

APRIL 1989

SERVICE VENDOR
ANALYSIS

PERSONAL COMPUTERS
AND WORKSTATIONS



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Customer Service Program (CSP)

***Service Vendor Analysis—
Personal Computers and Workstations***

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Abstract

This report, *Service Vendor Analysis—Personal Computers and Workstations*, analyzes the service and support offerings available to personal computer and workstation users from three major sources: manufacturers of systems, dealer/distributors of systems, and third-party maintenance organizations. In this report, 16 leading vendors from these three categories are surveyed, including Altos, Apollo, Businessland, Compaq, Computerland, Control Data Corporation (Technical Services), IDEA Servcom, Inacom, Intelligent Electronics (Entre Computer Centers), Intelogic Trace, MicroAge, Sun Microsystems, Tandy, and TRW CSD.

Each profile contains background and demographic information about each service organization, including information such as service locations, engineer population, and revenue base. In addition, each profile provides an in-depth analysis of the services offered to microcomputer and workstation users, and, in the case of manufacturer service organizations, what services are available to dealers and VARs.

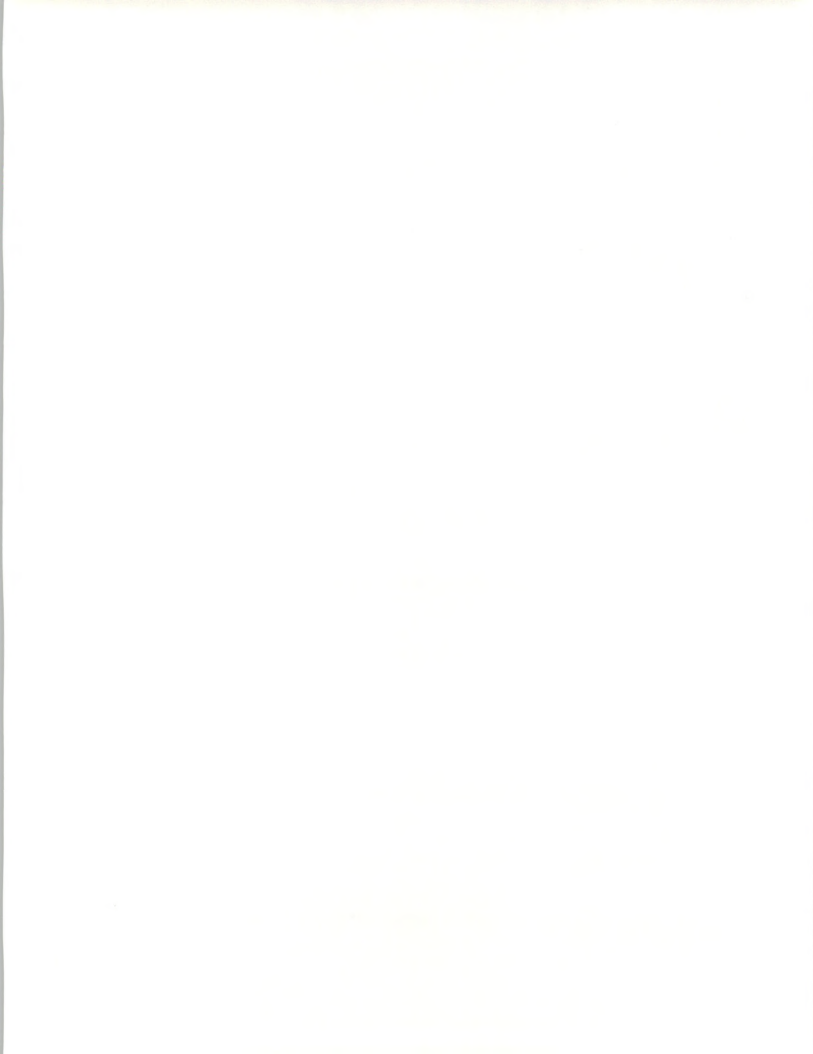
At the end of the report, comparative tables provide summary information about the service organization and service offerings available.

The report contains 78 pages, including 16 exhibits.



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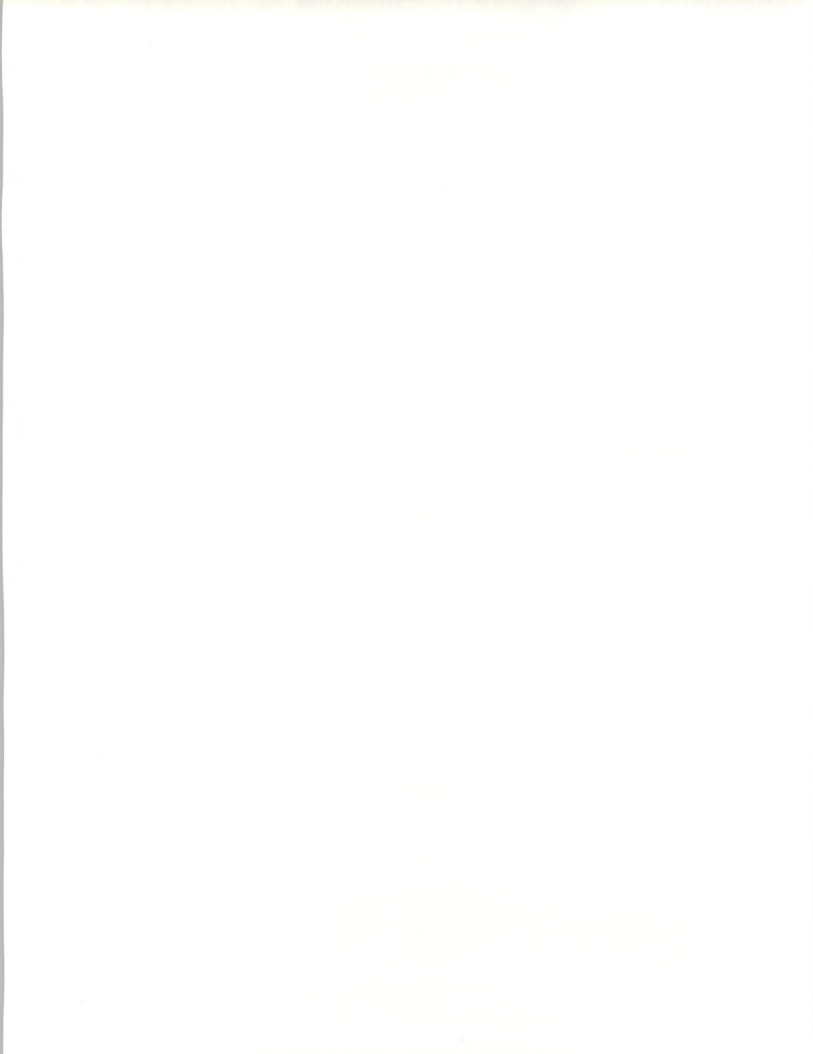
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Introduction







Introduction

This report, *Service Vendor Analysis—Personal Computers and Workstations*, is the first deliverable in the Personal Computer/Workstation Module of INPUT's 1989 Customer Service Program. The next report in this module, *User Service Requirements—Personal Computers and Workstations*, will analyze user requirements for service and support in the areas of hardware maintenance, software support, and ancillary support services (such as training, network planning, and other support services). The last deliverable in this module will provide current service market size and five-year projected growth in all product categories.

A

Scope

This report analyzes the service and support offerings available to personal computer and workstation users from three major sources: manufacturers of systems, dealer/distributors of systems, and third-party maintenance organizations. In this report, 16 leading vendors from these three categories are surveyed, including Altos, Apollo, Businessland, Compaq, Computerland, Control Data Corporation (Technical Services), IDEA Servcom, Inacomp, Intelligent Electronics (Entre Computer Centers), Intelogic Trace, MicroAge, Sun Microsystems, Tandy, and TRW CSD.

Each profile contains background and demographic information about each service organization, including information such as service locations, engineer population, and revenue base. In addition, each profile provides an in-depth analysis of the services offered to microcomputer and workstation users, and, in the case of manufacturer service organizations, what services are available to dealers and VARs.

At the end of the report, comparative tables provide summary information about the service organization and service offerings available.

Appendixes at the end of this report contain an example of the questionnaire used for this study as well as a useful list of definitions of terms found in this report.



B

Methodology

INPUT attempted to survey the companies profiled in this study using the questionnaire contained in Appendix A. When necessary, INPUT supplemented this effort with information (annual reports, 10K forms, press releases, marketing brochures, and press clippings) contained in INPUT's Information Center, located at its Mountain View (CA) headquarters.

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Service Vendor Profiles





COMPANY PROFILE

ALTOS COMPUTER SYSTEMS

2641 Orchard Parkway
San Jose, CA 95134
(408) 946-6700

David Jackson, Chairman, President, and
CEO

Jon Andreason, Director of Customer
Quality Assurance

Total Revenue, Fiscal Year End 06/25/88:
\$176 million

The Company

For more than a decade, Altos Computer Systems has been a leading manufacturer of multiuser computer systems, with products that have grown in complexity from their original 8-bit systems to their newest and most powerful system, the Altos 386 Series 2000 model 20. To date, Altos has installed more than 108,000 multiuser systems in over 70 countries.

In fiscal year 1988, Altos announced a new family of hardware and software communications products, called Advanced Local Area Network Telecommunications System (AdLANtes), that integrates UNIX-based multiuser systems with DOS-based microcomputers.

Altos was also busy from a financial standpoint in fiscal 1988. The company sold Communications Solutions, Inc. (CSI), a telecommunications software and professional services company, to 3Com Corporation and made investments in Wyse Technology, Informix Corp., and Laguna Systems, Inc.

In October 1988, Altos introduced Customized Support, an innovative service offering that addresses dealer and user concerns about service costs. Under the plan, Altos sells an agreed-upon number of service "credits" for use in procuring various technical support services. The cost of each minute of access to technical support varies by response time required (i.e., .75 credits per minute for next day response up to 3 credits per minute for 30-minute response).



Service Demographics

Not unlike many other manufacturers of microcomputer and supermicrocomputer products, Altos relies heavily on an extensive network of 139 Self-Servicing Resellers, who are authorized, trained, and provided spares by Altos to sell and service their systems. In addition, Altos offers hardware and software telephone technical support to both distributors and their VARs out of its Customer Support Center located at the company's San Jose headquarters.

For customers whose dealers do not provide on-site service, Altos has arrangements with three nationwide affiliate service companies—Triad, Bunker Ramo, and TRW—to provide on-site maintenance. Through these arrangements, Altos can provide timely on-site hardware maintenance out of over 225 affiliate service locations nationwide with over 700 Altos-trained field engineers. Altos performs all service call management (via an 800- number) after the dealer has screened the call. The dealer is responsible for selling service contracts and billing the customers.

Service Delivery

Through its on-site contract maintenance program, Altos provides on-site maintenance with four-hour response (within 50-miles of an affiliate service location) via a toll-free (800) number. Altos contacts the appropriate affiliate service location, and manages and documents any escalation procedures that may be required. In addition, problem isolation procedures are run by Altos technical support specialists to speed and improve problem resolution.

Beyond the 50-mile limit, Altos charges the following additional zone uplift charges: 51-100 miles, an additional 25%; 101-150 miles, 40%; and beyond 150 miles, the uplift is negotiated.

Basic coverage is five days a week, nine hours a day. Users can add weekend, evening, and around-the-clock coverage, but the uplift charges are negotiated on a case-by-case basis. If a contract customer requires service performed outside of its contracted coverage, Altos charges \$125 per hour (with a two-hour minimum).

Altos will refer noncontract service to the appropriate local service provider, which will quote its current T&M rate.

Altos estimates that 75% of its customers purchase service contracts. In addition, Altos estimates that 60% of its service business is derived from contracts, 30% from T&M service, and 10% from "flat fee" service (Altos' newly introduced Customized Support offering).



For the previously described Customized Support service plan, Altos charges \$625 for 500 credits (must be used within one year of purchase), \$1,100 for 1,000 credits, and \$2,125 for 2,000 credits.

Additional support options available under this Customized Support program include AltoServ, an on-line bulletin board with technical support information (for 100 credits); annual subscription to Technical Support Manual (250 credits); Remote Dial-Up System Administration, where a technical support specialist performs on-line remote system administration functions (75 credits per hour); Software Evaluation & Consulting (100 credits per hour); Remote Diagnostics (40 credits per incident); Software Updates (.7 credits per dollar spent—this represents a 12% saving over list cost of update); and Field Service Reference Manual (100 credits per issue).

In addition, customers can choose the Preferred Account Management premium option. Users who are suggested to be accounts of \$250,000 or larger receive an assigned support engineer, 20-hours of free access to AltoServ, subscriptions to all technical publications, enrollment in the Altos System V System Administration Course, enrollment in Altos product Beta Program, as well as 2,500 support credits.

Customers who purchase Altos On-Site Service contracts can negotiate certain discounts for service. For example, users who prepay their service contracts typically receive discounts in the 15% range. Altos also typically negotiates dollar volume discounts. Users who agree to perform call screening/problem management responsibilities also receive a discount in the 15% range.

Of course, Altos must provide a wide range of support to their VARs and other dealers who provide their own service offerings. Altos will provide maintenance training, spare parts kits and individual parts sales, technical phone support (typically regarding software), technical documentation, and engineering/field change orders. In addition, Altos offers a 40% discount (from list prices) for all spare parts sales to authorized service providers.

To qualify as an authorized self-servicing reseller, the VAR or dealer must agree to perform warranty work, maintain a specified level of spare parts, take Altos-supplied training, and pass a certification examination. Incidentally, Altos compensates the self-servicing reseller for any warranty work performed at a flat rate per call, and furnishes the parts used.

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**APOLLO COMPUTER
INCORPORATED**

330 Billerica Road
Chelsford, MA 01824
(617) 256-6600

Thomas A. Vanderslice, Chairman
Douglas P. Langenberg, VP, Apollo
Computer Services
Total Employees: 4,000
Total Revenue, Fiscal Year End 12/31/88:
\$650 million

The Company

Apollo Computer, founded in 1980, is a leading manufacturer of technical workstations for the engineering and scientific marketplace. After virtually creating the workstation market, Apollo now finds itself battling for sales with such competitors as Sun Microsystems, Digital Equipment Corporation, and even IBM.

The competition in the workstation market is such that when AT&T and Sun agreed in 1988 to team up and co-develop future versions of the UNIX, Apollo, Hewlett-Packard, IBM, and DEC rallied to form the Open Software Foundation (OSF), which plans to create an open system environment based upon current and emerging industry standards.

In 1988 Apollo announced two new service offerings, Network Services Program and Professional Services Program. Network Services Program provides network planning, design, installation, verification, certification, and management services. Professional Services Program offers software consulting services including application design and development, performance optimization, systems integration, and custom software design.

Apollo launched a new VAR support program in September, 1988, called the Apollo Partners Program. The program now supports over 1,000 value-added dealers and software developers, offers field-sales seminars, direct mail campaigns, co-operative advertising, and technical training services.

**Service
Demographics**

Apollo's 1988 worldwide customer service revenues were \$140 million, up 61% from 1987.

