# SPERRY UNIVAC Series 1100 Sales Information Manual

July, 1982

SPERRY✦UNIVAC

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# 1 SERIES OVERVIEW

## 1.1 FAMILY CONCEPT AND COMMITMENT

The SPERRY UNIVAC Series 1100 provides an unequaled family of computer systems to present and prospective users. Today, this family offers a growth potential from an entry 1100/61 B1 system to the largest 1100/94 – a more than forty-fold performance increase.

The advantage of this potential for growth is that increasing workload and application expansion can be accommodated without the disruptive impact of hardware swap-out or the burden of conversions from one operating system to another.

The benefits of family membership extend to all 1100 users from those 1108 owners who started as early as 1964, to the newest 1100/60 and 1100/90 customers. One of the major benefits is knowledgeable support. Sperry Univac Systems Analysts and Customer Engineers have been working with the 1100 type systems for many years and have reached a very high level of competence in servicing and supporting these systems. The Sperry Univac product designers have had many opportunities over the past 17 years to add new state of the art technology to the proven 1100 design and thus have been able to continually evolve the 1100 system. This umbrella of expert support, this continuing refinement of design, implementation and maintenance techniques insures each 1100 user of the most practical application of today's technology.

Changes in the Series 1100 products have always been evolutionary. Many significant improvements have come in recent years in peripheral subsystems. A part of the 1100 philosophy of evolution is to attach new peripherals to existing CPU's. Input/output channel compatibility has been retained throughout the product line and no arbitrary restrictions are placed on peripheral configurations. Flexibility for growth and ability to choose the best system from a cost/performance standpoint are the advantages offered by this approach.

The 1100 Operating System is the integral part of the system that ties the family together. From its beginning as EXEC 8 to its maturity as 1100 OS, the operating system has been the front runner among competitive systems and has been the unifying foundation of the entire family. As CPU and I/O architecture have changed through hardware evolution the Operating System has provided a bridge of compatibility between all of the system members. It allows upgrade from one model to another without forcing the user into a conversion exercise. This is undoubtedly the most workable way of approaching upgrades – allowing the maximum in hardware design flexibility while continuing to allow upgrades without conversion.

Perhaps more important to the 1100 user is the steady increase in system capability furnished through the 1100 Operating System. Each new release provides better performance through more efficient resource utilization and new functionality through added features.

The large user base of 1100 systems makes it possible for Sperry Univac to continue to enhance its 1100 OS, and its basic evolutionary design means that there is no reason for us to want to "start over" in order to provide new capabilities.

The benefits to 1100 users of this evolutionary growth and continuing compatibility in essence guarantee the ability to support almost unlimited growth in workload while experiencing continuity in applications and operations. For Sperry Univac the benefits are in a different vein. We are able to provide reasonable cost/performance increments to customers, thus enabling them to expand without the competitive bids that growth frequently dictates. We can do a continuous steady selling job offering a series of add-ons without the risk of a full system bid. Our full menu of peripheral sub-systems makes it easy to expand or speed up in whatever part of the system the customer's growth indicates.

Sperry Univac has an advantage of a well educated user group – one that has used the operating system over a period of time and can assimilate new features without a massive training effort. This provides a large group of users who tend to be "community-minded" regarding their 1100 Systems. They work together and with us to find areas in need of improvement, features that can be added for the benefit of many and to exchange useful information, ideas and programs.

Our commitment to this policy of compatibility, growth and continuity through evolution is complete. Add-on business from the Series 1100 systems accounts for a significant portion of Sperry Univac's annual revenue. The continuity in the product line enables us to invest our development dollars in new features and capabilities while building on the foundations of previous years' investments. In this way we can offer more proven value in every 1100 System without incurring massive investments in totally different hardware designs and operating systems every few years.

The richness of the operating system and software products, the hardware capabilities tuned to the state of the art, coupled with the family commitment of the Series 1100 makes a value package which would be hard for any competitor to equal.


