



Smithsonian  
*National Museum of American History*  
*Kenneth E. Behring Center*

## Guide to the Del Mar Avionics Holter Monitor Records

NMAH.AC.1249

Alison Oswald

2011

Archives Center, National Museum of American History  
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## Collection Overview

<b>Repository:</b>	Archives Center, National Museum of American History
<b>Title:</b>	Del Mar Avionics Holter Monitor Records
<b>Identifier:</b>	NMAH.AC.1249
<b>Date:</b>	1951-2011
<b>Extent:</b>	3 Cubic feet (8 boxes)
<b>Creator:</b>	Del Mar, Bruce Del Mar Avionics Corporation
<b>Language:</b>	English  Some materials in French and Japanese.
<b>Summary:</b>	Collection documents the development of the Holter Monitor, a portable device for continuously monitoring heart activity for an extended period, through engineering logbooks, drawings, operator manuals, correspondence, photographs, sales brochures and catalogs, biographical information about the engineering staff who worked on the monitor, patents and trademarks, and marketing and sales materials.

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## Administrative Information

### Acquisition Information

The collection was donated by Del Mar Avionics through Bruce Del Mar, President on September 12, 2011.

### Related Materials

#### Materials in the Archives Center

Project Bionics Artificial Organ Documentation Collection [videotapes], 2002 (AC0841) documents the invention and development of artificial internal organs through oral history interviews with scientists and others involved.

The James A. E. Halkett and Sigmund A. Wesolowski, M.D., Papers, 1948-1951 (AC0200) documents Halkett and Wesolowski's experiments on an early mechanical heart. Halkett and Wesolow(ski) materials show the process of technological innovation through laboratory protocols.

The George Edward Burch Papers, 1984-1986 (AC0316) documents Burch's pioneering work in clinical cardiology and research through technical notes, diagrams, and correspondence regarding laboratory work on the "2-pump heart model," 1984-1986.

Wilson Greatbatch Innovative Lives Presentation, 1996 (AC0601) documents the invention of the implantable cardiac pacemaker in 1958.

The Ronald J. Leonard Papers, circa 1980-1997 (AC1109) documents Leonard's development of pumps and oxygenators used in cardio-pulmonary bypass surgery.

### **Materials in the Division of Medicine and Science, National Museum of American History**

The Division of Medicine and Science holds two monitors: the Dynamic and the Del Mar Avionics ElectroCardioCorder (Model 445), 1977 and the ElectroCardioScanner (Model 660), 1971. Both were developed by Del Mar's Medical Device Manufacturing staff. See accession #: 2011.0196.

### **Materials at the Montana Historical Society Research Center, Archives**

Holter Family papers, 1861-1968

Includes documentation about the Holter Research Foundation, Inc.

Holter Research Foundation, Inc. records, 1914-1985

The Holter Research Foundation, Inc. was a private, non-profit, scientific research foundation started in Helena, Montana, in 1947 by Norman J. "Jeff" Holter. Records (1914-1985) include correspondence, financial records, laboratory records, subject files, photographs, etc. Also included are subgroups for N.J. Holter; his work in the U.S. Navy on bombs and waves; his work as assistant chancellor at University of California, San Diego; and the Society of Nuclear Medicine.

## Processing Information

Collection processed by Alison Oswald, archivist, September, 2011.

## Preferred Citation

Del Mar Avionics Holter Monitor Records, dates, Archives Center, National Museum of American History

## Restrictions

The collection is open for research.

## Conditions Governing Use

Collection items available for reproduction, but the Archives Center makes no guarantees concerning intellectual property rights. Archives Center cost-recovery and use fees may apply when requesting reproductions.

## Accruals

An additional .15 cubic feet of material documenting the Holter Monitor was added to the collection in February 2012.