Apollo employs 700 people in service capacities, with 245 field engineers and 455 technical support specialists. In addition, Apollo employs 60 training specialists.



Service is available from 70 locations in the U.S. Depot service is offered out of their Chelmsford headquarter location, which also functions as their central spare parts location.

Service Delivery

Apollo systems carry a 90-day warranty, during which time Apollo provides on-site service to users, covering the prime shift (9-hours per day, 5-days per week) only.

After the warranty expires, Apollo offers a wide range of support services, including remedial and preventive hardware maintenance, software support, training, installation and relocation, conversions and upgrades, and product refurbishment.

Operating software support is typically provided via telephone support, and is bundled into the hardware maintenance agreement. Application software support is sold separately as a subscription service, entitling users to telephone support and technical bulletins. Users can separately purchase media and documentation (upgrades and additional copies).

Basic on-site service provides on-site remedial support covering five-days by nine-hours per day. Apollo guarantees four-hour response time for users within 50 miles of an Apollo service location. Users with high system availability requirements can negotiate extended coverages up to 7-days, 24-hours per day.

Apollo also offers time-and-material service to both noncontract customers and to contract customers who want service outside of their coverage. Apollo currently charges \$125 per hour (with a two-hour minimum) for prime shift, increasing to \$145 per hour for nonprime T&M. Apollo also charges an additional \$.25 per mile for auto travel, on top of the typical portal-to-portal travel time expenses.

Apollo customers can negotiate a wide range of service discounts, including prepayment discounts (at 5% off list), dollar volume discounts (ranging from 3 to 12%), unit discounts (up to 20%), as well as multiyear service contracts (offering a wide range of discounts to Apollo customers).

Apollo also provides a wide range of support to their resellers, including service training, spare parts sales, hardware and software technical support, engineering/field change, and orders. Spare parts discounts are negotiated with each reseller based upon volumes purchased.



COMPANY PROFILE

**APPLE COMPUTER,
INCORPORATED**

20525 Mariani Avenue
Cupertino, CA 95014
(408) 996-1010

John Sculley, Chairman
Morris Taradalski, VP Customer Services
and Information Technology, Apple USA
Total Employees, 10,000
Total Revenue, Fiscal Year End 09/30/88:
\$4.1 billion

The Company

Apple Computer was formed on April Fool's Day, 1976, debuting their Apple I computer circuit board at a meeting of the Homebrew Computer Club in Palo Alto, CA. Topping \$1 billion in sales in December, 1982 (the first personal computer to do so), Apple (and their products) became symbolic of the rapid growth potential of the personal computer industry. At the same time, Apple became identified as the alternative to computer industry giant IBM (an image carefully fostered by Apple and their enigmatic co-founder Steve Jobs), both in terms of product and corporate culture.

In August, 1988, Apple announced a major restructuring program that created four main internal operating divisions, each led by a divisional president. Apple Products, led by Jean-Louis Gasse, is responsible for product marketing, worldwide manufacturing, and research and development; Apple Pacific, under Del Yocam (who will leave Apple in November, 1989), reflects the company's growing presence in that geographic region; Apple Europe, under Michael Spindler, will grow in importance as the European market for Apple products continues to grow; and Apple USA, under Allan Loren, which oversees the following groups: U.S. Sales and Business Marketing, Information Systems and Technology, Customer Service, Systems Integration, and Education.



There have been a number of key Apple personnel changes in the last few months. Along with the aforementioned Yocam (formerly Chief Operating Officer who many thought was destined to become the next president of the company), Charles Berger resigned his post as VP and GM of Apple Integrated Systems to take a position at Sun; Charles Bosenberg, formerly Senior VP Sales and Marketing, resigned in January, 1989 after being bypassed by Loren's promotion; Deborah Coleman will take a leave of absence as Chief Financial Officer; and Joseph Schoenderf announced his resignation after being hired in Spring of 1988 as VP of Apple's marketing and customer support group. Gasse now appears to be next in command at Apple, but many point to Loren as the rising star with the company.

Service is now under the direction of Morris Taradalski, who was appointed VP, Customer Services and Information Technology (MIS), reporting to Apple USA president Allan Loren. Taradalski, an eighteen year vet at IBM (on the software development side), has responsibilities to oversee Information Systems and Technologies, Training Support, and Technical Support and Service groups at Apple.

Apple has made a number of recent service-related announcements. In April, 1988, Apple announced the formation of an End-users Services organization that will provide systems integration and other support services to business users of Macintosh computers. Future services proposed by this organization include needs assessment planning in the areas of hardware, software, and networking, system installation, and maintenance and support services. This group was later renamed the Integrated Services Division.

In May, 1988, Apple announced a consumer on-line service available to end users of Apple II and Macintosh systems. The new service, called Consumerlink, was developed by Quantum Computer Systems of Vienna, VA. The new on-line technical support service is similar in scope to Applelink, an on-line technical support service available to developers, dealers, and selected major Apple users.

In October, 1988, Apple named Digital Equipment Corporation as an authorized service provider for Apple products at DEC sites. The announcement came on the heels of DEC's multivendor support release, called Enterprise-Wide Service.



Service Demographics

Apple has a limited direct service organization, per se: rather Apple has an organization designed to support their dealers in order to avoid competing with their dealers for post-sale support revenues.

Organizationally, Apple service is located under Apple USA. Apple has three Customer Service Centers (located in Chicago, IL, Charlotte, NC, and Campbell, CA) that provide telephone support, spare parts, and training to their authorized dealer network, as well as to users who provide their own service (under the Servicing Account Program). Training is also offered out of three additional satellite training centers located in Los Angeles, Boston, and Dallas.

Apple also breaks down the U.S. into 30 sales regions. Each sales region has a Customer Service Manager whose primary responsibility is to routinely call on resellers to provide a wide range of support, including development of service business plans and organizing technical information exchanges between dealer technical support technicians in each city.

Service Delivery

The primary focus of Apple Customer Service is supporting the network of dealers and distributors who sell and service Apple products. Apple provides service training, administrative support (warranty and contractual assistance), spare parts, and technical (telephone) support to their authorized dealers, self-servicing customers (under the Servicing Account Program), and selected third-party maintenance organizations selected by users to perform their service (under the Third-Party Program).

In addition, Apple provides (for a fee) technical phone support directly to users of Apple products running AUX multiuser operating system.

In January, 1989, Apple announced a new VAR training program called Apple Training Alliance (ATA), a self-paced interactive video-based program that replaced the previous two-day certification program. Apple plans to link all of their regional sales offices with the interactive videodisk technology to run ATA, and hopes to be able to offer the hardware and downline links to resellers in the future. Eventually, Apple hopes to expand the ATA program to include users.



COMPANY PROFILE

**BUSINESSLAND
INCORPORATED**
1001 Ridder Park Drive
San Jose, CA 95131
(408) 437-0400

David Norman, Chairman
Ronald Brown, Senior VP Businessland
Services
Total Revenue, Fiscal Year End 09/30/88:
\$1 billion

The Company

Businessland, Inc., started over six years ago by ex-Dataquest founder David Norman and Enzo Torresi, entered the microcomputer retail market to focus on the business-user marketplace. With this focus in mind, the company recognized the importance of meeting the service and support requirements of corporate users, and, as a result, endeavored to build the strongest retail support presence in the industry. The strategy has paid off, as Businessland sales surpassed the one billion dollar mark in fiscal year 1988.

In April, 1988, Businessland announced a major reorganization, elevating Ron Brown (ex-Osborne Corp) to Senior VP, Businessland Services reporting directly to the Chairman. The reorganization refocused the chains attention on service and support by putting all of the chains 94 stores service activities and all of the company's service marketing programs under one person. At the same time, the company announced the formation of a Value-Added Services Group, to assure the continued increased focus on service.

In July, 1988, the company finalized an acquisition of ComputerCraft, a 25-store chain, (annual sales of \$111 million) in a \$23 million stock deal. Businessland will not change the name or focus of the ComputerCraft stores (to avoid confusing customers of either chain). What obviously attracted Businessland to ComputerCraft were the seven "superstores" that range in size from 7,000 to 16,000 square feet, and are divided into departments by product lines. Businessland hopes to add ComputerCraft superstores in 50 major U.S markets in the next two years.

In addition, the company has been rumored to have interest in purchasing Centel's Information Systems microcomputer reselling and service division in 1988, a move that would have added 70 centers and service contracts with such large users as Transamerica Commercial Finance, Ford Motor Co., Aetna Casualty and Life, and Chrysler (a \$25 million contract).



In January of 1989, Businessland announced that they would enter the microcomputer rental business. This new effort would be test marketed in their San Francisco and Sacramento (CA) stores, and handled by a new division, Businessland Rents, headed by Brian Leeland. Businessland estimated the microcomputer rental market as being \$22 billion, and expects a 30% per year growth rate over the next two years. Other retailers already renting equipment include Computerland Corp. and Computer Factory Inc. Businessland plans to rent products from Apple, IBM, and Wyse, and will provide a wide range of services including delivery, installation, training, and technical support.

Not all of Businessland's moves have been successful. In 1984, the company launched a much publicized effort in private-labeling (that reportedly enjoyed some level of success), then quietly pulled out of the private-labeling business the following year as rapidly dropping product sales cut into margins. In addition, the company pulled out of the vertical market applications turnkey market in 1987 (an effort first started in 1983), citing thin margins and admitting a lack of expertise in necessary vertical application areas. The company maintained that while they were abandoning the vertical market turnkey systems market, they would still identify themselves as a "value-added dealer," since they will continue to package systems in networks.

The company was shaken by a February, 1989 announcement by Compaq that Businessland would no longer be an Authorized Compaq Computer Dealer. Citing differences in corporate directions, Compaq alleged that Businessland recommended other systems over Compaq systems and also sought to negotiate a new agreement with Compaq that would provide unfair advantages (i.e., larger margins) over other authorized dealers. Compaq reported that Businessland represented approximately 7% of total Compaq sales (or just under \$150 million).

Businessland's overall strategy for both product and service appears to focus heavily on larger corporate sales to a much greater extent than most retail networks. To do so, Businessland has created an extensive "menu" of service offerings built around a corporate designed and approved "standardized" service contract, pricing, and policies that will attract nationwide users.



Service Demographics

Businessland reported 1988 total sales (FYE September 30) in excess of \$1 billion. The company declined to report service revenues, but has stated a goal of service revenues equaling 15% of total revenues. Thus, INPUT estimates Businessland's dealer service network made between \$100-130 million in service revenue.

Businessland offers sales and support out of 94 stores in 34 states, as well as 10 stores in the United Kingdom. All stores offer standardized service offerings, pricing, and contracts. Each store maintains an adequate sparring level, supported by a National Parts Distribution Center and a Corporate Technical Support staff. Service dispatching to all dealers is handled via a centralized toll-free number linked to their ServiceLine call distribution and service management system located at their San Jose headquarters. Information about a clients service history is captured and stored by ServiceLine, and customers can request system management.

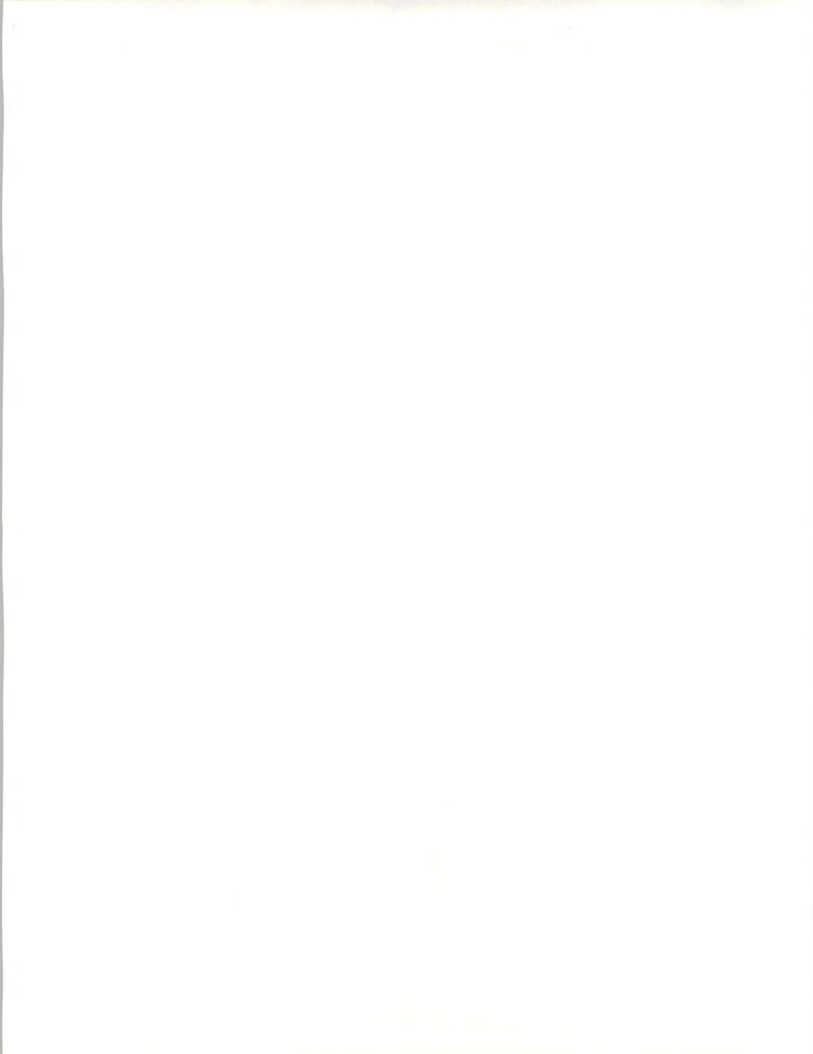
The entire service dealer network employs a total of 553 technicians and systems engineers. Each store's service staff will range from one technician up to 25, depending upon local market demand for service. The Sacramento (CA) store, for example, employs ten technicians (including a service manager).

Service Delivery

Businessland offers an extensive list of support services, including hardware maintenance, software support, training, installation, network design and management, and technical support.

On-site maintenance contracts cover Monday-Friday, 9AM to 5PM (excluding holidays). Users call a toll-free (800-) number which is located at the corporate headquarter, which dispatches the call from the appropriate sales/service location. Typical response times are next day if the user is within 30 miles of a service location. Users purchasing service contracts must submit to and pay for an inspection (currently a one-time charge of \$250).

Noncontract service is available at the current time-and-material charge of \$75 per hour for on-site service and \$60 per hour for carry-in service. Additional T&M charges for on-site service are a flat travel charge of \$30 for travel that is less than 30 miles, and \$2.50 per mile travel charge for calls further than 30 miles.