## 1.2 HISTORY AND SUCCESS

The success of the Series 1100 systems can be described from many points of view. If taken from an internal Sperry Univac view, the basic facts center around revenue, customer retention rate, profitability, supportability, and market penetration. However, these facts should be of interest to the customer as well.

The experienced computer user is looking for a supplier with technical expertise, but more importantly, with dedication to a successful product. What better way to explain Sperry Univac's dedication than to point out the growing revenue realized from the Series 1100. Sperry Univac exceeds $1 billion annually in Series 1100 revenue. This is a product position that we obviously are dedicated to sustaining with new models, added software capability, and solid field support. The Series 1100 product line is a significant portion of Sperry Corporation's business base.

The history of revenue growth clearly removes any doubt about the wisdom of our policy of conversion-free expansion, and encouraging the retention of older systems by adding new peripherals and taking advantage of new operating system capabilities.

The success of the product line from your point of view as a Sales Representative can be measured by its competitive stature in price, performance, and capability when

compared against other systems. It can be further measured by its customer retention at an installation. The potential for easy, cost effective growth makes an 1100 System virtually impossible to dislodge once a customer has had an initial experience with it.

Add-on business and expansion business is highly profitable for everyone concerned, and it is a way of life with the Series 1100.

Perhaps the most attractive aspect of expansion is the multi-mode capability of the 1100 Operating System. With it, a user can justify, install, and utilize a system based on his short-term requirements. Most users, though, are constantly investigating and installing new applications. When the time comes to implement more remote batch or timesharing, or realtime, or a combination of them all, the program and application development can be done on the existing system. No previous capability disappears or changes; the new features simply are turned on. The Operating System provides the tools to run all the processing modes.

Any 1100 System with 1100 OS can be a realtime system, a timesharing system, a local/remote batch system, or a cost effective melding of all of these!

## 1.3 INDUSTRY ORIENTATION

It may be useful for you to know how many Series 1100 systems are being employed by our customers and in what businesses. You will see that Series 1100 systems have received remarkably wide acceptance throughout the spectrum of industry, education, government, and other areas of human endeavor. You can inform your prospects of this success regardless of his business. Similarly, geographic distribution throughout the world shows the wide acceptance of the Series 1100 and the services provided by Sperry Univac. Not only are all major industrial categories and nations represented, but all processing modes, batch, timeshare, and realtime, are all widely used. There is virtually no area of the computing business where Series 1100 systems are not performing with superior results for their owners.

### Quantity

By the end of March 1966 (FY 67), the first year of 1108 shipments, there were just 23 systems installed. Five years later there were about 325 1108s and 1106s installed.

In less than three more years (before the end of FY 74) that figure had doubled. The rate of growth has accelerated in a marketplace where growth has generally stabilized or slowed down.

As of this writing, there are over 3800 CPUs or CAUs (1106s, 1108s, 1110s, 1100/10s, 1100/20s, 1100/40s, 1100/60s and 1100/80s) installed or on order and operating in customer locations throughout the world.

### Major Workload Types

Most customer systems do both scientific and business type processing, with many also doing special work (such as communications). Recognizing this broad overlap, it is possible to divide systems according to the type of processing which predominates. Here is the approximate division:

| | |
|---|---|
| Business: | 55% |
| Scientific: | 20% |
| Special: | 10% |
| Scientific and Business (equally): | 15% |
| | 100% |

| | |
|---|---|
| Financial | 10 |
| Education | 10 |
| Medical | 1 |
| Serv. Bureaus | 5 |
| Communications | 5 |
| Manufacturing | 20 |
| Energy | 10 |
| Transportation | 4 |
| Distribution | 3 |
| U.S. Military | 11 |
| U.S. Aerospace | 3 |
| U.S. Civ. Gov't | 3 |
| Non-U.S. Nat'l Gov't | 7 |
| State and Local Gov't | 7 |

