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March 3, 1992

Donna R. Searcy
Secretary
Federal Communications Commission
1919 M Street, N.W.
Washington, D.C. 20554

Re: Errata - PageMart, Inc. Petition for Rulemaking
Filed February 28, 1992

Dear Ms. Searcy:

Enclosed herewith for filing with the Commission on behalf of PageMart, Inc., are an original and four (4) copies of a corrected version of the Petition for Rulemaking to allocate 800 kHz in the 930-931 MHz band and to establish rules and policies for a new nationwide and local Personal Information Messaging Service (PIMS), originally filed February 28, 1992. This corrected version is being filed in order to make certain minor editorial and typographical corrections, which include the following:

- page i, 16th line - the penultimate word is corrected from "and" to "or";

- page 2, 6th line - first word is corrected from "and" to "or";

- page 21, 9th line - the word "that" is deleted;

- page A7, 1st line - the words "HVAC ducts," are deleted;

- page A10, the last two lines of the first paragraph are deleted;

- page A15, in the 4th line the word "made" is deleted, and in the second paragraph "STM" where it appears is corrected to "unit";

- page A23, the figure "13" is corrected to "131" in the 8th line, and the figure "36,00[?]" is corrected to "36,000"; and,

- page A27, the word "advance" is corrected to "advanced" in the first line of the Conclusion.

Please address any inquiries regarding this Errata to the undersigned.

Respectfully submitted,

F. Thomas Tuttle
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FTT/vs
Enclosures

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter Of:

PageMart, Inc.	)	
	)	
Petition for Rulemaking to Allocate	)	RM - _____
800 kHz in the 930-931 MHz Band and to	)	
Establish Rules and Policies for a	)	
New Nationwide and Local	)	
Personal Information Messaging Service (PIMS)	)	

PETITION FOR RULEMAKING

PAGEMART, INC.

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Dated: February 28, 1992

SUMMARY

PageMart, Inc. ("PageMart") requests the Commission to initiate a rulemaking to allocate 800 kHz in the 930-931 MHz band and to establish rules and policies for a new wireless communications service known as Personal Information Messaging Service ("PIMS"). PIMS is an advanced messaging service which permits users instantaneously to receive or send textual or graphical information of any length, in any format, to or from a wide variety of portable or stationary devices—including personal organizers, pagers and palmtop computers—nationwide. PIMS achieves spectrum efficiencies, cost savings and network capacities which are orders of magnitude superior to existing or proposed services or technologies.

PageMart is a telecommunications company with extensive paging operations throughout the United States. The company currently operates Part 90 paging stations in each of the top 30 U.S. markets. In seven major U.S. cities (Los Angeles, San Diego, Atlanta, Dallas/Ft. Worth, San Antonio, Austin and Houston), the company operates extensive wide-area paging networks with up to 40 transmitters operating in a simulcast configuration at 1200 bps. The company has an outstanding record of technological innovation.

PIMS is the first truly personal, portable and ubiquitous two-way information messaging service. Such information messaging is currently either unavailable or uneconomic using existing paging, cellular or other packet network technologies. By combining technical advances in system design and architecture with the continuing refinement of consumer electronics, PIMS can serve as a network "platform" for the development of both mass-market and sophisticated personal messaging services, meeting consumer needs for data messaging that are today either unmet or vastly underserved. With its dramatic advances in spectrum efficiency and architectural flexibility, PIMS will be able to deliver messaging services with extraordinary increases in network capacity and with costs per character up to 100 times lower than the most advanced nationwide paging services currently available.

PIMS is a technologically advanced combination of radiolocation, frequency reuse and state-of-the-art communications technologies. PIMS enables hand-held data communications

transceivers to signal their location to a wide-area transmission network, and to be contacted on a selective, spectrally-efficient basis. Similar to cellular mobile radio service, PIMS architecture is based on the concept of "reusing" frequencies among cells in a given service area on a reuse pattern which assures that co-channel interference is kept to acceptable levels. This approach is essential to transmit text and other messages (i.e., alpha-numeric pages, graphics and facsimile) that consume large segments of transmission time. Existing "simulcast" paging technologies cannot economically deliver these types of messages to large numbers of users without devoting considerable bandwidth and utilizing high-speed and unacceptably high-cost receiving equipment.

