ; 1959-1967 Ampex Southwestern Regional Manager, 1967-1969 General Manager, Ampex Professional Audio Products Division; 1969 - present, Ampex Vice President - General Manager Professional Audio Products Division.

CHARLES A. STEINBERG

- 1955 B. S. City College of New York; 1957 M. S. Massachusetts Institute of Technology; 1955, member of technical staff of Bell Telephone Laboratories; 1955-58, Research and Teaching Assistant, Massachusetts Institute of Technology; 1958-1963 Engineering Section Manager, Airborne Instruments Laboratory; 1963-1965 Ampex Medical, Industrial and Commercial product manager, Video and Instrumentation Division; 1965-1967 Manager, Videofile Department; 1967-1969 General Manager of the Videofile Information Systems Division, 1969-present, Ampex Vice President and General Manager of the Videofile Information Systems Division.

HEATH WAKE LEE

- Graduate Amhurst College; 1948-1956 director of industrial relations, Sears Roebuck and Co., Chicago; 1956-1960 director of Industrial relations, McLean Industries, Mobile, Alabama; 1960-61, director of personnel administration, Hughes Aircraft Company, Culver City, California; 1961-1968 director of industrial relations, Litton Industries, Beverly Hills, California; 1968 - present Ampex Corporation, vice president, personnel and industrial relations.

AMPEX OFFICERS (continued)WALTER P. WEBER

Northwestern Technical Institute, BS in engineering; post graduate of Northwestern University, business administration; 1951-1963 Bell and Howell Company, latterly controller; 1963 - present Ampex Corporation, assistant treasurer, 1965 controller, 1968 vice president - finance.

LAWRENCE WEILAND

- 1948 BSEE Columbia University; 1948-1960 Manager Advanced Planning for National Broadcasting Company; 1960 - present Ampex Corporation, 1968 vice president general manager video products division.

ROBERT J. WEISMANN - 1968 present Ampex Corporation, electronic

technician, 1952 electronic engineer, 1953 manager of custom products, 1962 manager of manufacturing, 1963 general manager of video and instrumentation division, 1964 vice president, 1966 vice president - general manager of manufacturing and engineering services - international division.

DANIEL J. YOMINE

- Graduate studies at Northwestern University and American University from 1943-1959; 1944-1950 Northern Tool & Die Co., Chicago, tool engineer; 1951-1955 ACF Industries, Maryland, production engineering manager; 1955-1959 Bell & Howell, Chicago, manufacturing engineering manager; 1960-1962 Tomioka Optical Co., Japan, chairman of executive committee and director; 1959-1962 Bell & Howell, Japan, general manager and director; 1962 - present Ampex Corporation, 1962 operations manager - consumer products division, 1963 assistant corporate secretary, 1967 director of staff manufacturing operations, 1968 vice president - staff manufacturing.

MANDREL INDUSTRIES, INC. , OFFICERS

- CHARLES J. BECKWITH - Lafayette College: 1942-45, U.S. Marine Corps; 1952-55, manager of glide electronics division of Glide Windows, Inc. ; 1955-56, manager, Electronic Wire and Cable Corporation; 1956-59, assistant to the president, Ling Systems, Inc. ; 1959-63, contracts administrator, Burbank division of Mandrel Industries, Inc., (eventually became MEG products division); 1963, general manager, MEG products division, Mandrel; 1963-64, ESM division Mandrel; 1964-66, general manager, ESM Domestic Operations, 1966-present, vice president-general manager, ESM division of Mandrel.
- MES E. BUESCHER 1947 BBA, University of Texas; 1941-45, U.S. Navy; 1945-58, vice president, assistant general manager, MEG products; 1959-60, administration assistant manager, MEG products division; 1960-63, manager, products division, MEG products ; 1963-64, vice president, manager, products division, Mandrel Industries Inc.; 1966-present, vice president, and assistant secretary, Mandrel Industries, Inc.
- THOMAS CANTWELL - 1948 BS, MIT, chemical engineering; 1960, PhD, MIT, Geophysics; 1951- MBA Harvard; 1946-47, military service; 1951-52, chemical engineer, Ionics Inc., 1952-54, industrial liaison officer, MIT; 1954-58 MIT nuclear reactor division; 1958-65, assistant professor of geophysics, MIT; 1963-66, president, Geoscience, Inc. ; 1966-69, vice president, Mandrel Industries; 1969-present, president, Mandrel Industries.
- THOMAS E GRIMES, JR. - Tarleton State College; 1944-45, field crew member, Robert H. Ray Company; 1945-68, field assignments abroad, Ray Company and Mandrel Industries; 1968-present, vice president, Mandrel Industries.
- ASHLEY A. HUNZICKER - 1930 MS Geology, University of Wisconsin; 1930-32, graduate work-Geology, University of Wisconsin; 1930-31, Texaco; 1933-35, Petty Geophysical Engineering Company; 1935-51, assistant to manager, geophysical division, Texaco, Houston; 1951-62, vice president, Seismic Exploration Inc. ; 1963-present, vice president and manager of Western Hemisphere operations, Ray Geophysical Division, Mandrel Industries.

