



FOR RELEASE IN SEPT. ISSUE

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FIRST AFFORDABLE GPS NAVIGATION PRODUCT

INTRODUCED TO THE MARINE MARKET

- Magellan GPS NAV 1000 (TM) is hand-held or mountable, lightweight and bouyant -

WEST COVINA, Calif., Sept. 29, 1988 - The first hand-held, affordable, Global Positioning System (GPS) navigation device has been developed for the marine market by Magellan Systems Corporation, a Southern Calif.-based manufacturer of navigation products that use GPS.

The Magellan GPS NAV 1000 (TM) is the first GPS navigation device priced under \$3,000, making the accuracy of GPS available to a large commercial and recreational boating community.

Magellan will introduce the product at the International Marine Trade Exhibition Conference (IMTEC), Sept. 29 - Oct. 2 in Chicago and at Fish Expo, Oct. 12 - 15 in Boston.

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(TM) Trademark

"The Magellan GPS NAV 1000 (TM) will revolutionize marine navigation as we know it," said Randy D. Hoffman, president and chief executive officer of Magellan Systems Corporation. "It combines the previously unavailable benefits of portability and economy of size and power with affordability. It has no rival."

Measuring 8.75 inches by 3.5 inches by 2.25 inches, the Magellan GPS NAV 1000 weighs only 1.5 pounds and can be used by boaters as a portable unit or in a permanent-mount configuration.

In its portable state, the product's PowerSaver (TM) design allows it to be hand-carried to and used on a boat's deck or flybridge, a friend's boat, a chartered boat while on vacation, or a lifeboat during and emergency. In portable operation, the unit is powered by six AA alkaline batteries.

In its permanent mount, the Magellan unit is connected to the boat's power supply and an external antenna.

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The result of extensive market research and testing, the Magellan GPS NAV 1000 (TM) uses the Global Positioning System to determine location. GPS is a U.S. Government-sponsored satellite system designed to provide navigation information for civilian and military use.

The satellites that comprise the GPS constellation transmit time and position signals to GPS receivers, which then process this information into a position fix.

The revolutionary Magellan GPS NAV 1000 (TM) uses its FASTFIND (TM) satellite selection algorithm to quickly locate three GPS satellites. It then "reads" signals to solve for position. After receiving the position and time information from each satellite, the Magellan unit rapidly solves a series of complex mathematical equations that incorporate satellite positions, signal times, the speed of light, the "Doppler effect" and other variables.

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To convert the GPS satellite information into a position fix requires the computing power and speed similar to that of an IBM-PC computer. Computer engineering experts at Magellan Systems Corporation have developed and incorporated specially designed gallium arsenide and silicon integrated circuits, enabling the Magellan unit to perform the complex processing functions while remaining portable, energy-efficient and affordable.

"Magellan Systems Corporation has achieved a technological breakthrough which enables us to provide navigators with the benefits of GPS in the palms of their hands," said Mr. Hoffman.

Developed with the guidance of navigation experts and serious recreational boat owners, the Magellan GPS NAV 1000 (TM) is also waterproof, non-corrosive, buoyant and constructed of a durable, high-impact resistant compound.

Other features of the Magellan GPS NAV 1000 (TM) include:

- o Basic position display of latitude and longitude
- o Computes course over ground, speed over ground, time to go (TTG), estimated time of arrival (ETA), velocity made good (VMG) and distance made good (DMG)

-more-

- o Permanently stores up to fifty waypoints;
provides range and bearing to any destination
- o Automatically saves five recent positions
- o Automatically adjusts to upgrades in GPS
constellation
- o One year warranty

Accessories include a permanent mount kit,
exterior antenna and 50 feet of cable for wheelhouse
adaptations.

Based in West Covina, Calif., Magellan Systems
Corporation develops navigation products that use the
Global Positioning System.

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MAGELLAN
SYSTEMS CORPORATION

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THE MAGELLAN GPS NAV 1000 (TM)

Product Features/Specifications

UNIT SIZE:

- Portable Unit: 8.75 inches X 3.5 inches X 2.25 inches
- External Antenna: 3.5 inches diameter X 3.5 inches height (50 feet of cable)
- Mounted Unit: 9 inches X 5 inches X 2.5 inches

WEIGHT:

- Portable Unit: 1.5 lbs.