% OF 1100 CUSTOMER BASE WORLDWIDE
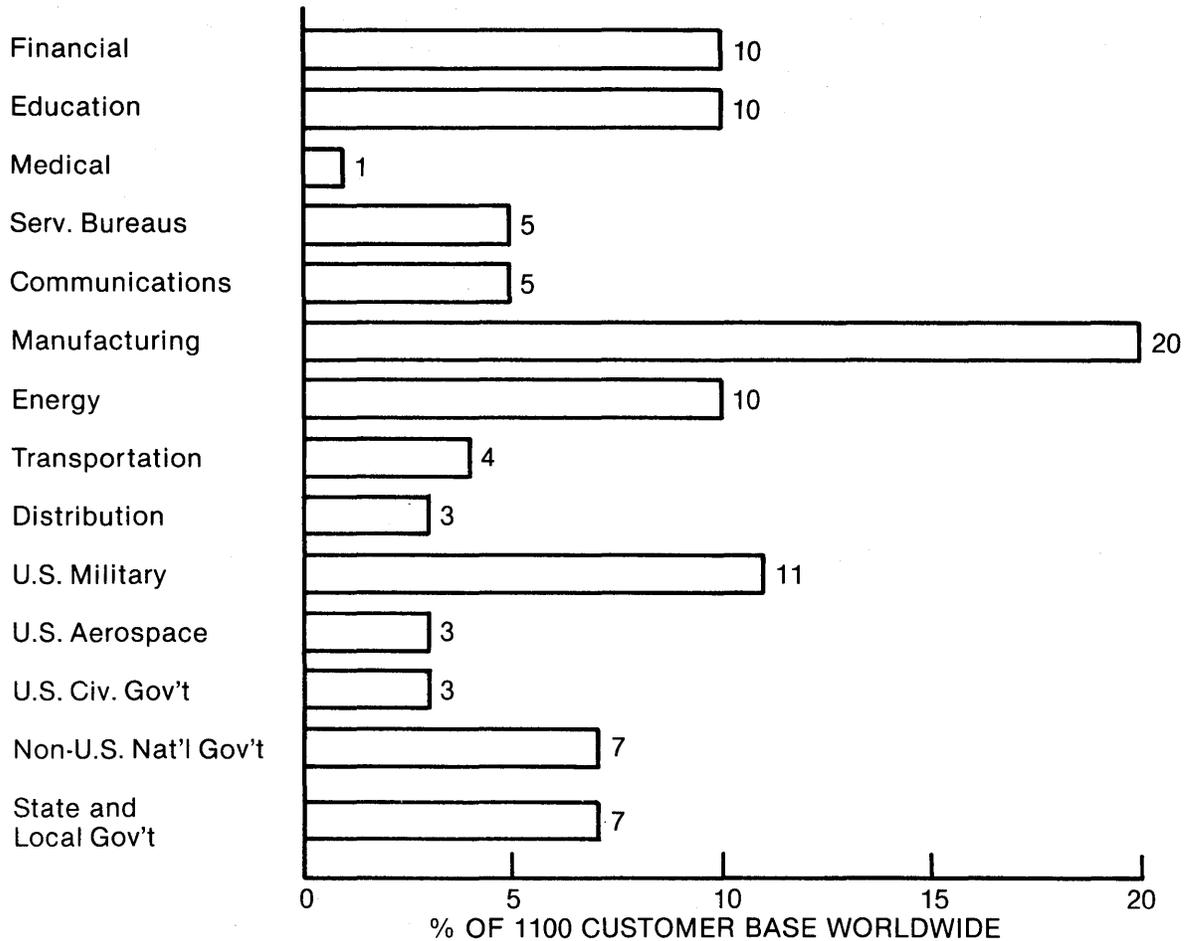
Figure 1-1. How the 1100 Customer Base is Divided

## 1.4 SOFTWARE ARCHITECTURE

The 1100 Operating System includes all Program Products ordered with a Series 1100 System. It is a single source Software System with the capability of suporting any 1100 System. The Operating System is made up of several groups of software components. From these components, an 1100 user configures them into an Operating System to support the exact hardware, applications and processing modes that he has implemented.