PageMart's proposed allocation of 800 kHz is in the public interest because it would support a competitive, multiple provider market structure for the provision via PIMS of high throughput, low-cost messaging services with an extraordinarily broad range of innovative applications for business and individual users nationwide.

PIMS would be offered with two nationwide carriers and two local carriers in each applicable city or MSA, thus ensuring effective competition in the development of PIMS networks and in the provision of PIMS services. Each service provider -- nationwide and local -- would be assigned multiple 25 kHz channels. The two nationwide licensees would each be assigned 250 kHz for use in a ten-channel configuration consisting of eight data channels and two command/control channels, the polling channel and the return link channel. Local licensees could be assigned 150 kHz configured as four data channels and the polling and return link channels. Moreover, PIMS is structured as a "protocol transparent" service, permitting equipment manufacturers or end users to devise and implement their preferred and efficient methods for formatting information.

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Establish Rules and Policies for a	)	
New Nationwide and Local	)	
Personal Information Messaging Service (PIMS)	)	

PETITION FOR RULEMAKING

PageMart, Inc. ("PageMart"), by its attorneys, hereby requests the Commission to initiate a rulemaking to allocate 800 kHz in the 930-931 MHz band and to establish rules and policies for a new wireless communications service known as Personal Information Messaging Service ("PIMS"). PIMS is an advanced messaging service which permits users instantaneously to receive or send textual or graphical information of any length, in any format, to or from a wide variety of portable or stationary devices—including personal organizers, pagers and palmtop computers—nationwide. PIMS achieves spectrum efficiencies, cost savings and network capacities which are orders of magnitude superior to existing or proposed services or technologies. PageMart's proposed allocation of 800 kHz is in the public interest because it would support a competitive, multiple provider market structure for the provision via PIMS of high throughput, low-cost messaging services with an extraordinarily broad range of innovative applications for business and individual users nationwide.

I. INTRODUCTION

With this petition, PageMart proposes that the Commission utilize the 930-931 MHz band for a new, wireless personal messaging industry in the United States by allocating 800 kHz of this reserve spectrum to Personal Information Messaging Service. PageMart's PIMS is the first truly personal, portable and ubiquitous information messaging service. Such information messaging is either unavailable or uneconomic using existing paging, cellular or other packet network technologies. By combining technical advances in system design and architecture with the continuing refinement of consumer electronics, PIMS can serve as a network "platform" for the development of both mass-market and sophisticated personal messaging services, meeting consumer needs for data messaging that are today either unmet or vastly underserved. With its dramatic advances in spectrum efficiency and architectural flexibility, PIMS will deliver messaging services with extraordinary increases in network capacity and with costs per character up to 100 times lower than the most advanced nationwide paging services currently available.

PIMS is a technologically advanced combination of radiolocation, frequency reuse and state-of-the-art communications technologies. PIMS enables hand-held data communications transceivers to signal their location to a wide-area transmission network, and to be contacted on a selective, spectrally-efficient basis. Similar to cellular mobile radio service, PIMS architecture is based on the concept of "reusing" frequencies among cells in a given service area on a reuse pattern which assures that co-channel interference is kept to acceptable levels. This approach is essential to transmit text and other messages (i.e., alpha-numeric pages, graphics and facsimile) that consume large segments of transmission time. Existing "simulcast" paging technologies cannot economically deliver these types of messages to large numbers of users without using considerable bandwidth and utilizing high-speed and unacceptably high-cost receiving equipment.