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## Biographical / Historical

Norman Jefferis "Jeff" Holter (1914-1983) was born in Helena, Montana, to a prominent Montana pioneering family. After attending public schools in Helena, he earned master's degrees in chemistry from

the University of Southern California (1938) and physics from the University of California, Los Angeles (1940). During these years Holter also organized Applied Micro Sciences, a scientific photography business, and began working with Dr. Joseph A. Gengerelli of UCLA on nerve stimulation in frogs and brain stimulation in rats. Holter's interest in studying electrical activity in humans in their daily activities without touching them, spawned his lifelong pursuit to develop the Holter Monitor.

During World War Two, Holter served as a senior physicist for the U.S. Navy's Bureau of Ships, conducting research into the behavior of ocean waves in preparation for wartime amphibious operations. After the war, in 1946, Holter headed a staff of oceanographic engineers at Bikini Atoll during Operation Crossroads, the first postwar atomic bomb tests, measuring wave actions and underwater disturbances caused by the explosions.

Because of demands of his family's business affairs, Holter returned to Helena in 1947 to continue his research activities. In 1947 he formed the Holter Research Foundation, with a laboratory originally located in the rear of the Holter Hardware Company building. From 1956 to 1971 the laboratory facilities were located in the Great Northern Railroad depot building in Helena. The foundation was initially funded by Holter and other members of his family, but in 1952 Holter began to receive grants from the National Institutes of Health (NIH).

Holter continued his collaboration with Dr. Gengerelli of UCLA in attempting to transmit information, primarily brain waves, by radio. Holter turned his attention from the brain to the heart because the heart's greater voltage made the electronics easier, and because heart disease was far more prevalent than cerebral disease. Holter's introduction to Dr. Paul Dudley White (1886-1973), a renowned physician and cardiologist, helped convince him to focus his research on recording electrical activity from the heart. Holter's goal was to radio broadcast and record the more obvious electrophysiological phenomena occurring in humans while carrying on their normal activities, rather than having to lie quietly on a couch.

The first broadcast of a radioelectrocardiogram (RECG) took place circa 1947 and required eighty to eighty-five pounds of equipment, which Holter wore on his back while riding a stationary bicycle. This was not practical and in no way could be worn by a patient. The initial transmitter and receiver required that the subject remain in the general area of the laboratory, so a portable and lighter RECG receiver-recorder had to be developed.

Next, Holter created a briefcase-like device that could be carried by a patient. By using very thin magnetic recording tape, twenty-four hours of RECG could be captured on a reel five inches in diameter. The initial method of examining the voluminous records from the tape recordings developed by Holter was called Audio-Visual Superimposed ECG Presentation (AVSEP). AVSEP made it possible to examine twenty-four hours of RECGs in twenty minutes, with signals being presented visually on an oscilloscope and audibly through a speaker.

With the development of transistors, radioelectrocardiography was made obsolete, and it became possible for the amplifier, tape recorder, temperature-control circuits, motor speed control circuits, and batteries to be placed in a single unit small enough for a coat pocket or purse. In 1952, Holter succeeded in creating a small unit that weighed 1 kilogram. Wilford R. Glasscock, a senior engineer working with Holter, traveled to Cedars of Lebanon Hospital (now Cedars-Sinai Hospital of Los Angeles) in 1962 to demonstrate the Holter monitor system and discuss making it more practical. At Cedars, Dr. Eliot Corday observed the practicality of the system and not only embraced the technology, but collaborated with Holter's team and was an early promoter of the technology to both industry and physicians. Holter and Glasscock were issued US Patent 3,215,136 on November 2, 1965 for the Electrocardiographic Means.

As articles describing the foundation's invention of these devices began to appear in the professional literature, there was considerable demand from doctors and hospitals for the equipment. Dr. Corday introduced Holter to Bruce Del Mar, founder of the Del Mar Avionics Corporation in Irvine, California. Del Mar engineers developed the "electrocardiocorder" for clinical use, producing a commercially viable monitor which came to be known as the Holter Monitor Test. Further refinements led to the creation

of a "minimonitor" in 1968, which was described by Holter as being the "size of a cigarette package." Commercial production of the Holter minimonitor, AVSEP, Jr., began in 1969. The Holter Research Foundation ultimately sold exclusive rights to their patents to Del Mar Engineering Laboratories.