MANDREL INDUSTRIES, INC. , OFFICERS (Continued)

- RAYMOND F. KELLER - 1941 BS Geological Engineering, Colorado School of Mines; 1941-62, vice president, General Geophysical Company; 1962-present, vice president, Mandrel Industries.
- GEORGE D. MCELREE, JR. - 1945 BS Mechanical Engineering, Rice University; 1954, MS Petroleum Engineering, University of Houston; 1946-49, field gravity work in Middle East area, Robert H. Ray Company; 1949-52, agent, London Office, Robert H. Ray Company; 1952-62, personnel manager, Robert H. Ray Company; 1962-67, director of personnel and industrial relations, Mandrel Industries, Inc. ; 1967-present, vice president, Mandrel Industries, Inc.
- WEIMAN H. REESE - 1943 BS, Petroleum Engineering, Louisiana State University; 1944-46, U.S. Navy; 1943-44, National Geophysical Company, Dallas; 1947-55, Geophysical Associates, Houston; 1955-58, vice president, McCollum Exploration Company; 1958-62, vice president, Ray Geophysical Company; 1962-present, vice president, Mandrel Industries.
- FRED E. STAPLETON - 1954 University of Houston; BS, Petroleum Engineering; 1943-45, U.S. Army; 1941-65, held just about every job possible in the Robert H. Ray Company and the Ray Geophysical Division in geophysical exploration services; 1965-66, vice president, Mandrel Industries; 1966-69, president, Mandrel Industries; 1969-present, chairman of the board.
- EDWARD G. YOUNG - 1962 BBA, Accounting, West Texas State University; 1954-56, U.S. Army; 1963-64, accountant, Texaco Oil and Gas; 1964-66, assistant supervisor oil and gas financial accounting, Cabot Corporation; 1966-67, supervisor oil and gas accounting, George Mitchell and Associates; 1967, foreign account supervisor, Mandrel Industries, Inc. ; 1967-68, chief general ledger accountant, Mandrel Industries, Inc. ; 1968-69, finance manager, Mandrel Industries; 1970-present, treasurer, Mandrel Industries, Inc., Libya.

AMPEX DOMESTIC FACILITIES
(Excluding Mandrel)

October 31, 1969

<u>LOCATION</u>	<u>ACTIVITIES</u>
Redwood City, California including buildings in Menlo Park, Burlingame and Los Gatos	Corporate and international offices, research and advanced technology, professional video, instrumentation and Videofile information systems manufacturing and engineering. Twenty-eight buildings, 857, 000 square feet.
Sunnyvale, California	Videofile Information Systems and Terabit Memory System manufacturing, one building, 92,000 square feet.
Culver City, California - 229, 850 and West Los Angeles, California - 23,600	Administration, manufacturing and engineering for instrumentation recorders, core memories, tape transports, data conversion systems and other computer products. Six buildings, 253, 450 square feet.
Opelika, Alabama	Manufacturing magnetic tape. Twelve buildings, 272, 384 square feet. Additional construction underway.
Colorado Springs, Colorado	Manufacturing professional audio, closed circuit video and broadcast video products. One building, 229, 961 square feet.
Elk Grove Village, Illinois	Administration, manufacturing and engineering, consumer and educational audio and video products, prerecorded tapes. Five buildings, 452,674 square feet.
Westfield, Massachusetts	One building, 43, 530 square feet.
Ampex field offices, service centers and depots in the United States.	Twenty-nine locations, 155,626 square feet. Additional buildings under construction.

PRINCIPAL AMPEX FACILITIES OUTSIDE THE UNITED STATES

<u>LOCATION</u>	<u>ACTIVITIES</u>
Ampex International manufacturing facilities	Eight locations, 280,028 square feet.
Ampex International sales, service and technical service centers (not including Boeblingen, Germany)	Ten locations, 26,193 square feet.
Nivelles, Belgium	Manufacturing of computer tape handlers, audio and video tape recorders. Building contains 82, 871 square feet.
British Crown Colony of Hong Kong	Manufacturing of ferrite core products. One building, 55,000 square feet. Under direction of Computer Products Division.
Malton, Ontario, Canada and Toronto, Ontario, Canada	Administration, engineering, sales of professional video products and systems, and consumer and educational audio and video products. Two buildings contain 37,657 square feet.
Reading, England	Administration, manufacturing of instrumentation, professional audio and consumer and educational audio and video products. Headquarters for European, African and Middle Eastern operations. Four buildings, 64,000 square feet.
Boeblingen, Germany	Service and training center and spare parts depot, 24,217 square feet.
Tokyo, Japan	Manufacturing and sales of computer tape handlers and video recorders. (Toamco, joint venture with Toshiba.) Two locations, 148,062 square feet.
Tao-Yuan, Taiwan	Manufacturing of computer products, 40,500 square feet.