PageMart's PIMS proposal promises to serve as the foundation for a new wireless messaging industry, enabling American consumers to receive and transmit full-text messages from palmtop and pocket sized personal organizers and notebook computers, and their successors, which are increasingly becoming an integral part of modern business and personal information management. Unlike existing "simulcast" paging technologies and proposed enhancements for data delivery, PIMS achieves high throughput rates without necessitating proprietary or confining modulation schemes or substantially increased costs for high-speed receiving equipment. Unlike cellular and other packet network technologies, PIMS achieves instantaneous messaging, with reliability and portability, without the network control, battery consumption and size constraints dictated by these voice and document-based technologies.

PIMS architecture offers enormous flexibility of design while achieving the fundamental objectives of the service concept. In particular, alternative approaches in both bandwidth size and modulation can be used without sacrificing either the basic service concept or the benefits of high spectrum efficiency, high throughput, and low cost operation and user equipment.

PIMS' flexibility will support multiple local and nationwide service providers as well as highly competitive markets for manufacture and sale of receiving equipment. PIMS is structured as a "protocol transparent" service, permitting equipment manufacturers or end users to devise and implement their preferred and efficient methods for formatting information. PIMS also permits adaptive development of system architecture, allowing service providers to deploy individual network cells of any size -- office, building or geographic-based -- and to easily alter system configuration as demand dictates.

As proposed by PageMart, PIMS would be offered with two nationwide carriers and two local carriers in each applicable city or MSA, thus ensuring effective competition in the development of PIMS networks and in the provision of PIMS. Each service provider -- nationwide and local -- would be assigned multiple 25 kHz channels. The two nationwide licensees would each be assigned 250 kHz for use in a ten-channel configuration consisting of eight data channels and two command/control channels, the polling channel and the return link channel. Local licensees could be assigned 150 kHz configured as four data channels and the polling and return link channels.

II. PERSONAL INFORMATION MESSAGING SERVICE IS AN INNOVATIVE APPLICATION OF ADVANCED TECHNOLOGIES FOR THE PROVISION OF PORTABLE TEXT AND GRAPHIC COMMUNICATIONS

A. PageMart Has Pioneered the Development and Implementation of New Paging and Communications Technology

PageMart is a telecommunications company with extensive paging operations throughout the United States. The company currently operates Part 90 paging stations in each of the top 30 U.S. markets. In seven major U.S. cities (Los Angeles, San Diego, Atlanta, Dallas/Ft. Worth, San Antonio, Austin and Houston), the company operates extensive wide-area paging networks with up to 40 transmitters operating in a simulcast configuration at 1200 bps.

The company has a record of technological innovation. PageMart has pioneered the use of direct broadcast satellite ("DBS") control link architecture, under which the paging transmitter control is conducted through a satellite link to a receiver at each paging transmitter, permitting both increased transmission efficiency and conservation of spectrum otherwise necessary for terrestrial control channels. The company's operational satellite control link is through a Ku band satellite covering the continental United States, and thus any paging transmitter in the continental U.S. can be controlled through this link. This advanced architecture has

the potential to alleviate the demand for control link frequencies in the scarce resource spectrum below 1 GHz, and has led to an improved time alignment system that allows for higher data rate transmissions in the future.

PageMart received experimental authorization from the Commission in September 1991 for the development of cellular paging services. Using this experimental authorization, PageMart has continued to develop and refine the technological and engineering ingredients of Personal Information Messaging Service, including such advanced elements as two-way messaging capabilities, building and office-based cell configuration, and incorporation of RF transceivers in PCMCIA-like standard cards and AT-compatible computer boards. PageMart has worked closely with several major equipment manufacturers, including Motorola, in its DBS-control paging systems and will continue to work with leading equipment manufacturers in the development of PIMS equipment prototypes.

B. PageMart Has Developed Personal Information Messaging Service as a Highly Cost-Effective and Ubiquitous Wireless Communications Service

PageMart's experience in paging, including its innovative efforts in direct broadcast satellite control of transmitters, has provided it a unique perspective with which to implement the next major step in advanced wireless messaging services. Personal Information Messaging Service not only provides a cost-effective solution to today's service alternatives, but addresses major applications gaps in current wireless messaging technology.