Later known as Del Mar Avionics, a team of engineers diverted their attention from successful manufacturing of military weapons training devices to focus on improving the speed and accuracy of computerized ECG analysis and they became the acknowledged leader in Holter monitoring technology for over 40 years. In 1969, because of the increased amount of required paper work and red tape, Holter canceled the grant funding his foundation had been receiving from NIH. He was also in constant conflict with the Internal Revenue Service over the foundation's non-profit status, rights to patents, and commercial production of equipment. The foundation continued to maintain a laboratory and conduct varied scientific work, but on a much smaller scale. The Holter Research Foundation, Inc. was dissolved in 1985, two years after Holter's death.

Del Mar Avionics was founded on January 9, 1952, as Del Mar Engineering Laboratories in Los Angeles, California by Bruce Del Mar, who led the development of aircraft cabin pressurization systems. Del Mar was born in Pasadena, California in 1913. An engineer, inventor, entrepreneur and businessman, Del Mar graduated from the University of California, Berkeley (1937) with a Bachelor of Science degree. Del Mar worked for Douglas Aircraft (1933-1951) as a research engineer on many projects before founding Del Mar Engineering Laboratories. In 1938, Del Mar married Mary Van Ness. The couple had two daughters, Patrica Jean Parsons and Marna Belle Schnabel.

In 1958, Del Mar formed a wholly-owned subsidiary, Electromation Inc., which manufactured tape recording and communication equipment. He later established, Aeroplastics Corporation to manufacture plastic products and Avionics Research Products Corporation to develop and produce biomedical instrumentation. By the mid-1960s, the company had become a leading U.S. Defense Department prime contractor in the development and production of aerial tow target systems for weapons training and instrumented ground targets for scoring air-to-ground automatic weapons delivery. It also produced helicopter target drones and helicopter flight trainers for the U.S. Army.

In 1961, the company entered the growing medical instrumentation market with the development of the first long-term ambulatory monitoring systems.

In 1965, the company introduced the Hydra Set Load Positioner that controls the precise vertical positioning of loads up to 300 tons (272,000 kg) in increments as small as 0.001 inch (0.025mm). This unique product, mounted between the load and the crane (or hoist), permits precise mating and demating of critical components, thus eliminating unforeseen damage to valuable loads. Hydra Set Load Positioners are in use worldwide in the aerospace, military/commercial aviation, nuclear and fossil fuel power generating industries and in various industrial applications. In 1975, the company, then re-named Del Mar Avionics, moved to its current location in Irvine, California.

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## Scope and Contents

The collection includes engineering logbooks, drawings, operator manuals, correspondence, photographs, sales brochures and catalogs, biographical information about the engineering staff who worked on the monitor, patents and trademarks, and marketing and sales materials documenting the development of the Holter Monitor, a portable device for continuously monitoring heart activity.

The records document the successful collaboration of an independent inventor and a manufacturing firm to identify problems, develop solutions and bring to market diagnostic technologies. Bruce Del Mar's role as an innovator and collaborator with Holter is especially important, because Del Mar's work spurred the development of an entire diagnostic industry. In addition, the records also chronicle how "Holter

technology" was affected by progressive technological innovations in the industry, as vacuum tubes were replaced by transistors, as microprocessors gave way to microchips and circuit boards, and as analog recordings were replaced by digital formats.

Documenting manufacturing developments (highs and lows) and marketing considerations is an important element in better understanding the invention process. Del Mar Avionics was the first to design and manufacture instrumentation for long-term monitoring of the human heart for the medical profession. Today, Holter Monitors continue to be an important diagnostic tool for monitoring the health of the heart.