MANDREL FACILITIESLOCATION

Domestic - Houston, Texas

Mandrel (major) locations
outside the United States

Total Ampex and Mandrel
throughout the world

ACTIVITIES

Seven buildings, 293,060 square feet.

Seven locations, 157,618 square feet.

More than 118 factories, offices, service
centers and depots containing more than
2,804,597 square feet, plus some 250,000
square feet of facilities under construction.

AMPEX SALES OFFICES

(as of November 15, 1969)

UNITED STATES

A LA BAMA

3322 South Memorial Parkway
Huntsville 35801
(205) 881-4271

CALIFORNIA

500 Rodler Drive
Glendale 91201
(213) 245-9373 TWX No. 910-497-2268

120 Independence Drive

Menlo Park 94025
(415) 367-3861 TWX No. 910-378-5920

COLORADO

5650 E. Evans Ave.
Office 24
Denver 80222

FLORIDA

1325 North Atlantic Avenue
Cocoa Beach 32931
(305) 783-1811 TWX No. 510-958-2199

GEORGIA

1680 Tully Circle, N.E.
Atlanta 30329
(404) 633-0513 TWX No. 810-751-8586

ILLINOIS

10 King Street
Elk Grove Village 60007
(312) 439-4600 TWX No. 910-222-2864

MASSACHUSETTS

34 Bear Hill Road
Waltham 02154
(617) 899-2040 TWX No. 710-324-6944

MISSOURI

400 Brookes Lane
Hazelwood 63042
(314) 731-2161 TWX No. 910-762-0647

NEW JERSEY

75 Commerce Way
Hackensack 07601
(201) 489-7400 TWX No. 710-990-5143
(in New York, Phone 736-6116)

NEW MEXICO

116 Washington Avenue, S.E.
Albuquerque 87108
(505) 265-8507 TWX No. 910-989-1168

OHIO

4130 Linden Avenue
Dayton, 45432
(513) 254-6101 TWX No. 810-459-1846

PENNSYLVANIA

947 Old York Road
Abington 19001
(215) 887-7650 TWX No. 510-665-0723

TEXAS

1615 Prudential Drive
Dallas 75235
(214) 637-5100 TWX No. 910-861-4967

6001 Gulf Freeway

Suite C-109
Houston 77023
(713) 928-3741 TWX No. 910-881-5783

VIRGINIA

3620 27th Street South
Arlington 22206
(703) 671-4000 TWX No. 710-955-9832

WASHINGTON

1910 Fairview Avenue East
Seattle 98102
(206) 329-3544 TWX No. 910-444-2036

AMPEX SALES OFFICES (Continued)

(as of November 15, 1969)

INTERNATIONALARGENTINA

ELECTRONICA AMPEX S.A.
Cerrito 836 - 9th Floor
Casilla de Correo 5403
Buenos Aires

AUSTRALIA

AMPEX AUSTRALIA PTY. LTD.
NRMA House
26th Ridge Street
New South Wales 2060

BRAZIL

AMPEX DO BRASIL ELECTRONICA LTDA.
Assembleia 51
conj. 701
Rio de Janeiro

CANADA

AMPEX OF CANADA, LTD.
100 Skyway Avenue
Rexdale, Ontario

COLOMBIA

AMPEX PAN AMERICAN CO.
Apartado Aereo 9019
Carrera 10 No. 19-64
Bogota, D. E.

ENGLAND

AMPEX GREAT BRITAIN LTD.
Acre Road
Reading, Berkshire

FRANCE

AMPEX SARL
14, ave. Pierre Grenier
92 - Boulogne

GERMANY

AMPEX EUROPA GMBH
Elberstrasse 1
Frankfurt/Main

HONG KONG, B.C.C.

AMPEX WORLD OPERATIONS, S. A.
3 Salisbury Road
Kowloon

LEBANON

AMPEX S. A.
Dumit Building, Al Hamra Street
Beirut, Lebanon

JAPAN

AMPEX JAPAN LTD.
3, Kojimachi 3 - Chome, Chiyoda-ku
Tokyo 102

MEXICO

AMPEX DE MEXICO S. A. de C. V.
Apartado Postal 13-615
Division del Norte #1832
Mexico 13, D. F.