POWER REQUIREMENTS:

- 6 AA alkaline batteries
- 10 to 15 volts DC with adapter
- 115 volts AC +/- 10% with adapter

PHYSICAL FEATURES:

- Portable
- Lightweight
- Bouyant
- Battery or external power
- Liquid Crystal Display: 2 line, 16 character alphanumeric display
- User-friendly: no double-function keys

PROTECTIVE FEATURES:

- Waterproof
- Durable, high-impact construction
- Automatic status check of memory and power
- Low battery indicators
- Continuous or battery-conservative operation
- Tested thoroughly for mechanical shock, vibration, thermal shock, humidity and temperature extremes
- One year warranty

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(TM) Trademark

NAVIGATIONAL FEATURES:

- Position to within 30 meters
- Automatically saves last five position fixes
- Saves 50 waypoints; easy entry, search, organization
- Range and bearing to any destination
- Time, date, accuracy stamp; each position, waypoint
- Displays instantaneous velocity (speed over ground)
- Displays heading (course over ground)
- Computes velocity made good (VMG), distance made good (DMG), time to go (TTG) and estimated time of arrival (ETA)
- Automatic computation of magnetic variation
- Steering using cross track error

OPERATIONAL FEATURES:

- Worldwide 24-hour operation
- Insensitive to weather, electronic interference
- Adjusts automatically to GPS constellation upgrades
- Displays time in universal time or local am/pm time
- Automatic evaluation of quality of the fix
- Automatic selection of best satellites
- Wake-up alarm to take automatic fix
- Computer satellite availability
- Customized information displays

TECHNOLOGY FEATURES:

- Custom, revolutionary hardware design including: frequency plan, gallium arsenide technology, custom silicon chips, GPS quadrifilar antenna
- Innovative hardware and software including: PowerSaver (TM) design which enables unit to compute GPS information while consuming little power and FASTFIND (TM) satellite selection algorithm

* Made in the U.S.A.

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Background Information

THE GLOBAL POSITIONING SYSTEM (GPS)
&
THE MAGELLAN GPS NAV 1000 (TM)

THE SYSTEM

The Global Positioning System (GPS) has been designed by the United States Government to be an accurate, world-wide, three dimensional navigation system, available on demand, 24 hours a day. The system is highly resistant to interference.

GPS is a constellation of 24 satellites, each approximately 10,900 miles above the earth's surface, orbiting the earth twice daily in orbits inclined at 55 degrees to the Earth's equator.

Each satellite is equipped with two atomic clocks (one as a spare) and radio transmitters. The satellites continuously transmit accurate time, position and satellite health information on special frequencies at 1575.42 megahertz and 1227.6 megahertz. The 1227.6 MHz frequency is encrypted and is intended for use by the U.S. military only.

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A control station on earth monitors the satellites in order to ensure accuracy of orbital paths, accurate time and satellite health. Through the control station, each satellite receives and transmits information about the relative positions of the other satellites in the constellation. This information is referred to as an "almanac".

The conceptualization and realization of the Global Positioning System is the result of many advances in aerospace technology, a large financial commitment from the U.S. government and the endeavors of individuals expert in communications technology.

As complex as GPS is, it is meaningless to the end user without a receiver to convert the satellites' time and position information into a position fix.

THE RECEIVER

In order to provide the user with accurate navigation information, the GPS receiver must be able to "read" at least three satellites at one time if at sea and at least four satellites at one time if on land, as altitude does not remain constant on land.

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The receiver first compares the time of signal reception against the time the signal was transmitted from each of the satellites. It multiplies the difference in these times by the speed of light (approximately 186,000 miles per second) to determine its distance from each satellite. By using the distance to each of the three satellites and the orbital position of each as factors, the receiver can determine a position fix by completing a series of complex mathematical equations based on geometric principles (basically, the receiver has determined three radii and, by using the radii to create three separate spheres centered at the three satellite locations, the receiver determines the position as the intersection of the three spheres).

Using GPS, the receiver determines and displays the position fix in degrees of latitude and longitude. An inherent by-product of the position solution is the exact time. The position accuracy determined using GPS varies with satellite geometry but errors less than 30 meters are commonly obtained. Time is accurate to about one ten-millionth of a second.

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THE MAGELLAN GPS NAV 1000

The uniqueness of the Magellan GPS NAV 1000 is its size, portability, price and, in particular, its ability to compute GPS information while consuming very little power.

Finding the navigation solution using GPS requires the computing power of an IBM-PC running at full speed. Through specially designed software and the use of gallium arsenide computer chips, the Magellan GPS NAV 1000 is able to achieve this power and speed using only 6 AA alkaline batteries.

In operation, the Magellan GPS NAV 1000 uses its almanac information to determine which satellites are visible from its assumed position at the current time. Using its proprietary Satellite Selection Algorithm, the Magellan GPS NAV 1000 then determines the three satellites that have the relative positions most favorable to determining an accurate position fix.