**Series 1, Historical Background, 1951-2010 and undated**, consists of biographical materials for Bruce Del Mar, founder of Del Mar Avionics, company histories, copies of the Del Mar Avionics newsletter *Pacemaker*, employee information, newspaper clippings and ephemera, and photographs of some employees. The employee information contains a 1979 handbook, explaining company policies and the benefits of employment with Del Mar Avionics and a 1951 memo detailing overtime working hours for women, presumably from Douglas Aircraft, where Bruce Del Mar was employed.

**Series 2, Del Mar Avionics Engineering, 1958-1976**, is divided into three subseries, Subseries 1, Correspondence, 1965-1976; Subseries 2, Reports, 1964-1969; and Subseries 3, Drawings, 1958-1968. The documentation consists primarily of correspondence from the engineering department, 1965 to 1976, related to the development, design, budgeting, testing, and marketing of the Holter Monitor. The majority of the documentation is correspondence and is written by engineering staff members, but also included are quotation requests, trip reports, and technical reports. Correspondence between Holter and Del Mar about the development of the Holter Minotor is in Series 6. The drawings, 1958-1968, include six drawings (22" x 34" or smaller) for Avionics Research Products projects (panel assembly, chassis assembly, and battery chargers for model 602), and Electromation Company (degausser single coil).

**Series 3, Patents and Trademarks, 1965-2002 and undated**, consists of copies of patents by Norman J. Holter, W.E. Mills, and W.E. Thornton, Cliff Sanctuary, and Isaac Raymond Cherry related to the development of the Holter Monitor. Also included are lists of United States patents issued to Del Mar Avionics employees, as well as lists of registered trademarks and activities for Del Mar Avionics and copies of trademarks issued to the company.

**Series 4, Product Literature, 1968-2010 and undated**, consists of product literature for Del Mar Avionics products and some of its competitors. The product literature for Del Mar Avionics is arranged chronologically by model number, and the competitor literature is arranged alphabetically. All of the product literature is related to medical instrumentation with the exception of the Hydra Set, a precision load positioner which is the only product Del Mar Avionics sells today.

**Series 5, Sales, 1967-1985**, consists of price lists, price catalogs (both domestic and international) and sales objectives for medical instrumentation sold by Del Mar Avionics.

**Series 6, Holter Monitor Materials, 1958-2005 and undated**, is divided into three subseries, Subseries 1, Background Materials, 1958-2005 and undated; Subseries 2, Model 445, 1974-1978; and Subseries 3, Model 660, 1967-1978 and undated, and consists of materials documenting the relationship between Norman J. Holter, an inventor, and Del Mar Avionics.

Holter and Wilford R. Glasscock were issued United States Patent 3,215,136 on November 2, 1965 for the Electrocardiographic Means. Dr. Eliot Corday introduced Holter to Bruce Del Mar, founder of the Del Mar Avionics Corporation in Irvine, California. Del Mar engineers developed the "electrocardiocorder" for clinical use, producing a commercially viable monitor which came to be known as the Holter Monitor Test. Further refinements led to the creation of a "minimonitor" in 1968 which was described by Holter as being the "size of a cigarette package." Commercial production of the Holter minimonitor, AVSEP, Jr., began in 1969. The Holter Research Foundation ultimately sold exclusive rights to their patents to Del Mar Engineering Laboratories.

The materials include biographical materials about Norman J. Holter, journal articles about the Holter Monitor, correspondence, engineering notebooks, a licensing agreement, product literature, reports, price lists, catalogs, operating manuals and specific information about the Dynamic Del Mar Avionics ElectroCardioCorder (Model 445), 1977, and the ElectroCardioScanner (Model 660), 1971. Both models were developed by Del Mar's medical device manufacturing staff. The licensing agreement and correspondence detail in chronological order the relationship between Norman Holter and Del Mar Avionics, specifically president Bruce Del Mar, in the rapid commercial marketing and development of Holter's electrocardiorecorder. Although Holter assigned exclusive rights to his patent to Del Mar Avionics, he was involved in the design and development process, albeit from a distance. The engineering staff at Del Mar kept Holter informed, and it is clear that Holter regularly visited the company.