The Operating System consists of several main groupings of routines and components:

1. Executive System and related elements

2. System Processors

3. Language Processors, Compilers

4. Applications

5. Utility Processors

6. Conversion Routines

7. Evaluation and Testing Packages

The Executive System (EXEC) area forms the central core of the entire software system. It provides the detailed linkage between each of the distinct hardware architectures, (i.e. 1100/60, 1100/80 and 1100/90) the users' needs and all of the rest of the software available. The EXEC provides services for the other components, and automatically schedules and monitors all work introduced into the system, using guidelines and priorities established by the user. The EXEC serves as the bridge which makes all programs run on any 1100 model.

Two other Executive-related functions are offered for those users who need data communications support. The Communications Management System (CMS 1100) provides support for remote communications devices, eliminating the need for any user to write detailed communications code. TIP, the Transaction Interface Package, provides a framework around which transaction-based applications can be organized. It provides control over the time dependent activities characteristic of this type of processing, and offers the user all transaction system elements except those directly involved in the user application programs.

EXEC, TIP, and CMS 1100 are all, in themselves, groups of capabilities rather than fixed routines. They are all configurable into systems that efficiently meet user needs. Each user installation defines and describes his requirements so that a unique, tailored Executive system is generated to fill the needs of his specific installation.

As computer usage has developed over the past decade, many powerful and useful ways have been found to organize information and its usage. Much of the value in a data processing installation today lies in how the files are organized and how program libraries can be manipulated. To support this important area, OS 1100 provides System Processors which facilitate file maintenance and manipulation, provide for editing and program building from libraries, and collect, organize and help analyze data on system utilization and management. These latter items especially allow the intelligent control and management of today's systems.

Language Processors, which are compilers with many helpful functions added, form an important part of Series 1100 software support. The user may choose among many standard languages or special program-producing tools to find the one that best fits his needs for writing the application programs. For the most often used languages, COBOL, FORTRAN, PL/I and others, compiling systems are provided that have selectable options designed to optimize the use of system resources depending on how a program will be run – once or many times, developed interactively, or in the traditional manner. Particularly for conversational users, many supportive language processor features are provided to make the man-machine interface as efficient as possible for the human side.

The 1100 Operating System includes a Data Management System (DMS 1100), complying with CODASYL standards, which provides a fully developed set of tools for set-

ting up, maintaining and accessing even the most elaborate data base. This capability has become one of the most important features for large scale systems.

Other application packages with widespread appeal include a mathematical programming system for linear programming and other scientific management techniques; an industrial management system; simulation tools; scheduling tools; and many more.

A number of the processors and tools already mentioned could be classified as utility processors since they provide facilities to the user which allow him to more fully utilize his entire computing system, both hardware and software. Also provided are the more traditional utilities which list, compare, and sort. There is an extremely useful documentation utility as well as one which produces billing information from system log entries.

Two fundamental requirements for effective computer system management are evaluation and testing. In large, complex, ever-changing systems, it is often impossible to tell whether or not the system is being well utilized. The OS 1100 provides routines which collect internal statistics and facilitate their analysis. Using these routines, as well as an error log analyzer, it is possible to achieve short-term improvements in both system configuration and utilization by identifying and eliminating bottlenecks.

Almost a way of life in large systems is the necessity for change by adding new applications. Utility packages for testing are provided by OS 1100 which reduce both the time consumed, and the risk involved whenever change is made.

The evolutionary policy of the Series 1100 applies to the entire Operating System, as well. Each software product is carefully managed to provide an efficient, useable tool.

During the active life of a software component, a close watch is kept on its adherence to industry standards and to its competitive position in the marketplace. As new features become desirable or required, they are incorporated into improved versions of the software. These are released periodically after extensive qualification and testing. Users receive these new releases (called "levels") and may install them at their convenience or continue to use previous levels.