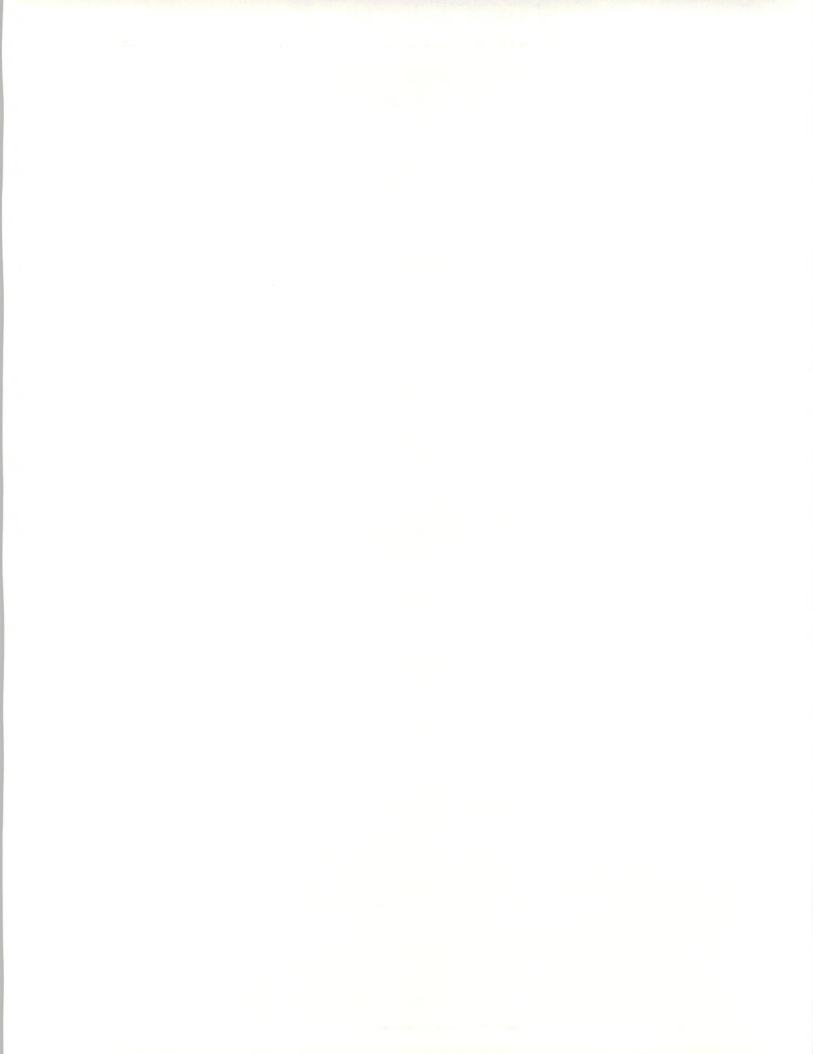


Businessland offers a hardware and software telephone support service out of their San Jose headquarters called Solution Line. Users purchase a set number of "solutions" (\$50 for one "urgent" solution, \$225 for 10 solutions, \$525 for 25 solutions, and \$1,895 for 100 solutions), enabling them to call the Solution Line Telephone Support number during the hours 6:30 AM to 6:00 PM (PST), Monday through Friday. Customers must use all of their "solutions" within one year.

Businessland offers a premium service plan directed to users of local area networks, called the Gold Plan, which provides hardware and software installation, system documentation, training for the user's system administrator, and a choice of several remote support and diagnostic services, as well as on-site follow-up support. Each Gold Plan customer is assigned a team of support personnel, including an account manager, systems engineer, field service technician, trainer, and a technical support specialist.

Additional support offerings include Expert! The LAN Planner, a technical manual and three hours of consulting (for a flat fee of \$595) to help users configure their network; Solution Link, an on-line (via modem) access to Businessland Technical Support's problem data base, documentation library, and vendor listings (\$495 annual subscription); and Technology Link, a 32-page technical journal that includes articles on new technologies and a Q&A section from Businessland Technical Support (\$300 annual subscription for six issues).

Businessland publishes an extensive catalog of training coursework available on a wide range of software and network applications. Most software training classes cost \$125 per student for half-day courses. Network courses cost \$495 per student. Users can receive one-on-one training from Businessland Training Specialists for \$90 per hour.



COMPANY PROFILE

COMPAQ COMPUTER CORPORATION
P.O. Box 692000
Houston, TX 77269
(713) 370-0670

Joseph R. Canion, President
Gordon Munson, VP Customer Service
Total Employees: 5,000
Total Revenue, Fiscal Year End 12/31/88:
\$2.1 billion

The Company

Compaq designs, manufactures, and distributes (through their authorized dealer network) desktop and portable microcomputer systems. After seizing upon an opportunity stemming from the need for a portable PC-compatible, Compaq now manufactures a wide range of PC-compatible systems, including 80286 and 80386-based systems.

In 1987, Compaq celebrated their fifth full year in operation by surpassing the billion dollar mark in sales (with 1987 revenues of \$1.2 billion)- faster than any other company in history. Compaq continued this growth through 1988, reporting year-end sales of \$2.1 billion.

Compaq hopes to continue this growth by expanding into the workstation market. In January, 1989, Compaq announced a \$3,500 advanced graphics system, based on an improved board and monitor, that will compete for CAD/CAE applications. In addition, Compaq has enjoyed greater than expected market demand for their SLT 286 laptop, particularly in the government market place, where the Compaq system has replaced Toshiba's laptop in the GSA schedule.

In 1988, Compaq joined the list of computer companies that formed strategic alliances with other computer manufacturers as a way of expanding into new markets. Compaq signed an agreement with midrange system specialist Digital Equipment Corporation that will allow DEC to provide nonwarranty service (and warranty service at the customer's request) on Compaq products located at DEC sites. Both companies stated that the purpose of the agreement was to satisfy the "single-source" support requirements of their shared customers. But, the agreement did result in some concern from Compaq dealers, who may now find themselves competing for post-sales service business with a "name" player.

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In February, 1989, Compaq dropped Businessland as an authorized dealer (see Businessland profile).

Service Demographics

1988 sales for Compaq were \$2.1 billion, up 75% over 1987. Customer service revenues, derived in their entirety from spare parts sales and exchanges, were \$35 million in 1988.

Compaq has 2,400 Authorized COMPAQ Computer Dealers worldwide who sell and service their products. Each dealer location acts as a spares holding center, receiving their spares from Compaq's headquarters in Houston.

Service Delivery

Since all customer services delivered to Compaq customers come from Compaq's Authorized Dealer network, the primary support responsibility of Compaq is to provide their dealers with technical support, training, and spare parts necessary to service the customer base.

Compaq provides the following support services to their dealers: service training, spare parts sales, technical (phone) support, technical documentation, and engineering/field change order support. Typically, Compaq compensates their dealers on a flat fee basis (that varies by component) for any warranty work performed, with a 100% exchange on parts. Additional labor expenses incurred by the dealer may be reimbursed at the current labor rate.

Compaq places the following requirements on dealers in order to become qualified as an Authorized COMPAQ Dealer: the dealer must provide warranty service; the dealer must provide established minimum sparing levels; the dealer must take Compaq-supplied training; and the dealer must take (and pass) a certification examination.

In 1987, Compaq established an Advanced Technical Support Team to work with their dealers in resolving networking questions with respect to operating system issues, micro-to-mainframe issues, and such industry- and application-specific requirements as computer-aided design needs.

Compaq also broadened its Salespaq dealer program in 1987, providing \$30 million advertising, promotional, and technical support to their authorized dealers. One specific objective of this support was to help underwrite the cost of people dedicated to the support of their products.

Also in 1987, Compaq moved to assist their dealers by reducing spare parts restocking fees on returned parts (dropping from 15% to 5%) and increasing warranty reimbursement fees (from a low of \$20 increasing to \$45).

COMPANY PROFILE

**COMPUTERLAND
CORPORATION**
P.O. Box 9012
Pleasanton, CA 94566
(415) 734-4070

William Y. Tauscher, President
Alan Andrus, President, Computerland
Service
Total Employees: 17,500
Total Revenue, Fiscal Year End 12/31/84:
\$2.0 billion

The Company

ComputerLand Corporation, founded in 1976, was purchased by an investment group led by E.M. Warburg, Pincus, & Co., one of the largest venture banking firms in the U.S., in 1987. The acquisition provided ComputerLand with an infusion of capital and financial stability that allowed the company to make a number of organizational changes as well as allow a reemphasis on the corporate marketplace. One structural change announced was the formation of ComputerLand's National Service Company as a separate subsidiary. The primary function of this organization is to provide franchisees with service contracts and technical assistance.

ComputerLand brought in new service management from respected service organizations, most notably Al Andrus from Grumman Systems Support Corporation. His arrival signaled ComputerLand's desire to not only improve user satisfaction with service delivery, but also a corporate objective to transfer the newly formed service organization into a separate revenue generator.

**Service
Demographics**

ComputerLand offers sales and service from 740 dealer locations worldwide, all of which maintain a supply of spare parts and all offering on-site and carry-in service capabilities for their users.

ComputerLand and its dealers employ a total of 17,500 people, approximately 2,500 of which are dedicated to service. The service staff can be further broken down into 1,800 field engineers, 200 technical support specialists, 150 software support specialists, and 150 training specialists.

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Service Delivery

ComputerLand sells and services over 240 brands of microcomputer-based systems and peripherals from such vendors as IBM, Apple, Compaq, Zenith, and Hewlett-Packard. ComputerLand offers a wide range of support services to users, including warranty service, remedial hardware and software maintenance, preventive maintenance, and training services.

ComputerLand estimates that 20% of their user base contracts for service. Basic service coverage is for five day, nine-hours per day, although ComputerLand will negotiate any window of coverage desired by a user, including 7-day, 24-hour per day. Optional services offered include network support services, consulting, installation, system configuration, system planning, remote support, system loaners and rentals, and telephone hotline support. Customers can build response time guarantees into their contracts, and many users do take advantage of 4-hour, same-day, and next-day provisions.

While 60% of all ComputerLand contract customers opt for on-site support, ComputerLand offers carry-in service to price-sensitive users. Depot service users can expect to save up to 50% of on-site service prices.

ComputerLand also addresses service cost concerns by offering a wide range of discount options, including multiyear contracts (with discounts of up to 10% per year), prepayment discounts, centralized support, deferred response time, and call screening (all carrying 10% discounts). ComputerLand attempts to attract large installation users with unit volume and dollar volume discounts of up to 50% off list price.



COMPANY PROFILE

CONTROL DATA CORPORATION

1101 East 78th Street
Bloomington, MN 55420
(612) 851-4416

Robert M. Price, President and CEO
William Fitzgerald, VP, Technical Services
Total Employees: 34,500
Service Employees: 4,000*
Total Revenue, Fiscal Year End
12/31/87: \$3.4 Billion
Service Revenue: \$400 Million
TPM Revenue: \$100 Million*

* INPUT estimate

The Company

Control Data Corporation, founded in 1957, manages a diverse set of technically oriented businesses that includes Business Services, Computer Systems and Services, Data Storage Products, Government Systems, and Training and Education/Ticketron. The Computer Systems and Services Group supplies large systems and associated services primarily to customers in the scientific and engineering markets. The group is engaged in three key businesses: computers, third-party engineering services, and systems integration.

Revenue increased for the Computer Systems and Services Group in 1987, boosted by the decline in the value of the dollar and a shift from leasing to purchasing systems. Hardware and software maintenance, as well as systems integration and consulting services, are delivered through CDC's Technical Services Division (formerly the Engineering Services Division), which consists of two integral organizations--Computer Maintenance Services and Professional Services.

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With profit margins on traditional hardware maintenance squeezed by fierce competition, and with revenue growth in hardware maintenance limited by the increasing reliability of computer equipment, CDC has expanded its customer service offerings in an effort to broaden its revenue base. The 1987 restructuring that broke out professional services from computer maintenance services places CDC in a favorable position to exploit strong growth in the professional services and software support markets. Recent introductions in this area include CDC's Total Operating Performance Package (TOPP), which provides IBM large system users with operating system maintenance, planning, and installation services on IBM system products MVS, VSE or VM, and major subsystems such as CICS, IMS, and VTAM.

In late 1987, CDC announced an agreement with Comdisco, Inc. (Chicago, IL), an IBM equipment leasing and disaster recovery specialist, that will allow Comdisco to offer CDC IBM maintenance service to customers of selected IBM products. The agreement benefits both parties: Comdisco gains the capability to provide recognizable, nationwide support; and CDC gains access to more potential service customers.

In the microcomputer service market, CDC does not actively pursue microcomputer service on its own. Instead, CDC will service microcomputers at large and small systems sites where they already service the larger systems. In this fashion, CDC hopes to meet the "single-source" needs of their existing user base.

In 1986, CDC approached the microcomputer support market with a novel service plan that combined elements of fixed-price-per-incident and contractual coverage. Called Flexible Fee service (under CDC's Backup Service Plan), the policy combined the responsiveness of contract coverage with the potential cost savings inherent in per-incident pricing (assuming the user had minimal service needs). While CDC still offers this plan, it is not actively marketed.

Service Demographics

Gross profits declined for CDC's maintenance services business due to increased labor and parts replacement costs, increased pricing and discounting competition, and a shift in its revenue mix, with a greater portion of total revenue attributable to lower margin maintenance services. Efforts to cut costs led to a significant reduction of personnel in 1987. Approximately 470 employees in administration, engineering, technical support, clerical, sales and marketing staffs were let go. INPUT estimates total customer service revenues remained relatively flat at \$400 million, while TPM revenues also stayed flat at \$100 million.

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CDC employs over 4000 service employees, including over 2600 field engineers (engineers and service locations serve both CDC and TPM customers). CDC operates approximately 110 service centers within the U.S. A World Distribution Center manages the parts inventories worldwide. CDC also has purchase, repair, and stocking arrangements with fourth-party suppliers that repair parts and assemblies, as well as purchase arrangements with the original manufacturer.

Service Delivery

CDC offers a wide range of support services to users of microcomputer systems and their associated peripherals, including remedial hardware maintenance, preventive maintenance, and training. Major brands currently serviced include systems and peripherals from IBM, Compaq, and Zenith.

CDC provides a single, 24-hour, toll-free number for all customers requiring either hardware or software support. CDC's Computer Maintenance Services (CMS) organization uses an Incident Management System to dispatch engineers to customer sites. For difficult problems, CMS maintains a Central Support team that provides technical hardware and software support to customer engineers in the field.

For most microcomputer users, CDC provides 11-hour, 5-day coverage, although CDC will negotiate extended coverages with users upon request. Response times are typically next-day for users within 25 miles of a service location, although CDC will negotiate faster response times with users with higher system availability requirements.

Price-sensitive microcomputer users can negotiate a wide range of discount service plans, including multiyear contracts, call screening discounts (both under CDC's User Friendly Option), prepayment discounts, volume discounts, deferred response time discounts, and centralized support discounts.

CDC does not offer time-and-material service to microcomputer users, and reports that virtually all (95%) service performed is performed at a users site.

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CDC offers two programs for resellers. Under the Independent Marketing Representative (IMR) agreement, CDC allows resellers to sell CDC maintenance contracts to end users. CDC invoices the users directly and pays resellers the commission. Under the Master Agreement program, CDC acts as the reseller's subcontractor. CDC discounts the maintenance price to the reseller based on volume. The reseller has the option of invoicing the customer separately for maintenance or bundling the costs into its total solution. CDC provides preventive and remedial maintenance, and, under the Master Agreement, installation service.