The engineering notebooks relate to the models 445 and 660. The notebooks were maintained by engineering staff members D. Anderson, N. Mohammadi, Ray Cherry and Fike. The notebooks are handwritten, although in some instances memos and other information have been inserted. For example, N. Mohammadi's notebook documenting Model 445 contains black-and-white prints, magnetic tape samples, and recorder tape (EKG graph paper) samples with data from the monitor. The notebooks are bound and paginated, and individual pages are stamped sequentially.

**Series 7, Slides, circa 1990s**, consists of color slides used for presentations by Del Mar Avionics staff to discuss and promote the marketing of the Holter Monitor.

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## Arrangement

The collection is arranged into seven series.

**Series 1, Historical Background, 1951-2010 and undated**

**Series 2, Del Mar Avionics Engineering, 1958-1976**

Subseries 1, Correspondence, 1965-1976

Subseries 2, Reports, 1964-1969

Subseries 3, Drawings, 1958-1968

**Series 3, Patents and Trademarks, 1965-2002 and undated**

**Series 4, Product Literature, 1968-2010 and undated**

Subseries 1, Del Mar Avionics, 1968-2010 and undated

Subseries 2, Competitors, 1974 and undated

**Series 5, Sales, 1967-1985**

**Series 6, Holter Monitor Materials, 1958-2005**

Subseries 1, Background Materials, 1958-2005

Subseries 2, Model 445, 1974-1978

Subseries 3, Model 660, 1967-1978 and undated

**Series 7, Slides, circa 1990s**



## Bibliography

Corday, Eliot. "Historical Vignette Celebrating the 30th Anniversary of Diagnostic Ambulatory Electrocardiographic Monitoring and Data Reduction Systems," *American Journal of Cardiology*. 1991, pp. 286-292.

Del Mar, Bruce Eugene. *Ready for Takeoff: An Autobiography*. 2010.

Kennedy, Harold L. "The History, Science, and Innovation of Holter Technology," *Annals of Noninvasive Electrocardiology*, January 2006, pp. 85-94.

Roberts, William C. and Marc A. Silver. "Norman Jefferis Holter and Ambulatory ECG Monitoring," *American Journal of Cardiology*, 1983, pp. 903-906.

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## Names and Subject Terms

This collection is indexed in the online catalog of the Smithsonian Institution under the following terms:

Subjects:

Medical innovations  
Medical instruments and apparatus  
Patents

Types of Materials:

Correspondence

Names:

Del Mar Avionics Corporation

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## Container Listing

### Series 1: Historical Background, 1951-2010 and undated

- Box 1, Folder 1      Bruce Del Mar biographical information, undated
- Box 1, Folder 2      Del Mar Avionics company histories, 1975-2002 and undated
- Box 1, Folder 3      Del Mar, Bruce. *Ready for Takeoff.*, 2010
- Box 1, Folder 4      Del Mar Avionics *Pacemaker Newsletter*, 1980 September; 1986 December
- Box 1, Folder 5      Employee information, 1951, 1979
- Box 1, Folder 6      Avionics Research Products Corporation (letterhead), undated
- Box 1, Folder 7;  
Box 1, Folder 7      Photographs, 1977 and undated
- Box 1, Folder 8      Newspaper clipping, 1965 July
- Engineers & Scientists [black-and-white print advertisement, clipping], July 26, 1965  
*1 Item (3.5 cm x 8 cm.)*  
[Image\(s\): Engineers & Scientists \[black-and-white print advertisement, clipping\] July 26, 1965.](#)  
 Los Angeles Times, Publisher  
 Advertisement for engineers and scientists by Del Mar Engineering Laboratories.
- Unrestricted research access on site by appointment.
- Newspaper clipping on paper.
- Local Numbers
- AC1249-0000001.tif (AC Scan No.)
- |        |  |
|--------|--|
| Topic: | Engineers<br>Inventions -- 1950-2000<br>Scientists |
| Genre/ | Advertisements -- 1960-1970                        |
| Form:  | Clippings -- 1950-2000                             |
- Box 1, Folder 9      Douglas Aircraft Company (ephemera), 1965