In major markets, shortages of paging spectrum are again plaguing the industry. Lotteries for the last available 900 MHz radio common carrier paging channels have already been conducted in New York, Los Angeles, San Francisco and Washington, D.C., and unsuccessful applicants have initiated litigation to seek to improve their plight. While the available spectrum is shrinking, new product lines of highly portable personal computer equipment, from pocket organizers to

notebook computers, are emerging to which services ranging from alpha-numeric messaging to graphics and facsimile transmission could be made available.

The result is that beneficial advances in messaging services and the ability to integrate communications with a new generation of portable personal electronics threaten to be stifled by spectrum limitations. The solution is to develop improved technology which enables messaging services to be offered on a more spectrally-efficient basis. PIMS, as proposed by PageMart, is designed to implement precisely this sort of technological solution. The central technical attributes of PIMS are described below and in Section IV, while a more detailed technical description is provided in the Technical Appendix.

1. Technical Advances

The fundamental throughput limitation for a conventional paging system is that all transmitters in a simulcast system broadcast the same data at the same time which preempts the channel from alternative uses throughout a broad geographic area. PageMart has solved this throughput limitation by combining recent advances in radiolocation, paging and cellular technologies. The cornerstone of this advance is the application of frequency reuse to overcome the spectrum inefficiencies associated with simulcasting. By "reusing" the same frequencies in multiple cells in a given service area, substantial increases in users served and message throughput can be achieved with significant spectral efficiency. Frequency reuse makes the limit to system throughput not only proportional to the data rate per channel, but also to the number of cells in a given area.

Essentially, the idea is to first locate a subscriber unit with regard to its "best" serving transmitter site (cell), then to transmit that subscriber's data only on that "best" transmitter cell site. This radiolocation process is repeated for all subscriber transmission requests, so that all cells that are capable of simultaneous operation without causing destructive interference are able to transmit different data

simultaneously. Because reuse of frequency allows for the transmission of different messages to many different users simultaneously, the efficient delivery of text messages (i.e., alphapages) and other communications (i.e., graphics or facsimile) that require large segments of transmission time is made feasible. In current paging system design, all transmitters in a simulcast system broadcast the same data at the same time, and thus a 7-second text message (typical transmission time for one page of text at 4,800 bps) will occupy all network transmitters for that 7 seconds. In contrast, by combining frequency reuse and radiolocation, PIMS can deliver an identical message by utilizing only one of many transmitters for this 7-second transmission interval, with the remaining capacity available for other messages.

PageMart has available several different and alternative reuse pattern configurations for design of PIMS in order to achieve maximum frequency reuse. First, for wide area coverage, a cell configuration similar to current cellular mobile telephone service is utilized. For example, a major metropolitan system might be composed of 40 paging cells (or transmitters) with a four cell reuse plan. This configuration could produce a potential ten fold (40 divided by 4) improvement in data throughput within this 40-cell system.

Second, for more narrow or focused coverage, smaller cells limited to a building or office that can simultaneously broadcast within a highly discrete service area are utilized. Consider the major U.S. cities where frequency congestion is greatest. High rise buildings, properly fitted with a low-power transmitter and slotted coaxial cable hung in the mechanical access space of the building core, or another site-specific antenna configuration, can function as independent cells capable of transmitting messages without adversely affecting the external RF environment. It is not difficult to envision 100 to 200 such building cells that could be transmitting simultaneously, providing a 100-fold or more increase in throughput.