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COMPANY PROFILE

IDEA SERVCOM
1515 West 14th Street
Tempe, AZ 85281
(602) 894-7000

Steve Scott, General Manager
Total Employees: 700
Total Revenue, Fiscal Year End 12/31/88:
\$82 Million

The Company

Alcatel Information Systems, consisting of Courier, XTRA Business Systems, and Servcom, was purchased by IDEAssociate, Inc. (Billerica, MA), a six-year old manufacturer of PC-related products and services on November 14, 1988 for an undisclosed amount. The new company is called IDEA Courier, Incorporated, and the third-party maintenance organization was renamed IDEA Servcom, a division of IDEA Courier.

On November 20, 1988, IDEA Servcom and Courier announced a combined layoff of 300 people. The reduction touched all areas of the company, up to and including the divisional vice-presidential levels. Reasons for the personnel adjustment were not made public, however, the earlier acquisition and consolidation of certain aspects of IDEA Courier and IDEA Servcom responsibilities certainly can account for some of the reduction.

In May, 1988, IDEA Servcom added fourth-party maintenance (FPM) to their list of services offered. With \$3.5 million in test equipment already in place, the move into FPM was a natural direction for the company in light of the attractive growth prospects of the market. The company was able to sign up two large contracts almost immediately, and plans to push the service to a greater extent in the second quarter of 1989.

In late 1988, IDEA Servcom announced a new support offering that targeted IBM System/38 and 4300 users. Called, ServiceFIRST, the new plan provides new customers a 90-day "risk-free" introduction to IDEA Servcom support. Customers are billed in arrears for the first 90-days of a one-year contract. At the end of the first 90-days, the customer can cancel the contract, for any reason, and not be required to pay.

IDEA Servcom is currently finalizing a new service plan for users of microcomputers. Users of the proposed program will pay for their service on a fixed-price-per-incident basis, where the user will "pay" for service with a coupon.

Service Demographics

IDEA Servcom currently employs approximately 600 people in service capacities. Their support organization can be further broken down as follows: 434 field engineers, 120 field support specialists, and the remaining 46 people split between management, sales, and administrative positions.

Service is offered out of 157 service locations spread throughout the U.S. and Canada. Seventeen of these are Mail-in/Carry-in (MICI) locations, and 24 also serve as major spare parts inventory. The company also maintains a centralized spares holding facility in Tempe (AZ).

IDEA Servcom reported TPM service revenues of \$79 million for 1987 (up from \$72 million in 1986). IDEA Servcom expects 1988 revenues will grow to \$82 million.

Service Delivery

IDEA Servcom supports over 500 manufacturer's products, ranging from mainframe systems, through peripherals and microcomputers, and including the following telecommunications products: LANs, modems, multiplexors, and front-end processors. Major microcomputer brands serviced include AST, IBM, Apple, Compaq, Zenith, ITT, Wang, and TI, along with a long list of peripheral products.

For these products, IDEA Servcom will provide an extensive list of services, including software support, training, consulting, and warranty support. Standard on-site coverage is five-day by nine-hours, but some users upgrade that service to around-the-clock (usually those users of larger systems). IDEA Servcom typically contracts by machine serial number, but will also negotiate contracts by cluster for larger installations.

Ninety-five percent of IDEA Servcom's service is now performed on-site, up from 87% in 1987. This growth in on-site support was expected (and predicted in last year's service vendor profile), since IDEA Servcom began concentrating more on larger system service. While IDEA Servcom does not expect any future reduction in depot support offerings, the company does expect to continue focusing on on-site support, since most of its users place greatest priority on this mode of service delivery. Incidentally, IDEA Servcom tracks both on-site support delivery and depot maintenance through its centralized service management, COMSAC (COMmunications Support Activity Center) that provides call handling, dispatching, call status, and (for depot service customers) depot delivery instructions.

PHYSICS 439: QUANTUM MECHANICS
 PROBLEM SET 10
 DUE DATE: 11/15/2011

1. A particle of mass m is confined to a one-dimensional infinite potential well of width a . The potential is zero for $0 < x < a$ and infinite elsewhere. The wave function $\psi(x)$ is real and satisfies the boundary conditions $\psi(0) = \psi(a) = 0$. The wave function is given by

$$\psi(x) = \sqrt{\frac{2}{a}} \sin\left(\frac{n\pi x}{a}\right)$$

where n is a positive integer. The energy eigenvalue E_n is given by

$$E_n = \frac{n^2 \pi^2 \hbar^2}{2ma^2}$$

2. A particle of mass m is confined to a one-dimensional infinite potential well of width a . The potential is zero for $0 < x < a$ and infinite elsewhere. The wave function $\psi(x)$ is real and satisfies the boundary conditions $\psi(0) = \psi(a) = 0$. The wave function is given by

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$$\psi(x) = \sqrt{\frac{2}{a}} \sin\left(\frac{n\pi x}{a}\right)$$

where n is a positive integer. The energy eigenvalue E_n is given by

$$E_n = \frac{n^2 \pi^2 \hbar^2}{2ma^2}$$

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where n is a positive integer. The energy eigenvalue E_n is given by

$$E_n = \frac{n^2 \pi^2 \hbar^2}{2ma^2}$$

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$$\psi(x) = \sqrt{\frac{2}{a}} \sin\left(\frac{n\pi x}{a}\right)$$

where n is a positive integer. The energy eigenvalue E_n is given by

$$E_n = \frac{n^2 \pi^2 \hbar^2}{2ma^2}$$

Ninety percent of IDEA Servcom's service revenue was derived from service contracts, with 5% coming from time-and-materials service (with on-site T&M rates ranging from \$115 per hour for prime shift to \$132 for non-prime shift service. IDEA Servcom also offers depot T&M, at \$60 per hour (there is no off-hours depot service). A growing part of IDEA Servcom's service business comes from support agreements signed with OEMs. IDEA Servcom reports that 5% of their service revenue now comes from warranty service performed under these agreements.

IDEA Servcom offers two support offerings designed to address price-sensitive customer service needs. The first plan, Deferred Maintenance, is comprised of two different options. The first option, Scheduled Deferred Maintenance, establishes a specified interval of maintenance visits, at which time the FE performs any necessary remedial maintenance at the equipment's location. The second option, "X" Units Down, specifies a minimum number of units "down", at which time a FE will be dispatched to perform on-site support.

The second maintenance plan, Centralized Deferred Maintenance, is similar to Scheduled Deferred Maintenance, except that the customer is required to bring failed equipment to a centralized location for scheduled support.

12/15/2023

COMPANY PROFILE

INACOMP COMPUTER CENTERS

1800 West Maple
Troy, MI 48084
(313) 649-5580

Rick Inatome, President
Lindsey Notwell, VP Support Services
Total Employees: 2,000
Total Revenue, Fiscal Year End 12/31/88:
\$250 million

The Company

Inacomp Computer Centers, headquartered in Troy, MI, is a 100-store chain of computer specialty stores that has been providing computer sales and service since 1976. The company offers support services out of three separate groups: Inacomp Technical Services (ITS) Group, which provides technical support services to users through the dealer network; Inacomp Educational Services (IES) Group, which develops and supports all training support services; and Inacomp Financial Services (IFS) Group, which provides product leasing services (maintenance being bundled into the lease).

Each Group is monitored as a separate profit-and-loss center, with the eventual goal of each Group representing 20% of total corporate revenues.

Service Demographics

Inacomp reported 1988 sales of \$250 million for 1988. While the company would not reveal service revenues, INPUT estimates that their 1988 service revenues fell in the \$20-30 million range.

Inacomp offers microcomputer sales and service out of 100 U.S. locations, all of which double as carry-in service locations and all maintaining some level of spares.

Inacomp employs 2,000 total people in the U.S. Of this total, the company employs approximately 250 people in service positions.

Inacomp also has a separate training department, which employs 125 people whose primary responsibility is operational training on both hardware and software operations.

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Service Delivery

Inacomp sells and services an extensive list of microcomputer products, including such major brands as IBM, Apple, Compaq, Toshiba, Epson, and Hewlett-Packard. Inacomp provides remedial and preventive hardware maintenance, software support, training, and for most brands, warranty service.

Most on-site service contracts provide five-day, nine-hours per day coverage during normal business hours. Some locations have negotiated expanded coverages with larger users. Most contracts provide for next-day response, however, premium response times of four or even two-hour response times are negotiable. All contracts are written to a specific machine's serial number.

Inacomp will negotiate certain service-related discounts with their users. For example, users can sign a three-year service contract that provides a 10% discount per year. In addition, Inacomp will negotiate volume discounts with major customers.

Inacomp offers separate software support contracts to users. Typically, this support is offered at the users site. Inacomp estimates that 80% of all software support is offered at the user's site.

Inacomp also performs non-contract service at the current time-and-material of \$90 per hour for on-site T&M and \$75 per hour for carry-in T&M service.

COMPANY PROFILE

**INTELLIGENT ELECTRONICS
INC.**

35 East Uwchlan Avenue
Exton, PA 19341
(215) 524-1800

Richard Sanford, Chairman, President, and
CEO
Tom Pilkington, GM Entre Computer
Center- Colton, CA

The Company

Intelligent Electronics Inc (IE), founded in 1982 by Richard Sanford (a former VP at Commodore International), began franchising Today's Computers Business Centers (TCBC) in 1984. By October, 1988, the number of signed TCBC franchises had grown to 193, and IE was able to announce total sales of \$130 million for fiscal year (ending October 31) 1988.

In November, 1988, IE extended a tender offer to acquire Entre Computer Centers, a franchised network of 185 North American locations (with 1988 sales of \$559 million) for \$62 million. IE successfully completed the tender offer in December 1988, creating a combined network of nearly 400 computer centers.

In February, 1989, IE announced a reorganization of the consolidated management and distribution organizations for the combined TCBC and Entre chains in an effort to drive sales to the \$1 billion mark for fiscal year 1989.

**Service
Demographics**

The combined networks of TCBC and Entre Computer Centers allows IE to boast nearly 400 computer centers in the United States and Canada. IE provides the following services for their computer centers: product purchasing, major account marketing, financial services, marketing communications, communications networks, and technical support. In addition, IE operates a 120,000 square foot distribution center in Chantilly, VA (near Dulles International Airport) which ships an average of \$1.3 million of products per day to its computer centers.

Each computer center acts independently with regard to support policy and pricing. As a result, this profile describes the Entre Colton (CA) Computer Center.

The Colton Center refused to divulge total store or service revenue information, however, the store reported that service accounts for approximately 22% of total store sales.

The Center employs 31 people, 14 of which are dedicated to service and support responsibilities. The Center employs 5 hardware engineers and 3 network support specialists. While the Center employs a full-time training manager, the Centers contracts out for individual instructors.

Service Delivery

The Colton Entre Computer Center provides a wide range of service offerings to their customers, including hardware maintenance, software support, training, and warranty service on all equipment that it sells. Brands currently (sold and) serviced include IBM, Compaq, Hewlett-Packard, Epson, and NEC.

A typical service contract calls for on-site support available Monday through Friday during normal business hours, although some customers have contracted for "around-the-clock" service coverage. The Center attempts to provide four-hour response by telephone and 24-hour resolution of most problems.

IE/Entre estimates that three-fourths of their service business is derived from service contracts, and that three-fourths of all service is performed at the user's site. Incidentally, The Colton Center has observed that the majority of their service customers are smaller companies, and that the larger companies are more likely to perform their own support.

Non-contract customers can receive service for \$85 per hour plus parts. This time-and-material service is only available during normal business hours.

The IE/Entre offers a technical support offering for software support out of their corporate headquarters. Users can call a toll-free (800-) telephone hotline for \$350 per year.



COMPANY PROFILE

INTELOGIC TRACE, INC.

8415 Datapoint Drive
San Antonio, TX 78224
(512) 699-5700

Clark Mandigo, President and CEO
Total Employees: 1,525
Total TPM Revenue, Fiscal Year End
7/31/88: \$135 Million

The Company

Intelogic Trace (IT) was formed as a spinoff from Datapoint Corporation in June of 1985. After much optimism regarding revenue growth, including unconsumated efforts to merge with the service arms of Mohawk Data Sciences (later spun off as Momentum Service and recently merged with Decision Industries' TPM business) and Telex Corporation (later purchased by Memorex), IT has been faced with declining revenues since its entrance in the third-party maintenance industry, largely due to declining revenues from captive Datapoint products and slower than expected expansion into new product markets.

IT attempted to expand its presence in the small systems TPM service market by announcing guaranteed response times for users of IBM System 34 and 36 equipment. Users within 25 miles of an IT service center located in 22 major metropolitan areas are guaranteed 4-hour response, and users between 26 and 50 miles are guaranteed 6-hour response. If IT fails to meet the response time, the user receives credit equal to the monthly maintenance charge.

At the same time, IT announced that they would match IBM's "around-the-clock" standard contractual coverage by expanding service coverage for System 34 and 36 users from 5-day, 11-hours to 7-days, 24-hours.

Texcom, a computer leasing company acquired by IT in 1987, acquired the assets of Southwest Computer Sales, Inc. (San Antonio, TX), a lessor and VAR of IBM mid-range systems. Terms of the acquisition were not made public, except that Southwest Computer sales employs 25 people and has 1,200 customers nationwide.

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Service Demographics

IT currently employs 1,525 total employees, including 641 field engineers and 351 field support personnel. Service is offered out of 229 service locations, 17 of which are repair depots and 44 which double as major spare parts inventory locations.

For fiscal year ending July 31, 1988, IT reported total service revenues of \$135 million, representing another significant decline in service revenues. This continued decline in revenues can be attributed to greater than anticipated defection of Datapoint product customers (who still make up the vast majority of IT service customers), as well as increased price competition from other service vendors. On a positive note, IT continues to benefit from cost-cutting measures first implemented in 1987, and accordingly reports improved profitability.

Service Delivery

IT provides service on an extensive list of microcomputers and peripheral devices, from such diverse manufacturers as Apple, AT&T, CDC, Compaq, Fujitsu, IBM, Kennedy, Memorex, NEC, Panasonic, Qume, Seagate, Shugart, Tandy, Televideo, Unisys, and Zenith, to name just a few. In addition, IT supports telecommunications products from 3-Com, Compaq Telecommunications, Pactel, Teknekron, Vitalink Communications, and Voice Computer Technologies. As stated previously, IT has most recently emphasized its support capabilities for IBM System 34 and 36 minicomputers, and hopes to expand into the IBM System 38, IBM AS/400, and DEC minicomputer lines.

Eighty-six percent of all IT's service revenue is derived from on-site service activities, and only 1% results from depot service. IT has been successful at growing the equipment sales/leasing aspect of their business, which now accounts for 13% of their total revenues.

IT offers contracted service that covers 5-day, 9-hours per day. Like most microcomputer service providers, IT contracts by machine number, not by "cluster". Response times for contract service customers is typically 24-hour (on a best effort basis).

While the vast majority of IT customers contract for service (accounting for 93% of their service business), IT offers time-and-material service at \$115 per hour for prime shift, rising to \$145 per hour for Sundays and holidays.