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## Series 2: Del Mar Avionics Engineering, 1958-1976

### Subseries 2.1: Correspondence, 1965-1976

Box 1, Folder 11	Correspondence, 1965
Box 1, Folder 12	Correspondence, 1966 February-1966 June
Box 1, Folder 13	Correspondence, 1966 July-1966 August
Box 1, Folder 14	Correspondence, 1966 September
Box 1, Folder 15	Correspondence, 1966 November-1966 December
Box 1, Folder 16	Correspondence, 1967
Box 2, Folder 1	Correspondence, 1968
Box 2, Folder 2	Correspondence, 1969
Box 2, Folder 3	Correspondence, 1970 April-1970 December
Box 2, Folder 4	Correspondence, 1970 February-1970 March
Box 2, Folder 5	Correspondence, 1971
Box 2, Folder 6	Correspondence, 1976

### Subseries 2.2: Reports, 1964-1969

Box 1, Folder 10	Reports, <i>Technical Characteristics of the Electrocardiographic Recording System</i> , 1964 October
Box 2, Folder 7	Reports, <i>Avionics Product Improvement Program Concerning Arrhythmia Monitors</i> , 1969 December 8
Box 2, Folder 8	Reports, <i>Technical Proposal for Dynamic Electrocardiographic System for the National Aeronautics and Space Administration at Edwards Air Force Base</i> , 1965 August 19

### Subseries 2.3: Drawings, 1958-1968

Box 2, Folder 9	Drawings for Avionics Research Products, 1963-1968
Box 2, Folder 10	Drawings for Electromation Company, ADB-01, 1958

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## Series 3: Patents and Trademarks , 1965-2002 and undated

Box 2, Folder 11	Patents (#3,215,136; 3,267,933; 3,267,934), 1965-1966
Box 2, Folder 12	Patents (3,718,772; 4,006,737; 4,073,011), 1973, 1977, 1978
Box 2, Folder 13	Del Mar Avionics patent lists, 1951-1996
Box 2, Folder 14	Del Mar Avionics registered trademarks, undated
Box 2, Folder 15	Del Mar Avionics trademark lists and activity reports, 1997, 1999, 2001-2002

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## Series 4: Product Literature, 1968-2010 and undated

### Subseries 4.1: Del Mar Avionics, 1968-2010 and undated

Box 3, Folder 1	Model 625/626, Continuous electrocardiorecorder, 1968 April
Box 3, Folder 2	Models 650/651, Composite electrocardioscanner operating and maintenance manual, 1972 October
Box 3, Folder 3	Model 680, DCG data terminal, 1977
Box 3, Folder 4	Model 800, Respiratory gas analyzer, undated
Box 3, Folder 5	Model 800A, Exerstress respiratory gas analyzer, undated
Box 3, Folder 6	Model 2800/2900, STress test monitors, undated
Box 3, Folder 7	Model E-20, Avionics treadmill, 1973
Box 3, Folder 8	Cardioguard Electrodes, 1969 January
Box 3, Folder 9	Dynamic electrocardiography systems, circa 1960s
Box 3, Folder 10	London pressurometer/writer system, 1968 December
Box 3, Folder 11	Stress test systems, undated
Box 3, Folder 12	Avionics Biomedical Electronics systems, circa 1960s
Box 3, Folder 13	Hydra Set, 2010
Box 3, Folder 14	Metreflo series 6000 blood flow meter, circa 1960s
Box 3, Folder 14A	Electrocardiocorder Model 385, 1973
Box 3, Folder 14C	Electrocardiocorder, model 350G, operators manual, 1972 February
Box 3, Folder 14B	Metretel/DCG Portacase carrying case, undated

### Subseries 4.2: Competitors, 1974 and undated

Box 3, Folder 15	AMSCO Rehab Corporation, 1974 and undated
Box 3, Folder 16	Clevite Brush recorder, undated
Box 3, Folder 17	Electrocardio Dynamics Inc., undated
Box 3, Folder 18	Spalding Rehabilitation Center, undated