Updated software levels are also furnished when required to incorporate corrections to problems or to provide specific performance gains. Both types of updates come as a result of user comments based upon their experience with the software. Sperry Univac provides a unique feedback mechanism for users' comments and is extremely interested in their suggestions.

The architecture of OS 1100 enables Sperry Univac to continue to enhance and evolve this unparalleled operating system without extensive reprogramming when new hardware architecture is introduced. The coding which is unique to each of the different hardware designs (1100/60, 1100/90) resides in small areas of the Operating System. It is this code that provides the final touch of compatibility.

In this way, the 1100 Operating System has become, and will remain, a mature, growing operating system, benefiting from years of continual exposure to use and refinement, capable of supporting the newest in hardware technology and architecture as it becomes available. The capabilities of the Operating System increase with each release as new features are added to the many components. This means that Sperry Univac can continue to lead the industry with its evolutionary operating system.

## 1.5 HARDWARE ARCHITECTURE

The three system types which comprise the Series 1100 family offer distinct differences in hardware design and architecture. In each case, the differences represent a technological solution to a specific system goal or requirement. The thrust of the Series 1100 family in today's marketplace is with the 1100/90 and 1100/60 systems.

### 1100/80

This system carries the concept of the separation of compute capability from the input/output capability. The input/output functions have been entirely removed from the Central Processor, and placed in an IOU (Input/Output Unit).

This unit contains the necessary logic to independently control I/O transfers; to initiate and terminate them, and to remove all I/O overhead from the CPU. The CPU merely loads the correct I/O channel program into the IOU and is only interrupted for error conditions.

Input/output channels have been enhanced. The word-oriented channels compatible with the /10-/20-/40 have been retained since these provide the most efficient high performance interface for high-speed drums and the disk subsystems. Byte channels, both byte multiplexer and block multiplexer have been added. These provide the most efficient hookup for paper peripherals, such as printers and card readers, and a potentially less expensive hookup for magnetic tape and disk subsystems using the standard byte control units.

Memory organization for the 1100/80 uses a very high-speed buffer, or cache memory, of 4K to 32K words, in front of a very large inexpensive main storage. This large main storage, or backing store, is designed to transfer 4-word blocks to the high speed buffer and is engineered for cost effectiveness. The high speed buffer then services the CPU at a high rate. This design results in an average memory cycle time very near the 100 nanosecond cycle of the high speed buffer. The high speed memory buffer and the resultant high average memory access time makes the instruction stack concept unnecessary.

Automatic maintenance capability has been further extended by providing a Maintenance Processor. This freestanding unit is itself a full computer system which scans, displays, and performs diagnostic services as directed by a Customer Engineer. It analyzes and organizes diagnostic data under its own program control, presenting it quickly and clearly to the CE for his guidance. Also included are further enhanced printed circuit card testing capabilities and an interface to the Roseville TRACE System.

### 1100/60

The 1100/60 System features a microcoded multiprocessor-based central processor, optional Storage Interface Unit (Buffer), and independent Input/Output Unit – all housed in a single cabinet. Main storage can be either integrated with the central processing cabinet or externally housed in a separate stand-alone cabinet. Unit processor systems with integrated main storage can be configured with from 524K words (2M bytes) minimum to 1048K words (4M bytes) maximum. Model C unit processors can be configured with from 1 million words (4M bytes) to 4 million words (16M bytes) of external storage. Model E and H unit processors may be configured with up to 8 million words (32M bytes).

Two, three or four central processing complexes may be interconnected to form "tightly coupled" multiprocessors. Multiprocessors may be configured with from 1 million words (4M bytes) to 8 million words (32M bytes) of external storage.

Circuit technology, packaging techniques, I/O structure, ARM features, and storage buffering are all extensions of the proven techniques used on the 1100/80.