PUERTO RICO

AMPEX PAN AMERICAN COMPANY
P.O. Box 1949, Old San Juan Station
San Juan 00903

SOUTH AFRICA

SOUTH AFRICAN OFFICE (not permanently named)
c/o Gallo (Africa) Ltd.
P.O. Box 6216
Johannesburg

SWEDEN

AMPEX A. B.
Box 30
Tradgardsgatan 26
172 38 Sundbyberg 3

SWITZERLAND

AMPEX S. A. LUGANO
P.O. Box 831
Via Berna 2
6900 Lugano, Ti.

UNITED STATES -CALIFORNIA

AMPEX INTERNATIONAL OPERATIONS INC.
Box 4000
Redwood City 94063

UNITED STATES - CALIFORNIA

AMPEX PAN AMERICAN COMPANY
Box 4000
Redwood City 94063

AMPEX SALES OFFICES

(as of November 15, 1969)

INTERNATIONAL (continued)

UNITED STATES - NEW YORK

555 Madison Avenue
22nd Floor
New York 10022

AMPEX SERVICE CENTERS

BOSTON AREA	391 Totten Pond Rd. Waltham, Mass. 02154 (617) 893-0248
CHICAGO AREA	5422 W. Touhy Avenue Skokie, Illinois 60076 (312) 679-8950
DALLAS AREA	6712 Oakbrook Blvd. Dallas, Texas 75235 (214) 637-5650
DETROIT AREA	1035 Hilton Road Ferndale, Mich. 48220 (313) 399-2128
LOS ANGELES AREA	500 Rodier Drive Glendale, California 91201 (213) 245-9373
MIAMI AREA	14632-34 N. W. 7th Miami, Florida 33168 (305) 681-3256
NEW YORK AREA	75 Commerce Way Hackensack, N. J. 07601 (201) 489-7400
PHILADELPHIA AREA	947 Old York Road Abington, Pa. 19001 (215) 887-1522
SAN FRANCISCO AREA	120 Independence Dr. Menlo Park, Cal. ,94025 (415) 367-2646
SEATTLE AREA	2826 Empire Way, South Seattle, Washington 98144 (206) 722-4410
WASHINGTON, D. C. AREA	3620 27th St. So. Arlington, Virginia 22206 (703) 671-4000

MANDREL OFFICES

(November 15, 1969)

UNITED STATES

Denver, Colorado 80226
219 Quay St.
Ph: 303-238-3561

Houston, Texas (General Office) 77036
P. O. Box 36306
Ofc: 6909 Southwest Freeway
Ph: 713-774-7561
Cable: ROBRAY
Telex: 077-252

Midland, Texas 79701
P. O. Box 206
Ofc : 405 W. Indiana
Ph: 915-683-5621

New Orleans, Louisiana 70121
201 Jefferson Plaza Building
422 Main Street
Ph: 504-834-1009

INTERNATIONAL

Alaska, Anchorage 99501
Ray Geophysical Limited
P. O. Box 3095
Ph: 907-279-5242

Alaska, Fairbanks 99701
Ray Geophysical Limited
P. O. Box 3017
Ofc : Interior Airways, Rm. 8
Ph: 907-452-4571

Arabian Gulf, Abu Dhabi
General Geophysical Co. (Bahamas) Ltd.
P. O. Box 106
Ph: 2477
Cable: GENERALGEO

Arabian Gulf, Abu Dhabi
Mandrel Industries Co., Ltd.
P. O. Box 3 84
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Argentina, Buenos Aires
Mandrel Industries, Inc.
c/o Baker and McKenzie
Corrientes 545, Piso 10
Ph: 49-7847, 49-3174 or 49-2551
Cable: ABOGADO B. A.

Australia, Perth, Western Australia
Ray Geophysics (Australia) Pty. Ltd.
273 Hay Street
Ph: 232-315
Cable : RAGE 0

Brazil, Cambe, Parana
Elexso Industria Electronica, Ltd.
Caixa Postal 361
Ofc: Rua Belo Horizonte
No. 1205/1235
Ph: 3194/3239

Canada, Calgary, Alberta
Mandrel Industries Ltd.
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Ofc: 303 Forge Road, S. E.
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Canada, Calgary, Alberta
Ray Geophysical Ltd.
207 61st Avenue S. E.
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Egypt, Roushdi, Alexandria, U.A.R.
Mandrel Industries Co. Ltd.
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England, Hayes, Middlesex
Robert H. Ray Company, Inc.
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France, Paris 8 eme. 75
Ray Geophysique de France
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