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## Series 5: Sales, 1967-1985

Box 3, Folder 19	Price lists, 1967-1968, 1970
Box 3, Folder 20	Price catalogs (domestic), 1977, 1983-1985
Box 3, Folder 21	Price catalogs (international), 1982, 1984-1985
Box 3, Folder 22	Sales objectives (medical), 1969

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## Series 6: Holter Monitor, 1958-2005 and undated

## Subseries 6.1: Background Materials, 1958-2005 and undated

Box 3, Folder 23 Norman Jeff Holter biographical materials, 1983, 1990 and undated  
[Image\(s\)](#)

[Norman J. Holter : black-and-white photoprint], [undated.]  
*1 Item (19 cm x 24 cm. (8" x 10" paper?))*

[Image\(s\): \[Norman J. Holter : black-and-white photoprint, undated.\]](#)

Subject is seated at a piano. Photographer unidentified.

Unrestricted research access on site by appointment.

Silver gelatin on paper.

## Local Numbers

AC1249-0000002.tif (AC Scan No.)

Names: Holter, Norman J.

Topic: Inventors -- 1950-2000  
Piano

Genre/ Form: Photographs -- 1960-1970 -- Black-and-white  
photoprints -- Silver gelatin  
Portraits -- Men

Box 6A, Folder 1 Wilford Glassock biographical materials, 1993

Box 3, Folder 24 History of the Holter Monitor, 1968, 1973-1979

Box 3, Folder 25 Agreement (licensing), 1962 April 19

Box 3, Folder 26 Correspondence, 1958

Box 3, Folder 27 Correspondence, 1961

[Image\(s\)](#)

Norman J. Holter / President / The Holter Research Foundation, Inc. [black-and-white business card], 1961  
*1 Item (5 cm x 9 cm.)*

[Image\(s\): Norman J. Holter / President / The Holter Research Foundation, Inc. \[black-and-white business card\], 1961.](#)

Holter, Norman J., Collector

Address 25 W. 6th Ave., Helena, Montana, laboratory at 100 Neill Avenue.

Unrestricted research access on site by appointment.

Business card on paper.

Stain from paper clip at top.

## Local Numbers

AC1249-0000003.tif (AC Scan No.)

Names: Holter Research Foundation, Inc.

Place: Helena (Mont.)

Genre/  
Form: Business cards

Box 4, Folder 1	Correspondence, 1962
Box 4, Folder 2	Correspondence, 1963
Box 4, Folder 3	Correspondence, 1965
Box 4, Folder 4	Correspondence, 1966
Box 4, Folder 5	Correspondence, 1967
Box 4, Folder 6	Correspondence, 1968
Box 4, Folder 7	Correspondence, 1969
Box 4, Folder 8	Correspondence, 1970
Box 4, Folder 9	Correspondence, 1971
Box 4, Folder 10	Correspondence, 1974-1977
Box 4, Folder 11	Correspondence, 1978-1979
Box 4, Folder 12	Correspondence, 1980-1982
Box 4, Folder 13	Correspondence, 1991-1992
Box 4, Folder 14	User list for Holter equipment, 1966 and undated
Box 4, Folder 15	Holter Monitor Marketing Report, 1981 November
Box 4, Folder 16	Holter Dynamic Electrocardiography Seminar, 1976 February 22
Box 4, Folder 17	Dynamic electrocardiographic (product literature), 1971-1974
Box 4, Folder 18	Holter recorder (product literature), 1987 September
Box 4, Folder 19	Innovator Holter Management System (product literature), 1986 March
Box 5, Folder 1	Journal articles, 1957-2005
Box 5, Folder 2	Ambulatory Electrocardiology, 1977 June; 19778 March; 1978 December; 1979 December; 1980 June