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IT also offers an extensive list of discount plans for microcomputer users. For example, users who opt for a three year contract receive a 5% discount off the first year, then a price increase cap equaling the consumer price index (CPI) plus 4%. Users who prepay their service contracts receive a 6% discount. And large installation users can receive volume (based either on unit or total dollar) discounts that range from 10% to 35%.



 COMPANY PROFILE

**INTERNATIONAL BUSINESS
MACHINES CORPORATION**

Armonk, NY 10504
(914) 765-1900

John Akers, President and CEO
David E. McDowell, President, National
Service Division
Total Employees: 398,348 worldwide
Service Employees: 27,000 (U.S. estimate)
Total Revenue, Fiscal Year End
(12/31/88): \$59.7 Billion
Service Revenue, Fiscal Year End
(12/31/88): worldwide \$7.3 Billion
U.S. only \$3.1 Billion

The Company

IBM is a leading manufacturer of information processing equipment and services to all industries. IBM's main product in the microcomputer market is the PS/2.

1988 proved to be a pivotal year for IBM in a number of areas. On January 28, IBM announced a major restructuring effort that in effect decentralized authority throughout the organization. IBM set up six new technology businesses under IBM United States. They are: IBM Enterprise Systems (where all of IBM System 370 architecture systems and products are handled, including 309X, 438X, and 937X computers and their associated peripherals and operating systems), IBM Applications Business Systems (responsible for all System 3X and AS/400 computers and their associated peripherals and operating systems), IBM Personal Systems (responsible for all copiers, typewriters, personal computers, and their associated peripherals and operating systems), IBM Technology Products (responsible for semiconductors and technology packaging), IBM Communications Systems (responsible for communications products), and IBM Programming Systems (responsible for SAA and other software development). IBM United States Marketing and Services Group (responsible for marketing and service, including the National Service Division) remains under IBM United States.



Beginning in late 1986 and continuing through 1989, IBM has made significant changes in their service pricing and offerings. To win back service customers, IBM offered unprecedented service discounts (the Corporate Service Amendment, the Mid-Range System Amendment), and service coverages (extending all systems service coverage to 24-hour by 7-day per week). IBM also implemented tougher policies toward TPM organizations by limiting hourly service to 9 hours per day, Monday through Friday, and by reducing the number of over-the-counter parts sites locations.

In June 1988, IBM announced the Technical Services Management service offering, under which IBM provides support on non-IBM products at IBM system sites. Specifically, IBM provides three levels of support under TSM:

- Repair Coordination, where IBM acts as the customer's designated representative in coordinating dispatching, escalation, problem tracking, and service status on all covered non-IBM equipment. Customers continue their service contracts with the other service vendor. Pricing for Repair Coordination (as well as all TSM options) is priced on a case-by-case basis.
- Maintenance Coordination, where IBM plans and coordinates scheduled (i.e., preventive) maintenance visits as well as remedial service calls (covered under Repair Coordination).
- Service Management, the most expansive of the TSM options, where IBM takes full responsibility for OEM maintenance. IBM has the option of performing the service or subcontracting it out to selected service vendors. IBM takes responsibility for service vendor identification, contract negotiation and administration, and invoice reconciliation. IBM will consolidate all maintenance charges and present the user with a single monthly bill. TSM customers who opt for Service Management automatically receive Repair Management. Maintenance Coordination is optional.

In August IBM announced a series of selected product and service price hikes (including some models of the PS/2 and RT systems), effective in November. All maintenance agreement rates (including CSA and MRSA) were increased by 3%; T&M rates, installation charges, and system engineering charges were increased 5%. These followed earlier selective price adjustments in February, marking a rare situation when IBM changes price more than once a year.



In September of 1988, IBM announced a broad series of telecommunications products and services, the most important (in a service sense) is IBM Network Support. This offering for voice and data communications networks involving both IBM and non-IBM devices provides the customer network problem determination assistance from problem detection to fix verification from the IBM Network Support Center that operates around-the-clock. Also, mixed-vendor coordination is offered. In essence, this offering is a TSM-like service offering for users of telecommunications products/services.

IBM's telecommunications support offering also includes options that utilize the skills and services gained by IBM's acquisition of the Spectrum Services division of Pacific Telesis in March. These options are data probe support, T-1 probe support, and voice probe support.

At the end of 1988, IBM reorganized its National Distribution Division (NDD), decentralizing decision makers closer to salespeople and ease the transfer of 100% of IBM's microcomputer sales to the dealer channel (currently, 90% of all IBM microcomputers are sold through Authorized Dealer and Industry Remarketer channels).

Also in 1988, IBM made a major change in its Customer Fulfillment Option by allowing IBM direct-sales representatives to recommend one dealer to their customers, versus a prior requirement to recommend at least three. By allowing these IBM direct sales reps to recommend one dealer over another, dealers will now have to work harder and demonstrate their capabilities to IBM, improving competition and overall dealer performance.

In January 1989 IBM announced a new simplified contract covering all services under one contract called IBM ServicePlan. A new Estimated Billing Option was announced under IBM ServicePlan that features a fixed price for one year for the customers estimated service requirements. This offering significantly reduces the complexity for both IBM and the customer.

Also announced in January were two new options for IBM's Business Partners to sell IBM service. Under one option, the IBM Business Partner sells IBM service and is paid a fee or commission for the sale. Under the other option IBM sells to the remarketer, who then packages it with his other products and sells the total product to the customer. The remarketer is responsible to the end user and also for establishing initial and screening and technical support to the end user.

In March 1989, IBM announced a new contract for IBM PC dealers and Industry Remarketers called Entry Systems Service Amendment (ESSA). This contract, sold directly to dealers by IBM, utilizes the Mid-Range System Amendment discounts that average 25% below list on three-year contracts. In addition, dealers are offered incentives for clustered volumes of P/C up to 20% and marketing fees up to 10%. In the aggregate it is possible to get 40% discount off list.

To qualify for ESSA contracts, dealers and industry remarketers must set up a help desk and take the end-users initial call (the dealer handles operational problems, if it is a hardware problem, then the dealer contacts IBM). In addition, the dealer is responsible for billing and accounts receivables.

Service Demographics

Worldwide maintenance revenues for IBM in 1988 were \$7,347 million, down \$344 million from 1987. U.S. maintenance revenues actually declined in 1988, falling from \$3,688 million in 1987 to \$3,102 million in 1988. IBM attributed the decline in revenues to improved product reliability, a greater proportion of maintenance gross income derived from long-term agreements at lower prices (read: CSA and MRSA), and increased competition (from third-party maintenance as well as other manufacturers).

INPUT estimates that IBM employs 27,000 total service employees in the U.S., approximately two-thirds of which (18,000) are hardware engineers. These engineers are dispatched out of 233 service locations nationwide.

Service Delivery

All IBM system users, including PS/2 users, receive 24-hour, 7-day a week coverage as their standard maintenance coverage. Maintenance agreement holders are assured of around-the-clock availability of IBM-spare parts (assured by IBM's Parts Inventory Management System, which tracks spares through a national parts distribution center, 21 regional distribution centers, 5 parts stations, and in over 15,000 customer branch office locations, and parts vans and customer engineer tool kits). Each customer engineer carries a 28-ounce portable terminal which links the CE via digital network to an extensive technical support network that provides dispatching, parts handling, diagnostic, and technical support capabilities.

1875

For large storage subsystems, IBM supplies a Personal System/2 and application software to warranty and maintenance agreement customers that is designed to provide automated analysis of system error log information. This system is called THE SERVICE DIRECTOR and it automatically initiates service requests determined to be required from the analysis.

IBM microcomputers come with a twelve-month depot warranty, however, users who qualify for CSA or MRSA service contracts automatically get their microcomputer warranty service upgraded to on-site service.

In March of 1989, IBM made a number of changes aimed at improving the support and partnership with its dealers.

In the parts area IBM made available the National Service Division parts system as a backup if the dealers national parts center is out of stock. They expect a 20% improvement in parts availability as a result. They also established a parts buy back program for specific parts numbers to handle dealers overstock problems and they now allow dealers to resell parts to others if they are to be used for maintenance purposes.

IBM also announced that they were going to provide additional technical support to the dealers by establishing a new organization in the national service division to provide channel coordination and business partner support.

For example, they announced a new policy to send an on-site customer engineer at no charge to support dealers if the NDD National Support Center is unable to resolve the problem over the telephone.



COMPANY PROFILE

MICROAGE COMPUTER STORES INC.

2308 South 55th Street
Tempe, AZ 85282
(602) 968-3168

Alan P. Hald, Chairman
Bruce Grant, VP Technical Operations
Dan Pitts, GM MicroAge Indianapolis
Total Revenue, Fiscal Year End 09/30/88:
\$255 million

The Company

MicroAge, founded in 1976 by Jeff McKeever and Alan Hald, has attempted to differentiate itself from other computer specialty store networks by expanding the scope of products and services provided. In 1977 MicroAge became the first retail chain to market multiuser systems. In 1978 the chain expanded into vertical market applications for lawyers, accountants, retail shopkeepers, and restaurants. In 1985 MicroAge introduced the computer industry's first satellite TV training network, MCN-TV, that featured weekly training programs that were available to dealers and users.

MicroAge's experience in selling (and servicing) multiuser systems helped them become one of the first resellers selected by Sun Microsystems to carry their 386-based dedicated workstations in April, 1988. Sun's experience with MicroAge helped kick-off Sun's VAR program.

Service Demographics

MicroAge reported 1988 (FYE September 30) of \$255 million. MicroAge currently offers computer sales and support out of 215 franchised dealers (175 in the U.S.), and 7 company-owned stores (all in the U.S.).

A Technical Support group of nine full-time support specialists is located at the corporate headquarters. The primary responsibility of this group is to provide telephone support to company-owned and franchise store personnel.

In addition, the company operates a separate division that performs fourth-party maintenance called MicroAge Central Support (MACS). The division currently employs seven support technicians, and offers both class-1000 clean room and class-100 bench service for company owned stores, franchises, and a few outside firms. Products serviced include hard disks (e.g., Seagate, Tandon, Miniscribe, etc.), floppies (e.g., Teac, Qume, etc.), boards (e.g., IBM, Apple, etc.), and monitors (i.e., AT&T).

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MicroAge allows each franchise and company-owned store to establish service pricing and policy. For the purposes of this study, the company-owned store in Indianapolis was analyzed.

1988 total sales for the Indianapolis MicroAge were approximately \$2.5 million, predominantly from sales of IBM, Apple, Compaq, and Epson systems and associated peripherals. Service revenues accounted for about 20% of total sales, or \$500 thousand for the year.

The store currently employs a total of 15 people, with five field support specialists, three in-house technicians, one Novell-trained network support specialist, one trainer (who doubles as their in-house software support person), and one service manager.

Service Delivery

The Indianapolis MicroAge provides the following support services: warranty service, remedial hardware and software support, preventive hardware maintenance, and end-user training. Users call into the store's main number to request service; if the call comes in after regular store hours, an answering machine takes the call and becomes the first call placed the next day.

The only on-site service contract offered by the Indianapolis MicroAge covers normal business hours (9AM to 5PM, Monday through Friday). There is no extended service contract available. Although the store cannot guarantee response times, the store attempts to meet a four hour response time objective for contract customers (within 50-miles of their location).

The Indianapolis MicroAge reports that 20% of their microcomputer customers purchase service contracts. Furthermore, the store estimates that contracts comprise 67% of their total service revenue (versus 33% derived from time-and-material service). Interestingly, the store observed that while 75% of their service agreements are for on-site maintenance (the store offers an annual depot support contract), time spent on servicing both types of service is evenly divided.

The current time-and-material charge for on-site service is \$65 per hour (with \$22.50 minimum) and \$45 per hour for T&M service performed in their store. There are no travel, mileage, or zone charges, as the T&M rate is portal-to-portal.

The Indianapolis MicroAge offers multiyear service contracts to customers, with a 2% to 5% per year discount.

COMPANY PROFILE

**SUN MICROSYSTEMS,
INCORPORATED**

2550 Garcia Avenue
Mountain View, CA 94043
(415) 960-1300

Scott McNealy, Chairman, President, and
CEO
Carol Bartz, VP Customer Service
Total Employees: 7,090
Total Revenue, Fiscal Year End 06/30/88:
\$1,052 million

The Company

Sun Microsystems, Inc is a leading supplier of network-based distributed computing systems. Fiscal year 1988 proved to be a momentous year for Sun, as they passed the one-billion dollar mark during the year, as well as having shipped their 100,000th system worldwide.

In July, 1987, Sun introduced and licensed their SPARC (Scalable Processor ARChitecture) 10-MIPs RISC microprocessor, incorporated in their Sun-4 family of supercomputing workstations, as well as licensed for use in such manufacturers' systems as Fujitsu, Xerox, Unisys, and others.

In October, 1987, Sun formed a strategic alliance with AT&T to co-develop a platform that will utilize a unified version of AT&T's UNIX System V operating system. Later, Sun's closest competitor, Apollo Computer, along with IBM, HP, and DEC, joined forces to form the Open Software Foundation to create a new, alternative operating system standard.

Sun formed other impressive partnerships with NAS to develop, support, and provide a common operating system; with Amdahl, to form a product development program that will lead to integration of Sun's workstations with Amdahl's mainframe systems.

In November, 1987, Sun first formed a support program for value-added resellers called SunPartners. Sun has expanded the breadth of dealers supported by their VAR programs, as exhibited by their authorization of selected MicroAge dealerships to carry their 386-based workstations. Currently, over 140 VARs now carry Sun products.

**Service
Demographics**

Sun reported 1988 total revenues of approximately \$1.1 billion, up 96% over the previous year. Service represents approximately 10% of total revenues, or \$110 million.

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Sun employs 700 people in service and support capacities. Sun will not disclose the actual number of field engineers, but INPUT estimates that Sun employs between 500 to 600 FE's.

Sun offers service in the U.S. out of 76 service locations in the U.S. and another 44 locations in Canada, Australia, Europe, and the Far East. Mail-in support is available at Sun's Support Center, located in Milpitas, CA. Each service location maintains a limited number of spare parts, however Sun's primary spares holding center is in Milpitas (CA).

Service Delivery

Sun offers their customers two different integrated service plans under SunClass Services. The first, SunClass Basic Service, provides both hardware maintenance and software support to customers with same day, on-site hardware maintenance for multi-server or network environments and next-day on-site hardware maintenance for single-user systems. SunClass System Service adds customer education and software update installation services.

Sun customers can customize their hardware maintenance with various service discount options. Clustered support is available for users with 25 or more user-installable Sun workstations under Sun's On-site Service Center Option, where a Sun engineer performs weekly service at a user's site at prices approaching depot service. Mail-in depot service is available under Sun's System Return Service, which promises three-day turnaround. Customers outside Sun's on-site coverage area (50-miles from a service location) can select Customer-Assisted Return Service, which provides telephone diagnostic support couple with system unit exchange, with replacements shipped via overnight express carriers with one business day of problem identification.

Other discounts available include prepayment discounts (5% off list), dollar volume discounts (ranging 3% to 12%), and unit volume discounts (3% to 20%, depending on site volume). In addition, Sun will negotiate discounts for multiyear contracts, call-screening, and site management.