Significant enhancements in Availability, Reliability and Maintainability have been incorporated in the 1100/60. Since microcoded processors perform most operations in the same hardware, a higher percent of the total machine functions can be fault checked with a smaller amount of additional hardware than would be required in a conventional processor. In addition, a microcoded processor is able to perform most fault analysis and recovery operations in microcode, using the same hardware which is used for instruction execution. In the 1100/60, fault detection is provided for the internal storages and for the main data path, and instruction retry capability is provided for those instructions being executed in a normal instruction mix. These capabilities mean that the 1100/60 hardware will be able to detect and retry most failures encountered during normal system operation. The major difference over previous 1100 systems is that any failure is retried by hardware first before any software is interrupted. This capability is an extension to the 1100/80 capability and a significant advance over previous 1100 systems.

## 1100/90

The Series 1100/90 system is the maximum performance member of a new family of computers within the Series 1100. The element of the 1100/90 which distinguishes it from previous members of Series 1100 is a new architecture for the system as a whole, and particularly for the Instruction Processor (IP), the system component which corresponds to the CPU or CAU in earlier Series 1100 systems.

The new architecture is transitional, in that it supports existing Series 1100 software and user programs in the so-called *basic mode,* while providing new capabilities primarily in *extended mode.* Extended mode architecture was conceived to provide substantial increase in functionality in the areas of reliability, security, testing, program size and program structure. The Series 1100 Executive has been upgraded and users will be able to transport their existing applications to an 1100/90 without modification. This upward compatibility is fully consistent with past Series 1100 development and marketing practice.

There are other aspects of the new system architecture which will be important in marketing the 1100/90, principally the modularity of design. Instruction Processors, I/O Processors (IOPs), and Main Storage Units (MSUs) may be assembled in any combination of from one to four each. The 1100/90 high performance packaging requires liquid cooling (absent from Sperry Univac products since the UNIVAC II), and the Instruction Processor Cooling Unit (IPCU) comes in two capacity choices. The motor alternator also offers two choices. Customers may select from many alternatives.

The 1100/90 offers performance, as measured by Work Capacity Ratio, of from 3.5 to 4.5 times that of the 1100/80, depending on the nature of the workload and restricting the comparison to basic mode operation only. The high end of this range will be realized for those workloads which can take advantage of the Extended Instruction Set included in the 1100/90 architecture. The EIS, first developed for the 1100/60, provides a considerable improvement in performance for COBOL applications. The low end of the range will be realized for general demand and transaction workloads.

The performance range of the multiprocessor configurations of the 1100/90 will span the performance range of the higher IBM models and beyond: a 4×4 1100/94 has a performance exceeding that of the high end of the H-Series by a factor of two.

Table 1-1. Systems

| Component | 1100/60 | 1100/80 | 1100/90 |
|---|---|---|---|
| Central Processor | Microprocessor Based | Microcoded & Hardwired | |
| Registers | 128 | 128 | 128 + 32 |
| Cycle Time (ns) | 116 | 130 | 30 |
| Multiprocessor | 4 x 4 | 4 x 4 | 4 x 4 |
| Buffer Storage | 8KW/CPU (opt'l on UP) | 4–32KW | 16–64KW |
| Cycle Time (ns) | 116 | 100 | 30 |
| Main Storage | 524–2,096KW Integrated 1,048–8,388KW External | 524–8388KW | 2,096–16,168KW |
| Cycle Time (ns) | 580 | 650 (4 words) | 600 (8 Words) |
| Input/Output | Separate | Separate | Separate |
| Storage Access | Direct | Direct | Direct |
| No. of Word Channels | 4–48 | 4–96 | 4–160 |
| Byte Channels | 1–12 | 2–28 | – |
| Block Mx Channels | – | – | 4–96 |
| Bandpass/IOU | 1.4M words/sec | 2M words/sec | 37.5M words/sec |
| Maintenance Aids | Maintenance Processor TRACE SCAN/SET Concurrent Maint. Fault Injection | Maintenance Processor TRACE SCAN/SET Concurrent Maint. – | Maintenance Processor TRACE SCAN/SET Concurrent Maint. Fault Injection |

## 1.6 MULTIPROCESSING

Sperry Univac introduced multiprocessing in 1965 in the Series 1100 with the 1108 multiprocessor. We know that multiprocessing is a very viable system architecture allowing expanded systems performance and redundancy of major, critical components thus increasing the availability of the system. In essence, multiprocessing means two or more processors working under the control of a single operating system, accessing common storage, and able in general to communicate with all peripheral subsystems.