PageMart employs two currently available radiolocation technical capabilities to support dramatic increases in throughput. First, the PIMS base station (cell site)

transmitter regularly identifies itself by transmitting a unique station identification code or "call sign." Second, each individual transceiver "captures" the strongest signal from the group of overlapping serving transmitters. When the control channel broadcast indicates that a message is available for delivery to a particular user, that user's transceiver notifies the transmitter of its location and optimal serving cell. Thus, upon receipt of a one-way communication to the system controller terminal for delivery to a subscriber unit, a coded message would be sent out asking the intended recipient subscriber unit to signal its location. A "smart" low power hand-held transceiver will read this message and the accompanying identifying base station transmissions, determine which particular transmitter offers the strongest RF signal, and then "signal back" to the system identifying the unique base station transmitter that should be utilized to communicate to that unit. Unlike cellular mobile radio service, this interactive identification process would only take place when a message is to be sent (i.e. the system needs to manage only active subscribers) so that battery life of the receiver units can be extended and administrative and logistical expenses associated with system control can be minimized.

2. Feasibility

The foundation of PIMS is its innovative use of currently available and newly developed technologies in a unique mix to support substantial increases in both spectrum and cost efficiency. Radiolocation technology has developed in recent years to a point where low-powered mobile transmitters have been effectively used for signalling to remotely located receiver stations. PIMS could easily be provided to and from a low-powered (0.1 watt) transceiver that is integrated into hand-held personal computer products, for instance using a small card type PCMCIA-like standard format for personal organizers. As noted below, PageMart envisions that the capability to accept such miniaturized RF modules on a plug-in basis could be

incorporated as well into personal computers and other stationary devices, allowing users a unique degree of "number portability" not currently available, by moving the RF card from device to device. These low-power transceivers will be able to transmit to receive sites that are located external to the building through the use of portable power modules, in the range of 10 watts, which would plug into electrical outlets and rebroadcast the signal.

In this configuration, a pocket organizer or notebook computer with an RF transceiver will be able to receive and send text messages reliably both "in-building" and "on the street." As described in Section III below, this personal, mobile information messaging capability meets significant unmet consumer demand and promises to dramatically improve personal communications options for American businesses and consumers.

3. Relative Advantages

Personal Information Messaging Service, as developed by PageMart, has inherent and significant advantages over the principal available methods of mobile communications, paging and cellular radio. In contrast to current paging technology, PIMS' use of cell technology rather than simulcast transmission for data delivery, supports higher-volume, lower-cost transmissions to a dramatically increased number of users. In addition, because PIMS' cellular-type system configuration allows higher throughput without costly increases in the data rate of receiving equipment, it is ideally suited to the type of text and alphanumeric messages that conventional paging systems cannot cost-effectively deliver.

Compared to cellular radio, PIMS has different but comparably substantial advantages. Designed principally as a voice medium where circuit connections must remain open in real time on a two-way basis, cellular radio requires constant control of subscriber units and far more complex receiving equipment, which in turn impose size constraints and battery life limitations on cellular telephones. Since PIMS receivers are only required to radiolocate when a message is "in que," system

control costs are reduced, and the subscriber unit can remain "off" until message delivery. More significantly, the relatively large cell size associated with cellular radio makes in-building penetration relatively unreliable and requires far larger investments of equipment and control expense for the installation of "micro cell" configurations.

In short, PIMS represents a vast improvement over conventional and proposed advanced simulcast paging systems, which are essentially limited either to short messages or a relatively small potential subscriber base. PIMS also represents a substantial improvement over cellular mobile radio for the provision of data and text messaging, since the same engineering attributes which make cellular radio an efficient means for voice communication make it an inefficient and unreliable for in-building data communication.

III. PERSONAL INFORMATION MESSAGING SERVICE WILL SATISFY SUBSTANTIAL CONSUMER NEEDS AND UNTAPPED DEMAND FOR UBIQUITOUS, PORTABLE TWO-WAY INFORMATION TRANSFER

The explosive growth of personal and portable computing devices over the past several years is likely just the start of a profound transformation in U.S. consumer approaches to information technology. While a decade ago personal computers were still relatively rare both in business and residential households, today virtually all business and as much as 35% of all households employ personal computers, proportions which are likely to continue to increase as relative hardware prices decrease. By the same token, miniaturization of consumer electronics has spawned entirely new types of computing devices, including laptop and notebook computers, personal organizers (e.g., HP95LX, Poquet, Sharp Wizard and Casio B.O.S.S., among others) and even smaller "palmtop" computers. Just as personal computers have steadily moved toward becoming standard pieces of personal electronic equipment, newer and continually smaller portable information devices should, over

the next decade, become a routine element of life and work for a substantial proportion of Americans.