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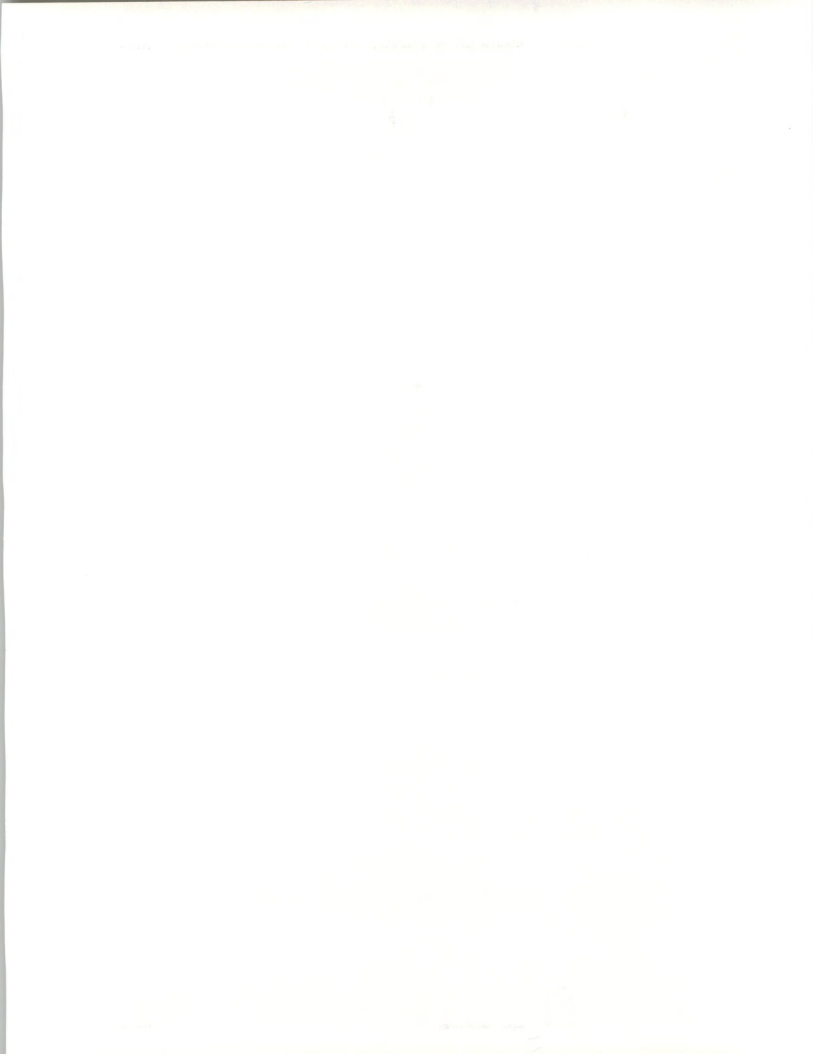
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Software support services include AnswerLine Service, which provides toll-free telephone support from the first available support specialist. Personal AnswerLine Service provides users an assigned Personal AnswerLine Account Engineer during normal business hours. Both options include Sun's Software Update Service, which provides periodic software updates, a subscription to Sun's Software Technical Bulletin, and access to Sun's UNIX electronic mail system to report software issues (this option can be purchased separately).

Sun also provides a wide range of support services to their reseller network, including service training, spare parts sales (including recommended spare parts kits), technical documentation, and engineering/field change orders.

Sun calls their VAR support program SunPartners, consisting of the following four programs: Foundation, Development, Partnership, and Co-op. Foundation, available to all dealers, keeps resellers abreast of new product and program developments through representation on the OEM council and technical symposiums. Development provides the OEM with technical assistance during the OEM's product life cycle, as well as start-up training and consulting, Personal Answerline Subscriptions Services (on-line abstracts of Sun's engineering change orders), and access to Sun's FEs. Partnership provides dealers with limited service capabilities access to Sun's service organization, where Sun acts as either the subcontractor to the OEM (an option called Maintenance Manager) or the primary servicer (the OEM sells a Sun service contract) and the OEM receives a 12% referral fee from Sun (called the Maintenance Reseller option). Under Sun's Co-op VAR option, the OEM gain access to diagnostics, documentation, maintenance training, spares, phone-in technical backup, subscription services, and tailored logistics planning, as well as an assigned account manager.

Sun offers a spare parts discount plan for VARs who buy large volumes of spare parts. Discounts currently range from 8% to 25%, depending upon volume purchased.



COMPANY PROFILE

TANDY CORPORATION

1800 One Tandy Center
Fort Worth, TX 76102
(817) 390-3700

John V. Roach, Chairman
Robert D. Myers, VP Business Products
David Goyne, VP Support Service
Total Revenue, Fiscal Year End 06/30/88:
\$3.7 billion

The Company

Tandy Corporation maintains a unique position in the computer industry, acting both as manufacturer and distributor of personal computer and related products, as well as a wide range of other electronic products (including telephones, home entertainment equipment, toys, and electronic parts, to name a few). Because of their long association with the (hobbyist) electronics market, Tandy has attempted to "spruce up" their computer business image (modernize stores, increase employee training, stricter grooming rules for in-store personnel) over the last few years. Still, Tandy has to be considered as a leading (and one of the oldest) supplier of personal computer products to both the home and business markets, selling 602,000 microcomputers in fiscal year 1988.

Tandy's microcomputer products fall into two general categories. The first group is based upon Tandy's traditional proprietary operating systems. These products are typified by their low-cost Color computer and their Model 100, 200, 400, and 600 laptop computers.

Tandy became a late entrant in the MS-DOS operating system environment, but, currently, two-thirds of all Tandy computers sold are IBM-compatible. These products range from the entry-level 1000 up to the 6000 multiuser system. In mid-1988, Tandy announced that they had developed one of the earliest clones of IBM's PS/2 Model 80. Called the 5000 MC, the Intel 30386-based microcomputers sparked a joint venture between Tandy and Digital Equipment Corporation to develop a new line of personal computers that would carry the DEC nameplate.

Later in 1988, Tandy announced another joint venture with Japanese manufacturing giant Matsushita Electric Industrial Company to develop a line of microcomputers that will be marketed in the U.S. under the Matsushita moniker.



In another departure from tradition, Tandy quietly began selling (and supporting) non-Tandy products. For example, Tandy now sells and supports Novell networks, as well as a growing list of leading software packages.

In July of 1988, Tandy made a major acquisition by purchasing GRiD Systems. By purchasing GRiD (a \$79 million producer of magnesium-cased laptop computers that specialized in the government and business markets), Tandy gained new in-roads into government and corporate marketplaces.

In 1989 Tandy has begun a major distribution reorganization that attempts to take advantage of their GRiD acquisition. Prior to 1989, distribution and service for users of Tandy 1000 computers and above were predominantly handled by 352 Radio Shack Computer Centers (Tandy 1000 and below computers were typically handled by the 4,600 company owned Radio Shack stores and the 2,200 authorized dealers). Tandy is currently beginning a three-month transitional process, after which 61 of the Computer Centers will become known as GRiD System Centers, which will handle the full line of Tandy and GRiD computers but will focus on Fortune 1000-size customers. Radio Shack Computer Centers will no longer call on larger accounts, but will continue to handle Tandy 1000 and above systems. The Computer Centers will pick up additional products to sell, such as phone answering devices and telephones.

In addition, Tandy is currently exploring the potential benefits of teaming with a nationwide third-party maintenance organization as a way of expanding the scope and accessibility to maintenance services.

Service Demographics

Tandy Corporation reported total company sales of \$3.8 billion in fiscal year 1988 (FYE June 30), an increase of 9.9% over 1987. Tandy did not disclose total microcomputer sales figures for 1988, but did disclose that unit sales growth of MS-DOS computers grew at 31% (down from 57% unit sales growth in the previous year). In 1987, Tandy reported that total microcomputer, peripheral, and software sales was 30.3% of Radio Shack sales (\$2.7 billion), or approximately \$820 million. This dollar figure represented 9% growth over 1986.

Tandy also revealed that dollar sales growth of all Tandy computers did not grow as fast as MS-DOS unit growth (Tandy did not mention non-MS-DOS unit growth, presumably, this segment of their product line did not exhibit growth).



As stated earlier, Tandy offers sales and support out of 61 GRiD System Centers, 291 Radio Shack Computer Centers, 4,600 company-owned Radio Shack, and 2,200 authorized dealers (which may be a department in another store). Tandy currently employs 390 system engineers (technicians who work primarily on computer products) and 450 field technicians (who may also service other electronic products). In addition, Tandy employs 90 support specialists who are skilled at supporting Novell and 3-Com local area networks.

Part of the major reorganization will be to return the training and service employees back to individual GRiD System Centers, Radio Shack Computer Centers, and Radio Shack stores, reversing a 1984 change that resulted in the "regionalization" of support to 63 Business Products Support Centers. In returning the employees back to individual store locations, Tandy hopes to bring training and service capabilities closer to the users, while at the same time improving communication between support and sales groups.

Service Delivery

Tandy offers a wide range of microcomputer service and support offerings to their users. Once a Tandy computer is outside of the 90-day warranty (covered by carry-in service), a user can select service via on-site, carry-in, or a novel replacement service called "Hot Spares Program."

On-site service typically covers the computer during prime shift (5-days by 9-hours a day), although users can negotiate customized coverages with their service location. Tandy estimates that 20% of their business users (those who will end up receiving their support from the 61 GRiD System Centers) purchase service. Tandy also estimates that 80% of their service revenue is derived from service contracts (typically on-site service), while the remaining 20% comes from time-and material service (typically depot) service.

Tandy estimates that 10% to 15% of their business users could be considered "self-servicing", with their own service capabilities established in house. Tandy attempts to support these users (identified by Tandy as among their largest corporate customers) with parts sales, T&M service, and training services.

1911

One possible change resulting from the reorganization will be a change in the phone support provided to customers. Historically, users either called their local Computer Center or Radio Shack for phone support. After 1984, Tandy regionalized their telephone support out of their 63 Business Product Service Centers. With the transition of primary service responsibility to the 61 GRiD System Centers, Tandy is evaluating the idea of centralizing all phone support and offering a toll free (800-) telephone number. Previously, such support was deemed prohibitive due to the high costs associated with Tandy's dispersed product base and the fear that users would deluge such a support offering with problems and questions that were more operational in nature.

Tandy is also attempting to evaluate their depot service delivery methodology, and may elect to establish regional or even centralized depot service locations.

Tandy supports 200 authorized value-added resellers of Tandy computers, offering a wide range of services, including promotion materials, sales training, technical training (for VARs that provide service), board exchange, a technical tips bulletin, and access to Tandy's Technical Support Group at the Fort Worth headquarter location.

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COMPANY PROFILE

**TRW CUSTOMER SERVICES
DIVISION**

15 Law Drive
Fairfield, NJ 07007
(201) 575-7110

Paul Snyder, VP and GM
Total Employees: 2,100
Total Revenue, Fiscal Year End 12/31/88:
\$260 million (INPUT Estimate)

The Company

TRW Customer Service Division (a division of a \$6.2 billion multinational, diversified company whose products and services range from satellites, information systems, and automobile electronics) is the leading supplier of independent maintenance service and support. TRW CSD offers hardware maintenance on a wide range of computer equipment, including mainframes, minicomputers, peripherals, telecommunications equipment (including local area networks), and microcomputers.

After entering the TPM market thirteen years ago with the acquisition of the old Singer computer maintenance business, TRW has been most successful at growing their service business through strategic agreements formed with product manufacturers which enabled TRW to become the exclusive service provider for that manufacturer's user base. These agreements, called Service Management contracts, benefited both parties by providing the manufacturer with a respected, nationwide service provider (and freeing the manufacturer from having to establish their own service), while providing TRW with an established revenue base (as well as assured access to spares, documentation, and technical support).

The Service Management approach was heavily used in the microcomputer market, where new manufacturers, without service (or even sales organizations) could benefit from a nationwide TPM's existing service capabilities.

In 1988, TRW concentrated its attention to centralizing its dispatching and logistics functions with the purchase of DATA Group's FIELDWATCH service management software system. Previously, TRW utilized a regional approach to dispatching and inventory management.



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TRW did make one acquisition of note. In the first quarter of 1988, TRW purchased the TPM service business of 3M (St. Paul, MN), the four year old service organization that concentrated on the microcomputer and related product support. Brands supported by 3M included IBM, DEC, Compaq, AT&T, TI, Hayes, Micom, and Dataproducts.

Service Demographics

INPUT estimates that worldwide revenues for TRW CSD was \$260 million for 1988. TRW employs 2,100 total service employees, with 1,300 field engineers dispatched out of 125 service locations. In addition, TRW employs 500 people in technical support capacities.

TRW CSD maintains a massive supply of spare parts in excess of ten million parts carrying over 130,000 unique parts numbers. TRW reports that their spare parts inventory costs over \$90 million.

Service Delivery

TRW offers remedial maintenance, preventive maintenance, and, to a limited degree, operating software support on an extensive list of microcomputer products, including systems and products from such manufacturers as IBM, AT&T, Compaq, Zenith, Okidata, Epson, NEC, Hayes, and many IBM-compatibles. In addition, TRW performs warranty service for many products that TRW has Service Management agreements on.

Base period on-site contract maintenance covers Monday through Friday, 11-hours per day (7AM-6PM), excluding holidays. Users can upgrade that coverage to five-days, 24-hours (for a 24% increase) and to 7-days, 24-hours (for a 39% premium).

TRW also offers time-and-material service for noncontract microcomputer users at \$115 per hour for prime shift (Monday-Friday, 7AM-6PM, 1-hour minimum), \$157 per hour for hours and days outside of the prime shift (2-hour minimum after hours on weekdays and Saturdays, 3-hours on Sundays and holidays). All T&M customers are charged \$.31 per mile mileage charge.

TRW estimates that 75% of their revenue base is derived from service contracts, versus 10% from T&M and the remaining 15% from flat fees (typically fourth-party maintenance customers).

TRW estimates that only 10% of their service business is derived from depot maintenance, most of which are peripherals such as terminals and personal computers. TRW offers fourth-party service from a separate group, called Electronic Industry Services.

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TRW also offers a wide range of services for resellers of microcomputer systems. The newest of these reseller support programs is called TRW Marketing Support Program PLUS (MSP PLUS), which allows resellers to sell TRW maintenance service contracts and earn commissions ranging from 11.7% (if the contract is billed quarterly) to 16.6% (if the contract is billed annually). TRW handles administration of the service, including all communications with the customer.