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The NAV 1000's computer then directs the NAV's radio receiver to search for each of the three chosen satellites using their known frequencies and factoring in the "Doppler effect," which causes the frequencies to differ slightly because of the relative motions of the satellites and the Earth.

The receiver "finds" each of the four satellites in turn and collects each satellite's time and position information, which is stored in the computer. Then, using the differences in time between signal transmission and reception for the four different satellites and the speed of light as factors, the computer determines distance estimates ("pseudoranges") to each satellite.

To find position, the computer begins a series of algorithms to solve for the two coordinates on the Earth's surface (latitude and longitude), and the local clock error.

In approximately four minutes of elapsed time, the Magellan GPS NAV 1000 provides the user with a liquid-crystal display (LCD) readout of latitude and longitude expressed in degrees and minutes.

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MAGELLAN SYSTEMS TEAM
SEEKS TO REVOLUTIONIZE NAVIGATION

MONROVIA, Calif., Sept. 29, 1988 -- A diverse group of managers and technicians believes they are about to revolutionize the world of navigation. Led by their 35-year-old president and chief executive officer, Randy Hoffman, the Southern California-based company today introduced the Magellan GPS NAV 1000. The product will be the first hand-held, affordable marine navigation device that uses the Global Positioning System (GPS) to determine accurate location.

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Background

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With current GPS receivers costing mariners over \$10,000, the NAV 1000 represents a significant step in marine navigation with a suggested retail price of \$3,000.

"Magellan Systems Corporation has achieved a technological breakthrough which enables us to provide mariners with the power of GPS in the palms of their hands," said Hoffman.

The idea for a high-tech portable navigator - and the genesis of Magellan - arose from a late-night discussion between two friends about the limitations of current navigation systems. Tom Osborne, inventor of Hewlett-Packard's HP-35 handheld calculator, and Ed Tuck, a general partner of The Boundary Fund, a venture capital firm, agreed there was a need for a hand-held, affordable navigation product using the advanced GPS technology.

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Background

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Osborne challenged The Boundary Fund to "do the same thing for navigation that Hewlett-Packard did for calculators."

Boundary accepted the challenge and enlisted Don Rea and Norm Hunt, whose engineering firm, Omicron Laboratories, specialized in navigation receivers. Hunt, known for his computer software genius, and Rea, a hardware expert, were commissioned to conduct a feasibility study.

In April 1986, Rea and Hunt exhibited a block diagram of a prototype with their assurance that a low-cost, hand-held GPS receiver could indeed be built. Magellan Systems was born.

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Background

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Extensive market research was then undertaken by Sharon Jones, a new product specialist and Magellan's Director of Marketing. Focus groups pinpointed the need among mariners for a more efficient navigation system, one not subject to electronic interference or limited by signal loss or geographic location. Specifications and design for the Magellan product were developed based on the needs identified by potential users.

The two-year development of the Magellan GPS NAV 1000 was not without setbacks. The most serious setback, which almost jeopardized the product entirely, was the untimely death of Norm Hunt. Valerie Wong, a former Magnavox GPS programmer, now Magellan's Manager of Software Development, was able to continue Hunt's work and keep Magellan's project on schedule.

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Background

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To develop Magellan into a viable business, the Boundary Fund recruited Randy D. Hoffman, as President and Chief Executive Officer. Hoffman was formerly president of the nation's largest sports optics company, the Bushnell division of Bausch & Lomb. His enthusiasm convinced Richard R. Sill to join the new firm as Vice President of Marketing and Sales. In the past, the two had led Bushnell to a 32 percent increase in earnings and orchestrated the successful launch of a new product line.

Hoffman strengthened the Magellan team by adding mathematicians, programmers, and the remainder of other technical specialists the project required.

Among them is Magellan's Vice President of Manufacturing, Harry S. Blackington, a quality control expert and former vice president with American Telecommunications Corporation.

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Background

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"We are extremely proud of our top notch team and our first product," said Hoffman. "The Magellan GPS NAV 1000 will set the standard for the future of precise navigation."

Empowered by the vision of The Boundary Fund, Magellan is solidly funded by venture capital firms with an industry preference for high technology. This seasoned management team will introduce the Magellan GPS NAV 1000 in the fall at the International Marine Trade Exhibition Conference and Fish Expo trade shows.

Based in Monrovia, Calif., Magellan Systems Corporation develops consumer navigation products that use the Global Positioning System.

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