This tremendous increase in portable information-processing devices has already begun to spawn demand for integrating wireless communications capabilities, permitting a single device to function both as a personal, portable computer and as a communications transceiver. Currently available technology is limited both in price and service options, with several manufacturers (Erricson-GE, Poquet-Motorola, AT&T Safari) producing devices priced between $2,000 and $6,000 for mobile data communications. These niche products have begun to penetrate the high-end business market for specific applications, such as a mobile office in a vehicle or transmission of customer orders in high-margin and extremely time-sensitive industries.

Given the steady and accelerating growth of portable computing and organizing electronics, the market for communications services is poised to expand to meet one- and two-way messaging needs of users. Personal Information Messaging Service is designed to meet this need by providing seamless, portable communication capabilities for all types of information devices at all types of locations. A single PIMS receiving module could be compatible with numerous consumer devices, allowing receipt of messages in virtually any environment and at any time. Furthermore, since the PIMS equipment is only required to signal its location to the network when a message is ready for delivery, PIMS equipment will not have to be turned "on" continuously like cellular telephones and current high-end wireless data receivers, thereby substantially increasing battery life and reducing size requirements.

The range of applications possible with PIMS is virtually unlimited. Instead of receiving a page indicating "call-the-office", business people could have their offices transmit all their telephone messages, in full-text form, to their palmtop computers. The computers would receive them on the integrated PIMS card even while turned off and then notify the users to "power-up" and that the messages had been received and were awaiting review. Instead of recording and giving out telephone, car phone, portable cellular and facsimile numbers for each location on a business trip or vacation, consumers could bring with them a single hand-held device, usable nationwide, with a receiver that could easily be slipped out and inserted into another office or personal computer if more sophisticated text or data-manipulation capabilities were required. And instead of manually retrieving electronic mail messages while travelling by calling a remote host computer using a modem -- or worse yet, waiting until return home -- these time-sensitive communications could automatically be forwarded via PIMS to the hand-held electronic device carried by the user while on travel.

Each generation of communications technology, from voice telephony through paging through facsimile through cellular radio, has left an indelible mark on consumer demand and American society. By offering nationwide, portable, one-way and two-way information messaging, PIMS will meet pent-up demand for mobile information messaging and serve as the catalyst for numerous other applications that have not yet been conceived.

IV. PAGEMART'S INNOVATIVE DESIGN MAKES PERSONAL INFORMATION MESSAGING SERVICE A HIGHLY SPECTRUM-EFFICIENT, INEXPENSIVE AND ADAPTABLE COMMUNICATIONS SERVICE

PageMart's proposal for Personal Information Messaging Service meets two pressing needs in communications business and policy: the ability to deliver messages at a dramatically reduced cost-per-character and the conservation of scarce

spectrum. No existing or proposed communications technology can, in a "stand-by" mode, instantaneously and automatically deliver similar amounts of information at comparable costs and with comparably efficient utilization of spectrum. The relative advantages of PIMS flow directly from the proposed service's seamless integration of both new and existing technology and engineering developments from a number of different communications areas. PIMS incorporates into a single, open protocol platform, the technological advantages of frequency reuse, radiolocation capabilities and adaptive architecture, as well as the device-independence available with modern consumer electronics.

A. Radiolocation

Radiolocation is provided by means of a single "polling channel" which broadcasts the unique identifiers of all subscriber units for which messages are ready for transmission. On receipt of such a polling message, the RF module in the subscriber unit answers back with a low-powered message that identifies the appropriate serving transmitter and instructions (set by the user) for delivery or storage of the message. PIMS messages are therefore delivered only to the particular areas in which intended recipients are located and only when the paged party's transceiver indicates it is ready to accept delivery.