Comparative Tables

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EXHIBIT III-1

PC/WORKSTATION REVENUE ANALYSIS

Company	1988 Total Revenues (\$ Millions)	Service Revenues (\$ Millions)	Percent Service/ Total Revenues
Altos	176	-	-
Apollo	650	140	22
Apple	4,100	-	-
Businessland	1,000	100 - 130 †	≈11
Compaq	2,100	35	2
Computerland	2,000	-	-
Control Data	100 *	-	-
IDEA Servcom	82	82	100
Inacom	250	-	-
IE (Entre)	1,000 **	-	-
Intellogic Trace	135	117	87
IBM	59,681	7,347	12
MicroAge	255	-	-
Sun	1,052	105 †	10
Tandy	3,800	-	-
TRW	260 †	260 †	100

*1987 Figure

**1989 Company Estimate

†INPUT Estimate

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EXHIBIT III-2

PC/WORKSTATION EMPLOYEE ANALYSIS

Company	Total Employees	Total Service Employees	FEs	Technical Support
Altos	-	-	700	-
Apollo	4,000	700	245	455
Apple	-	-	-	-
Businessland	-	553	-	-
Compaq	5,000	-	-	-
Computerland	17,500	2,500	1,800	200
Control Data	4,500	4,500	2,800	-
IDEA Servcom	700	700	420	120
Inacomp	2,000	250	35	60
IE (Entre)	31	14	8	-
Intelogic Trace	1,525	1,525	640	35
IBM	398,348	2,000	18,000	-
MicroAge	-	-	-	-
Sun	*	700	500 - 600†	*
Tandy	-	-	830	-
TRW	2,100	2,100	1,300	500

*Will Not Divulge

†INPUT Estimate

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EXHIBIT III-3

PC/WORKSTATION PRODUCT COVERAGE

Company	Products Served
Altos	Altos, Major Peripherals
Apollo	Apollo, CDC Peripherals
Apple	Apple
Businessland	Apple, IBM, Zenith, Major Peripherals
Compaq	Compaq
Computerland	Apple, IBM, Compaq, Zenith, Others
Control Data	IBM, Compaq, Zenith
IDEA Servcom	AST, Apple, IBM, Compaq, ITT, Others
Inacom	Apple, Compaq, IBM, Epson, Others
IE (Entre)	Compaq, IBM, PC-Compatibles
Intellogic Trace	AST, Compaq, IBM, Televideo, Others
IBM	IBM, AST, HP, Others
MicroAge	Apple, Compaq, Epson, IBM
Sun	Sun
Tandy	Tandy, Grid, Novell, 3 Com
TRW	Compaq, IBM, Altos, Others

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EXHIBIT III-4

PC/WORKSTATION SERVICE COVERAGE

Company	Number of Service Locations	Number of Depot Locations	Number of Spare Parts Locations
Altos	21	21	1
Apollo	70	1	1
Apple	3	3	34
Businessland	94	94	94
Compaq	-	-	1
Computerland	740	740	740
Control Data	50	2	1
IDEA Servcom	140	17	24
Inacomp	100	100	100
IE (Entre)	-	-	1
Intelogic Trace	222	18	222
IBM	233	-	21
MicroAge	-	-	-
Sun	76	1	1
Tandy	352 †	352	352
TRW	125	50	50

†Total include Grid Centers and computer stores only.

The table contains several columns and rows of data, but the text is too faint to read. It appears to be a summary of financial or operational metrics.

EXHIBIT III-5

PC/WORKSTATION SERVICES PROVIDED

Company	Services Provided				
	Warranty	Remedial Hardware Maintenance	Preventive Hardware Maintenance	Software Support	Training
Altos	X	X		X	X
Apollo	X	X	X	X	X
Apple					
Businessland	X	X	X	X	X
Compaq	X				
Computerland	X	X	X	X	X
Control Data		X	X		X
IDEA Servcom	X	X	X	X	X
Inacomp	X	X	X	X	X
IE (Entre)	X	X	X	X	X
Intellogic Trace	X	X	X		
IBM	X	X	X	X	X
MicroAge	X	X	X	X	X
Sun	X	X		X	X
Tandy	X	X	X	X	X
TRW	X	X	X		X



EXHIBIT III-6

PC/WORKSTATION CONTRACT COVERAGE

Company	Standard (Days/Hours)				Upgrades Available
	5/9	5/11	5/24	7/24	
Altos	X				
Apollo	X				Up to 7/24
Apple					
Businessland	X				
Compaq					
Computerland	X				Up to 7/24
Control Data		X			
IDEA Servcom	X				7/24
Inacomp	X				
IE (Entre)	X				7/24
Intelogic Trace	X				
IBM				X	
MicroAge	X				
Sun	X				Up to 7/24
Tandy	X				
TRW	X				

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EXHIBIT III-7

PC/WORKSTATION TRAVEL EXCLUSIONS

Company	Miles from Service Location			
	Over 25	Over 50	Over 75	No Exclusions
Altos				X
Apollo		X		
Apple				
Businessland	*			
Compaq				
Computerland				X
Control Data	X			
IDEA Servcom				
Inacomp				X
IE (Entre)				X
Intellogic Trace				
IBM				
MicroAge		X		
Sun		X		
Tandy				
TRW	X			

*30 Miles



EXHIBIT III-8

PC/WORKSTATION T&M RATES

Company	Current Hourly Charge (Dollars)				Min. Charge (Hour)	Mileage or Zone Charges
	Business Hours M - F	After Hours M - F	Sat.	Sun./Holidays		
Altos	125	NA	NA	NA	2 Hrs.	
Apollo	125	145	145	145	2 Hrs.	.25/Mile
Apple	-	-	-	-	-	
Businessland	75	NA	NA	NA	\$22.50	\$30.00 <30 Mi. \$2.50/Mi. >30 Mi.
Compaq	-	-	-	-	-	
Computerland	40-120	60-140	60-140	70-150	None	
Control Data	-	-	-	-	-	
IDEA Servcom	115	132	132	132	2 Hrs.	
Inacomp	90	NA	NA	NA	-	
IE (Entre)	85	NA	NA	NA	-	
Intellogic Trace	115	135	135	145	2 Hrs.	
IBM	190	217	217	217	2 Hrs.	
MicroAge	65	-	-	-	\$22.50	
Sun	110	130	150	150	2 Hrs.	.25/Mile
Tandy	-	-	-	-	-	
TRW	115	157	157	157	2 Hrs.	

Year	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
Jan											
Feb											
Mar											
Apr											
May											
Jun											
Jul											
Aug											
Sep											
Oct											
Nov											
Dec											

EXHIBIT III-9

PC/WORKSTATION DISCOUNTS AVAILABLE

Company	Percent Discount								
	Multiyear	Prepayment	Carry-In	Dollar Volume	Unit Volume	Call	Screening Deferred Response	Centralized	Negotiated
Altos	-	15	-	X	-	15	-	-	-
Apollo	X	5	-	3-12	1-20	-	-	-	X
Apple	-	-	-	-	-	-	-	-	-
Businessland	-	-	-	-	-	-	-	-	-
Compaq	-	-	-	-	-	-	-	-	-
Computerland	0-10	1-10	0-50	0-50	0-50	10	10	0-10	-
Control Data	X	X	X	X	X	X	X	X	-
IDEA Servcom	-	-	-	-	-	-	X	X	-
Inacom	10	-	X	X	X	-	-	-	-
IE (Entre)	-	-	X	X	15-35	-	-	X	-
Intelogic Trace	4-5	6	20-35	10-35	10-35	7	-	-	-
IBM	X	-	-	X	X	X	-	-	-
MicroAge	2-5	-	X	-	-	-	-	-	-
Sun	-	5	-	3-12	3-20	-	-	-	-
Tandy	-	-	X	X	-	-	-	-	-
TRW	X	X	X	X	X	-	-	-	X

X = Provide Discount, Would Not Divulge Percent

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EXHIBIT III-10

PC/WORKSTATION SOFTWARE SUPPORT

Company	Provide Software Support	How Performed			Bundled or Charged Separately (B/C)
		Percent On-Site	Percent Phone Support	Percent Remote	
Altos	X	-	75	25	C
Apollo	X	-	100	-	B
Apple	X	-	100	-	B
Businessland	X	-	100	-	C
Compaq		-	-	-	-
Computerland	X	10	30	20†	B
Control Data		-	-	-	-
IDEA Servcom	X	-	-	-	B
Inacom	X	80	20	-	C
IE (Entre)	X	100	-	-	C
Intelogic Trace	X	*	*	*	B
IBM	X	*	*	*	B
MicroAge	X	20	80		-
Sun	X	*	*	*	B
Tandy	X	*	*	*	B
TRW	-	-	-	-	-

†Plus 40% performed at store.

* Would not divulge.

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EXHIBIT III-11

PC/WORKSTATION BUSINESS ANALYSIS

Company	Percent Business Derived				Where Performed (Percent)	
	Contract	T&M	Flat Fee	Other	On-Site	Depot
Altos	60	30	10	-	75	25
Apollo	*	*	*	*	90	10
Apple	-	-	-	-	-	-
Businessland	*	*	*	*	*	*
Compaq	-	-	-	-	-	-
Computerland	*	*	*	*	60	40
Control Data	100	-	-	-	95	5
IDEA Servcom	90	5	-	5†	95	5
Inacomp	-	-	-	-	-	-
IE (Entre)	75	25	-	-	75	25
Intelogic Trace	93	7	-	-	86	1††
IBM	-	-	-	-	-	-
MicroAge	66	33	-	-	75	25
Sun	*	*	*	*	*	*
Tandy	80	20	-	-	80	7††
TRW	75	10	15	-	90	10

*Refused to Answer

†OEM Sales

††Sales/Leasing—13%

EXHIBIT III-12

PC/WORKSTATION VENDOR SUPPORT PROVIDED TO DEALERS

Company	Service Training	Parts Sales	Parts Kits	Operational Phone Support	Hardware Tech Phone Support	Software Tech Phone Support	Service Documentation	ECO/FCO
Altos	X	X	X	-	X	X	X	X
Apollo	X	X	-	-	X	X	X	X
Apple	X	X	X	-	X	X	X	X
Businessland	-	-	-	-	-	-	-	-
Compaq	X	X	X	X	X	X	X	X
Computerland	-	-	-	-	-	-	-	-
Control Data	-	-	-	-	-	-	-	-
IDEA Servcom	-	-	-	-	-	-	-	-
Inacomp	-	-	-	-	-	-	-	-
IE (Entre)	-	-	-	-	-	-	-	-
Intellogic Trace	-	-	-	-	-	-	-	-
IBM	-	-	-	-	-	-	-	-
MicroAge	-	-	-	-	-	-	-	-
Sun	X	X	X	X	X	X	X	X
Tandy	-	-	-	-	-	-	-	-
TRW	-	-	-	-	-	-	-	-

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EXHIBIT III-13

PC/WORKSTATION DEALER SERVICE QUALIFICATIONS

Company	Provide Warranty Service	Provide Installations	Maintain Parts Levels	Provide User Training	Take Mfr. :- Supplied Training	Take Certification Exam
Altos	X	-	X	-	X	X
Apollo	-	-	-	-	-	-
Apple	-	-	-	-	-	-
Businessland	-	-	-	-	-	-
Compaq	X	-	X	-	X	X
Computerland	-	-	-	-	-	-
Control Data	-	-	-	-	-	-
Idea Servcom	-	-	-	-	-	-
Inacomp	-	-	-	-	-	-
IE (Entre)	-	-	-	-	-	-
Intelogic Trace	-	-	-	-	-	-
IBM	-	-	-	-	-	-
Microage	-	-	-	-	-	-
Sun	X	-	X	X	X	X
Tandy	-	-	-	-	-	-
TRW	-	-	-	-	-	-

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EXHIBIT III-14

PC/WORKSTATION DEALER INCENTIVES/COMPENSATION

Company	Commissions for Service Contracts Sold (Percent)	Spare Parts Discounts (Percent)	Compensation	
			For Warranty Work	For Installations
Altos	15	40	T & M	-
Apollo	3-12	X	-	-
Apple	-	-	-	-
Businessland	-	-	-	-
Compaq	-	-	Flat Fee	-
Computerland	-	-	-	-
Control Data	-	-	-	-
IDEA Servcom	-	-	-	-
Inacomp	-	-	-	-
IE (Entre)	-	-	-	-
Intelogic Trace	-	-	-	-
IBM	-	-	-	-
MicroAge	-	-	-	-
Sun	12	8-25	-	-
Tandy	-	-	-	-
TRW	-	-	-	-

X = Provide, but Would Not Divulge Percent.

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EXHIBIT III-15

PC/WORKSTATION DEALER SATISFACTION WITH VENDOR SUPPORT

Dealer	Satisfaction With Support from: (Scale: 1 = Low Satisfaction)								
	Training			Parts			Technical Support		
	Apple	Compaq	IBM	Apple	Compaq	IBM	Apple	Compaq	IBM
Computerland	6	8	7	4	7	5	3	5	3
Inacomp	8	9	6	7	9	7	4	7	5
IE (Entre)	NA	8	3	NA	8	8	NA	9	*
MicroAge	8	8	6	8	8	7	8	8	5

NA = Not Applicable

*Did Not Receive

EXHIBIT III-16

PC/WORKSTATION DEALER COMPENSATION AS REPORTED BY DEALERS

Dealer	How Compensated				
	Warranty Work	Installations*	ECO/FCOS	Contracts Sold	Parts Usage
Computerland	Flat Fee	None	None	None	None
Inacomp	Flat Rate	None	Flat Rate	None	None
IE (Entre)	Flat Fee	None	None	None	None
MicroAge	Flat Fee	None	None	None	**

*Most Dealers Charge User Separately

**MicroAge Receives 30-40% Discount on Spares





Workstation/PC Vendor Survey







Workstation/PC Vendor Survey

Vendor Name: _____

Vendor Type (Circle One): Manufacturer Distributor TPM

Address: _____

Contact: _____

Title: _____

Phone: _____

(Instruction: To Mfrs, Distribs, and TPMs)

Demographics

1. 1988 total company revenues: _____

2. a. 1988 total service revenues: _____

b. Est. 1988 WS/PC service revenues: _____

3. Total employees: _____

4. a. Total service employees: _____

b. Field engineers: _____

c. Technical support specialists: _____

d. Software support specialists: _____

e. Training specialists: _____

5. a. Service locations: _____

b. Carry-in/mail-in depots: _____

c. Spare parts locations: _____



Product Coverage [WS/PC and Related Peripherals Only]

6. Brands serviced: _____

[Ask #7 to manufacturer-based service organizations only]

7. Warranty service
- Warranty length: _____
 - Warranty service delivery:
 - On-site: _____
 - Depot: _____
 - Base coverage (days/hrs covered): _____
 - Upgraded service available (Please describe): _____

8. Services provided: (Check all that apply):

- Warranty service _____
- Remedial HW maint. _____
- Preventative HW maint. _____
- Software support _____
- Training _____