- Box 5, Folder 3            Annals of Noninvasive Eletrocardiology, 2005 January
- Box 5, Folder 4            Cardiology Digest, 1967 January; 1967 April
- Box 5, Folder 5            Science News, 1968 March 16
- Box 5, Folder 6            Reports, Dynamic Electrocardiography A New Concept in Continous Long-term Electrocardiographic, undated
- Box 5, Folder 7            Report, Telemetry Information booklet, [1966?]
- Box 6A, Folder 2           Royalty report, 1971 - 1982
- Box 6A, Folder 3           Royalty report, 1964 - 1982

### Subseries 6.2: Model 445, 1974-1978

- Box 5, Folder 8            Engineering notebook (D. Anderson), 1974 October-1978 March
- Box 5, Folder 8            Engineering notebook (N. Mohammedi), 1974 September-1975 September
- Box 5, Folder 10           Enginnering notebook (Fike), 1977 February-1985 May
- Box 6, Folder 1            Eletrocardiocorder system operators manual, 1975 October
- Box 6, Folder 2            Eletrocardiocorder Service Manual, 1976 December
- Box 6, Folder 3            Electrocardiocorder recommended spare parts list, 1977 March
- Box 6, Folder 4            Eletrocardiocorder (product literataure), 1977
- Box 6, Folder 5            Patent for recorder for cardiac signals with manually actuated event marking (4,123,785) , 1978 october 31

### Subseries 6.3: Model 660, 1967-1978 and undated

- Box 6, Folder 6            Engineering notebook (Ray Cherry), 1973 July-1978 June
- Box 6, Folder 7            Dynamic electrocardioscanner operating instructions, 1973 August
- Box 6, Folder 8            Model 660A, dynamic electroscanner preliminary operating instructions (difference data), 1976 January
- Box 6, Folder 9            Price lists, 1969-1977
- Box 6, Folder 10           Model 660A, Electroscanner (product literature), 1976-1977  
[Image\(s\)](#)  
Del Mar Avionics Dynamic Electrocardiography Systems [color brochure], 1976

1 Item (21.5 cm x 28 cm.)

Image(s): [Del Mar Avionics Dynamic Electrocardiography Systems \[color brochure\], 1976.](#)

Image: Model 445 Mini-Holter Recorder, 1976.

Box 6, Folder 10.

Unrestricted research access on site by appointment.

Ink on paper.

Local Numbers

AC1249-0000004.tif (AC Scan No.: image of monitor)

Topic:           Electrocardiography  
                  Heart -- Diseases  
                  Radioelectrocardiography

Box 6, Folder 11	Model 660B, Dynamic Electrocardioscanner (product literature), 1978
Box 6, Folder 12	Model 650 (product literature), 1967
Box 6, Folder 13	Models 660/445 (product literature in Japanese), undated

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## Series 7: Slides, [circa 1990s?]

Box 7

[Image\(s\)](#)

[Patient attached to heart monitoring technology : slide: black-and-white, of cartoon], [undated.]

*1 Item (5 cm x 5 cm.)*

[Image\(s\): \[Patient attached to heart monitoring technology : slide: black-and-white, of cartoon, undated.\]](#)

Cartoonist unidentified.

Unrestricted research access on site by appointment.

Silver gelatin on film.

Local Numbers

AC1249-0000005.tif (AC Scan No.)

Topic: Heart -- Diseases  
Medical instruments and apparatus

Genre/Form: Cartoons (humorous images) -- 20th century  
Photographs -- 1960-1970 -- Black-and-white photoprints --  
Silver gelatin  
Slides (photographs) -- 1950-2000

[Bruce Del Mar : color slide], [1979.]

*1 Item (5 cm x 5 cm.)*

[Image\(s\): \[Bruce Del Mar : color slide, 1979.\]](#)

Unrestricted research access on site by appointment.

Slide: color

Local Numbers

AC1249-0000006.tif (AC Scan No.)

Names: Del Mar, Bruce

Genre/Form: Chromogenic processes  
Color slides -- 1960-1990  
Photographs -- 1960-1970 -- Color transparencies  
Portraits -- Men

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