Radiolocation technology, combined with low-power RF capabilities, is the cornerstone of Personal Information Messaging Service, since it is an essential element for effective frequency reuse and the cellular nature of PIMS system architecture. Moreover, because the PIMS network need only control subscriber units when messages are ready for delivery, the system achieves significant control and administrative advantages over cellular mobile radio systems of comparable size. Compared to conventional and other simulcast paging systems, radiolocation permits PIMS to achieve dramatic increases in throughput and relative spectrum utilization.

B. Frequency Reuse and Capacity

Application of an adaptation of the cell-based pattern of frequency reuse initially developed for cellular mobile radio is the foundation for PIMS' spectrum efficiency. Frequency reuse, coupled with adaptive architecture supporting cell sizes as small as a single floor or office, supports considerable increases in both the number of users and volume of messages which may be carried on PIMS networks. For instance, based on conservative assumptions of 6,000 character average message size and an average of 2.5 messages per subscriber during a 10-hour busy period, the PIMS model indicates that over 100,000 subscribers per MSA (at 4,800 bps) could be supported, at a relatively small system size of 40 geographic cells, 40 building cells and 400 office cells. This equates approximately to one page of facsimile transmission per person per day. Thus, relative to simulcast messaging systems, PIMS offers capacity increases of between 13 and 30 times on a projected case basis and multiples of up to 100 on a theoretical case basis. These capacity improvements are detailed in the Technical Appendix, pp. 20-24.

C. Adaptive Architecture and Flexibility

A significant technical input into PIMS system design is the flexibility of adaptive system architecture which permits real time dynamic allocation of spectrum and power to meet continued variations in demand. PIMS networks can utilize cells in any reuse pattern that is efficient from both an engineering and business perspective, and at a size ideally configured relative to the projected message demand in the locality. Cell size can range from large geographic cells similar to conventional mobile radio transmitters, to building cells based on slotted and modified coaxial cable distributed throughout the building core, to office cells utilizing low-power transmitters. Through advanced system control, subscriber units can be paged, and messages delivered, in any real-time combination of cells necessary for optimal system efficiency. As a result, not only are the capital and

network equipment costs associated with PIMS minimized, since cells can be built where required and no larger than required, but PIMS' adaptive architecture allows flexible system development keyed to the growth of subscriber demand.

This basic architecture as developed and proposed by PageMart offers enormous flexibility of design while still achieving the fundamental objectives of the service concept. In particular, alternative approaches could be taken in both bandwidth size and modulation used without sacrificing either the basic service concept or the benefits of high spectrum efficiency, high throughput, and low cost operation and user equipment.

D. Open Protocol

PIMS is designed as a non-confining platform for use by the widest possible number of different equipment manufacturers and service providers. No specific or proprietary modulation scheme or message formatting will be required. Messages may be input into a PIMS network from any available device and all standard formats (e.g., E-Mail, personal computer, Group 3 and 4 facsimile, touchtone, etc.). Messages will be transmitted and delivered in full-text or binary form, permitting individualized solutions through software and hardware based systems. PIMS can function as a completely transparent transmission path for exchange of information using mass-market software formats (e.g., spreadsheets) or custom-designed, proprietary formats on any subscriber device.

E. Device Independence

PIMS incorporates a superior interface to messaging hardware, allowing the service to be offered on a device-independent basis. As a result of the low-power requirements for return link transmission, RF modules can be designed as removeable cards for portable notebook and palmtop computers, PCMCIA-like standard cards or communications boards for other information-processing devices. This capability makes it possible for PIMS messaging to be offered in a manner

compatible with all devices a potential user may need to utilize, regardless of location. For instance, a consumer could use the same PIMS RF module in his personal organizer while travelling, in a notebook computer while working off-site, and in his office or home personal computer.

F. Consumer Benefits

PIMS will meet consumer needs for low cost, flexible information messaging not available from existing and proposed services. The engineering innovations underlying PIMS translate into a number of immediate benefits for end users.