9. Standard (base) contract coverage

- Days/hours covered
 - 7 x 24 _____
 - 5 x 24 _____
 - 5 x 9 _____
 - 5 x 11 _____
 - Other (Specify) _____
 - Optional upgraded services available: _____

b. Billable exclusions

- Customer error _____
- Product not under contract _____
- Software problem _____
- Alterations/attach damage _____
- Lightning/flood damage _____

c. Response time

- Guarantee (hrs) _____ or
- Objective (hrs) _____



- d. Travel exclusions
1. No exclusions _____
 2. Over 25 miles from service location _____
 3. Over 50 miles _____
 4. Over 75 miles _____
- e. Do you contract by machine (i.e., serial no.), by "cluster" or both? _____
-
10. Time and material service
- a. Hourly rates for noncontract
1. Business hours M-F _____
 2. After hours M-F _____
 3. Saturday _____
 4. Sunday/holidays _____
 5. Minimum charge _____
 6. Mileage/zone charges _____
- b. Hourly rates for contract customers (noncovered work)
1. Business hours M-F _____
 2. After hours M-F _____
 3. Saturday _____
 4. Sunday/holidays _____
 5. Minimum charge _____
 6. Mileage/zone charges _____
11. Discounts available (Provide discount range)
- a. Multiyear _____
 - b. Prepayment _____
 - c. Carry-in _____
 - d. Dollar volume _____
 - e. Unit volume _____
 - f. Call screening/problem mgt. _____
 - g. Deferred response _____
 - h. Remote support _____
 - i. Centralized support _____
 - j. Negotiate (What type negotiated) _____
-
12. Software support (defined as problem resolution, not new releases)
- a. % Delivered on-site _____ %
 - b. % Delivered by phone support _____ %
 - c. % Delivered remotely _____ %
 - d. Bundled or charged separately _____ %



Business Base

(Ask #13 to manufacturer-based service organizations only)

13. Estimated % of customers that buy service contracts _____ %
14. Percent of business that is derived from:
- a. Contract _____ %
 - b. T&M _____ %
 - c. Flat-fee _____ %
 - d. Other (Specify) _____ % _____
15. Percent of business that is performed:
- a. On-site _____ %
 - b. Depot _____ %

(Ask #16-19 manufacturer-based service organizations only)

Support Delivered to Distributors

16. Do you provide the following services to distributors?
- a. Service training _____
 - b. Spare parts sales _____
 - c. Recommended spare parts kits _____
 - d. Phone support (provide percent breakdown)
 - 1. Operational _____ %
 - 2. Technical HW support _____ %
 - 3. Technical SW support _____ %
 - e. Technical documentation _____
 - f. ECO/FCO _____
 - g. Commissions for service contract sold _____
 - 1. What % commission _____ %
 - h. Discounts for spare sales _____
 - 1. What % discount _____ %
17. How do you compensate dealers/distributors/TPMs for warranty work? _____

18. How do you compensate dealers/distributors/TPMs for installations? _____



19. What service qualifications are required for authorizing service dealers?

- a. Must provide warranty work _____
- b. Must provide installations _____
- c. Must maintain parts levels _____
- d. Must provide end-user training _____
- e. Must take manufacturer-supplied training _____
- f. Must take certification examination _____

(Ask #20-21 to Distributors Only)

20. How would you rate your satisfaction (1-10, 10 = Highest Satisfaction) with the support received from the following manufacturers?

	IBM	Apple	Compaq
a. Training	_____	_____	_____
b. Spare parts sales	_____	_____	_____
c. Tech (phone) support	_____	_____	_____
d. ECO/FCO	_____	_____	_____
e. Installations	_____	_____	_____

21. How are you compensated (e.g., flat fee, hourly rate, commission) by the following manufacturers for the following services that you perform?

	IBM	Apple	Compaq
a. Warranty work	_____	_____	_____
b. Installations	_____	_____	_____
c. FCO/ECO	_____	_____	_____
d. Contracts sold	_____	_____	_____
e. Parts usage	_____	_____	_____

(Ask all service organizations)

22. What is your foremost service concern? _____

23. What percent service growth do you expect in the next year? _____ %

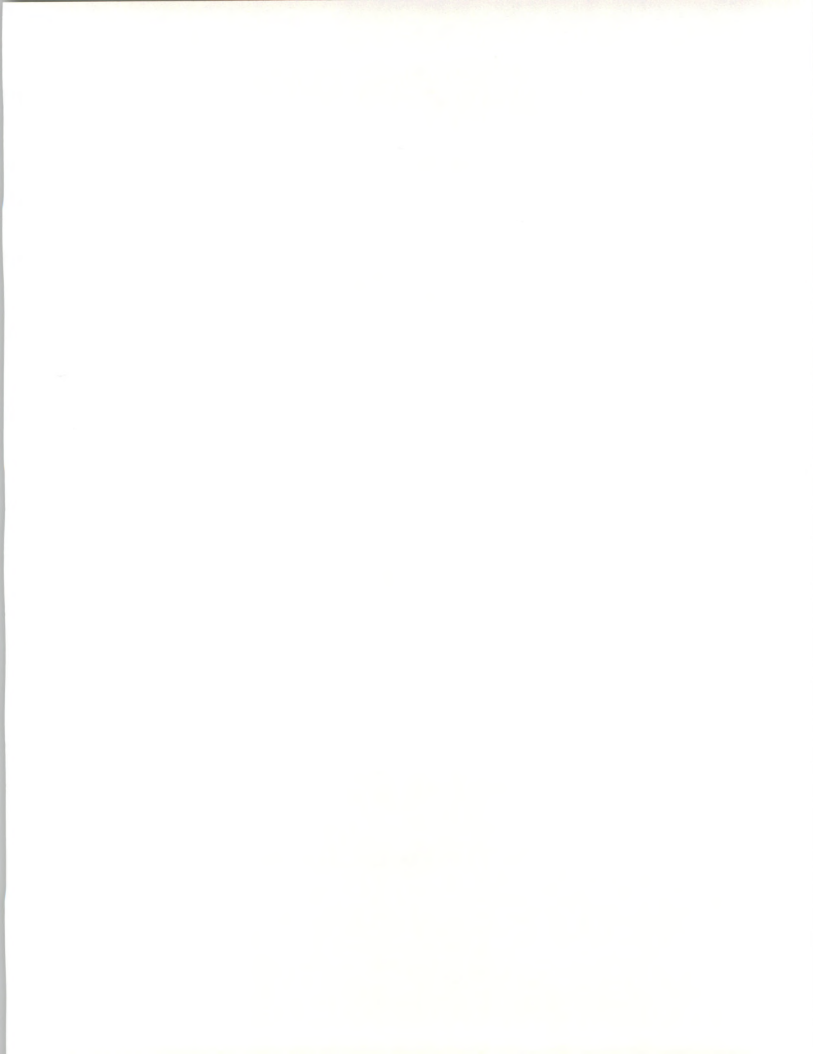






Definitions





B

Appendix: Definitions

Applications Software - Software that performs processing to service user functions.

Artificial Intelligence - The academic discipline involving the study of the processes by which humans perceive and assimilate data (and use reasoning to process this data) for the purpose of duplicating these processes within computer systems. Also, this term refers to the computer systems that accomplish these duplicated processes.

BOC - Bell Operating Company.

Consulting - Includes analysis of user requirements and the development of a specific action plan to meet user service and support needs.

Dispatching - The process of allocating service resources to solve a support-related problem.

Divestiture - The action, stemming from antitrust lawsuits by the Department of Justice, which led to the breakup of AT&T and its previously owned local operating companies.

Documentation - All manuals, newsletters, and text designed to serve as reference material for the ongoing operation or repair of hardware or software.

End User - May buy a system from the hardware supplier(s) and do own programming, interfacing, and installation. Alternatively, may buy a turnkey system from a systems house or hardware integrator.

Expert Systems Applications - Applications for expert systems—a computer system based on a data base created by human authorities on a particular subject. The computer system supporting this data base contains software that permits inferences based on inquiries against the



information contained in the data base. Expert systems is often used synonymously with "knowledge-based systems," although this latter term is considered to be broader and to include expert systems within its scope.

Engineering Change Notice (ECN) - Product changes to improve the product after it has been released to production.

Engineering Change Order (ECO) - The follow-up to ECNs that include parts and a bill of material to effect the change in hardware.

Escalation - The process of increasing the level of support when and if the field engineer cannot correct a hardware or software problem within a prescribed amount of time, usually two to four hours for hardware.

Fiber Optics - A transmission medium which uses light waves.

Field Engineer (FE) - For the purpose of this study, field engineer, customer engineer, service person, and maintenance person were used interchangeably and refer to the individual who responds to a user's service call to repair a device or system.

Field Service Management System (FSMS) - A specialized application program that automates some (if not all) of the following activities of a field service organization: call handling, dispatching, parts inventory and tracking, billing, efficiency reporting, and other functions. Ideally, the system accesses one data base from which each function can use and modify data.

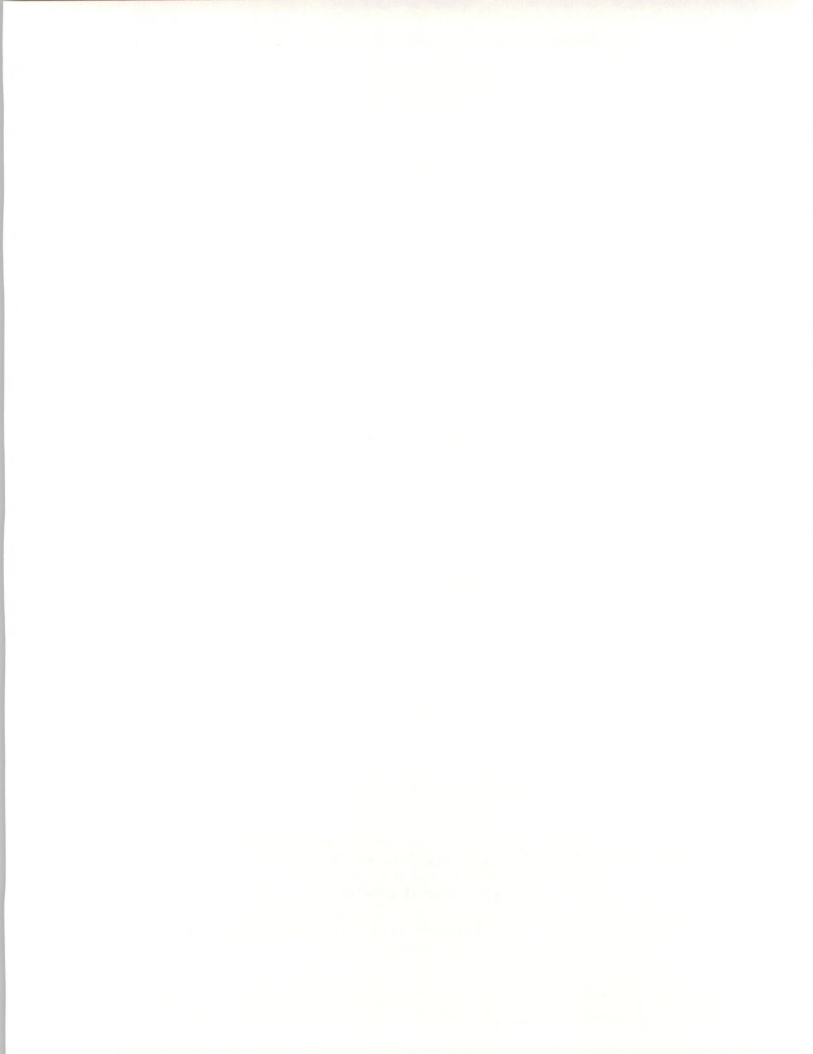
Hardware Integrator - Develops system interface electronics and controllers for the CPU, sensors, peripherals, and all other ancillary hardware components. May also develop control system software in addition to installing the entire system at the end-user site.

ISDN - Integrated Services Digital Network. A proposed standard for digital networks providing transport of voice, data, and image using a standard interface and twisted pair wiring.

LADT - Local Area Data Transport. Data communications provided by the BOCs within local access transport areas (LATA).

Large System - Refers to traditional mainframes including at the low end IBM 4300-like machines and at the high end IBM 308X-like machines. Large systems have a maximum word length of 32 bits and a standard configuration price of \$350,000 and higher.

Mean Time Between Failures (MTBF) - The elapsed time between hardware failures on a device or a system.



Mean Time to Repair - The elapsed time from the arrival of the field engineer on the user's site until the device is repaired and returned to the user for his utilization.

Mean Time to Respond - The elapsed time between the user placement of a service call and the arrival at the user's location of a field engineer.

Microcomputer - A microprocessor-based single- or multi-user computer system typically priced less than \$15,000. A typical configuration includes an 8- or 16-bit CPU, monitor, keyboard, two floppy disk drives, and all required cards and cables.

Minicomputer - See Small System.

Operating System Software (Systems Software) - Software that enables the computer system to perform basic functions. Systems Software, for the purposes of this report, does not include utilities or program development tools.

PBX - Private Branch Exchange. A customer premises telephone switch.

Peripherals - Includes all input, output, and storage devices, other than main memory, which are locally connected to the main processor and are not generally included in other categories, such as terminals.

Planning - Includes the development of procedures, distribution, organization, and configuration of support services. For example, capacity planning, "installation" planning.

Plug-Compatible Mainframe (PCM) - Mainframe computers that are compatible with and can execute programs on an equivalent IBM mainframe. The two major PCM vendors at this time are Amdahl and National Advanced Systems.

Professional Services - A category services including system design, custom programming, consulting, education, and facilities management.

RBOC - Regional Bell Operating Company. One of seven holding companies coordinating the activities of the BOCs.

Remote Diagnostics - Gaining access to a computer from a point physically distant from the computer in order to perform problem determination activities.

Remote Support Implementation - An extension of remote diagnostics where some level of support delivery is performed from a point physically distant from the computer. Currently, this capability is more common to software support where problems can be solved or circumvented through downline loading of new code (fixes).



Reseller - A marketing organization which buys long-distance capacity for others at wholesale rates, selling services at retail but discounted prices and profiting on the difference.

Small Business Computer - For the purpose of this study, a system which is built around a Central Processing Unit (CPU), has the ability to utilize at least 20M bytes of disk capacity, provides multiple CRT workstations, and offers business-oriented systems software support.

Small System - Refers to traditional minicomputer and superminicomputer systems ranging from a small multi-user, 16-bit system at the low end to sophisticated 32-bit machine at the high end.

Software-Defined Network - A private network which uses public network facilities and which is configurable on an as-needed basis by the user (see Virtual Private Network).

Software Engineer (SE) - The individual who responds (either on-site or via remote support) to a user's service call to repair or patch operating systems and/or applications software.

Software Products - Systems and applications packages which are sold to computer users by equipment manufacturers, independent vendors, and others. Also included are fees for work performed by the vendor to implement a package at the user's site.

Superminicomputer - See Small System.

Systems Integration - The action of a single service vendor's design, development, and implementation of a system or subsystem including integration of hardware, software, and communications facilities for a customer.

System Interruption - Any system downtime requiring an Initial Program Load (IPL).

Systems House - Integrates hardware and software into a total turnkey system to satisfy the data processing requirement of the end user. May also develop systems software products for license to end users.

T-1 - Refers to a standard 1.544 megabit per second digital channel used between telephone company central offices and now used for microwave, satellite, fiber optics, or other bypass applications.

Third-Party Maintenance (TPM) - Any service provider other than the original equipment vendor.



Training - All audio, visual, and computer-based documentation, materials, and live instruction designed to educate users and support personnel in the ongoing operation or repair of hardware and software.

Turnkey System - Composed of hardware and software integrated into a total system designed to completely fulfill the processing requirements of a single application.

VSAT - Very Small Aperture Terminal. A small satellite dish system, usually using Ku-band frequencies.

Virtual Private Network - A portion of a public network dedicated to a single user.