- By increasing spectrum efficiency without necessitating complex modulation schemes and/or vastly increased data transfer speeds, PIMS avoids the increased equipment costs inherent in other proposals for advanced messaging services.
- PIMS' architecture permits RF transceivers to operate on very low power on the order of 100 milliwatts, in turn supporting continued decreases in the size necessary for subscriber equipment.
- Multiple cell architecture and power module technology allows for superior in-building penetration, eliminating "dead" zones and allowing for truly portable devices.
- Radiolocation allows PIMS messages to be delivered without the need to maintain the subscriber unit in a continuous or periodic "on" position, reducing battery consumption, significantly extending useful life between charges, and further reducing size constraints.
- Reduced power requirements support integration of RF modules into standard computing interfaces, such as the PCMCIA-like standard cards used with personal organizers and pocket computers, permitting easy transfer of PIMS capabilities across numerous types of equipment platforms.
- Use of an "open protocol" for both message coding, RF modulation and subscriber equipment specification permits the entry of numerous competitive suppliers, creating both economies of scale and competitive pressures for maintenance of low end-user prices.

G. Cost Advantages

All of the above benefits have a substantial and favorable effect on expected PIMS system costs. PageMart estimates that message transmission costs for a fully developed PIMS system will be approximately 10 cents per kilobyte, achieving costs savings of up to 100 times or more compared to existing nationwide alphanumeric paging technologies with the added advantage of two-way messaging capability.

V. THE COMMISSION SHOULD ALLOCATE 800 kHz FROM THE 930-931 MHz BAND FOR PERSONAL INFORMATION MESSAGING SERVICE

PageMart recommends that the Commission allocate 250 kHz for each of two nationwide carriers and 150 kHz for each of two local carriers for provision of Personal Information Messaging Service, or a total of 800 kHz out of the reserve spectrum. Each service provider would be assigned multiple 25 kHz channels. The two nationwide licensees would each be assigned 250 kHz, for use in a ten-channel configuration consisting of eight data channels and two command/control channels, namely, the polling channel and the return link channel. Local licensees would be assigned 150 kHz, configured as four data channels and the polling and return link channels. Application of the 930-931 MHz band for PIMS is particularly well-suited, not only because the Commission has previously reserved this spectrum for advanced messaging capabilities, but also because these frequencies are uniquely suited to achieving the best balance between range of signal propagation and building penetration characteristics. With the combination of its major advance in spectrum efficiency, coupled with its capability for two-way data transmission to extend the range of advanced messaging services, PIMS is clearly superior to all existing or proposed messaging services that the Commission might consider for allocation in the reserve spectrum.

PageMart's proposed scheme for both national and local PIMS carriers is fully consistent with the Commission's historic policy objectives in utilizing market competition to spur technical development and system deployment and to ensure the lowest possible service prices for end users. The combination of national and local carriers also allows for service to differently situated consumers with different communications needs. Nationwide carriers are required to provide service to subscribers who are mobile either intercity or interstate; since a radio locationing approach is used to locate subscribers and then transmit the message, a nationwide system operator is needed to manage this traffic and notify subscribers on a nationwide basis that a message is waiting. Local carriers are needed to serve local subscriber requirements, particularly where the end user has a specific need for enhanced in-building, intraoffice coverage, permitting local carriers to differentiate themselves for such uses as local business, sales and service communication. In particular, the emergence of intra-office messaging services can be addressed by the local carrier.

PageMart recognizes that this request for spectrum comprises a significant portion of the total available in the 930-931 MHz band. The proposed Personal Information Messaging Service, however, is designed to provide for measured growth opportunities without confronting the Commission with additional near-term requests for more spectrum or piecemeal, smaller grants for a variety of niche services that do not adequately serve the public need and would underutilize scarce spectrum. As addressed above, the capacity increases and costs savings associated with PIMS, along with its adaptive architecture open protocol with flexible applications, allow the service to function as a platform for long-term growth and expansion in personal wireless messaging.