### Multiprocessing Benefits

There are several key benefits to be gained from multiprocessing that can be grouped basically into four categories: system efficiency, system economy, system availability and system growth.

- *System Efficiency* – Central facilities management tends to keep all facilities busy. Multi-mode environments gain by batch runs being initiated when realtime or demand program loads are low.

Program throughput times are decreased since various sections of the program can be assigned to different processors for simultaneous execution. Load leveling by priority is achieved by moving a program into a higher position as its deadline approaches. More efficient use of system files is achieved through centralized file management, by the operating system. Multiprocessing also allows improved system balancing where larger compute loads with respect to I/O requirements are balanced by adding more processors.

- *System Economy* – Multiprocessing is the most economical approach to system reliability. The failure of one processing unit does not halt system operations. At the same time, one processor need not be kept in the "ready" state as backup since all processors are taking part in the processing function during normal operations. The sharing of central complex and subsystem facilities can bring a substantial cost savings as well. The overall cost/performance ratio of the multiprocessing system is thus improved over the single processing system.

- *System Availability* – The full sharing of facilities and the partitioned processors in a multiprocessor system allows almost any component in the system to fail without halting system operations. An increment of performance is temporarily given up usually without interruption to operation. And maintenance activities, preventive or restorative, can be effected on components in the multiprocessing system while normal operations continue in a degraded mode.

- *Growth* – The multiprocessor organization facilitates orderly growth to accommodate increased processing requirements. This benefit greatly simplifies expansion of the central complex by adding rather than replacing processors. A cost benefit accrues as well since all existing components, especially main storage and subsystems are retained, thereby reducing obsolescence of the existing hardware.

Overall, multiprocessing makes sense. We have known this since 1965. It is interesting to note that some of our competitors only now appear to be discovering the benefits of multiprocessing for the first time.

## 1.7 AVAILABILITY, RELIABILITY, MAINTAINABILITY (ARM)

To develop an understanding of system availability, it is first necessary to note that three factors contribute to the hardware availability in the field:
- Quality of the design and manufacture of the product
- ARM Features
- Field Support (Customer Engineering)

The design and manufacturing quality is a very important factor in hardware availability. It lays the basis for the other two factors; determines, in large part, the failure rate experienced, and influences field support activities.

ARM features are logic items actually built into the equipment with the purpose of minimizing the effects of failures or abnormal conditions. Thus, the ARM features are responsible for error detection, system recovery, and failure isolation.

The field support activities mainly involve Customer Engineering responsibilities. This includes training, spare parts, and labor. The quality of the product and the ARM

features it contains determine how frequently the equipment fails and how long it takes to repair.

## ARM Features and Implementation

ARM features are defined to be the hardware and software added to products in order to minimize the effects of failures or abnormal conditions. The additional hardware logic or software code has three primary aims:

- To detect errors before they can cause data corruption
- To aid in recovery from the errors with minimum disruption to the user application
- To help isolate the hardware or software failures so that a repair or fix can be made quickly and accurately

These features are necessary even when the inherent quality of the product is very high, for the following reasons:

1. While individual *component* failure rates may be quite good, a large accumulation of devices may result in an unacceptable unit failure rate. An example is that a large memory (8 million words) using 16K MOS chips would have a 50 times better Mean Time Between Failure (MTBF) with Error Correction Code (ECC) (an ARM feature) than without it.

2. Even if the failure rate is acceptably low, there are some individual failures which can cause severe disruption to a customer's operations if insufficient ARM features are present. The most usual instance of this case is a failure which is undetected immediately, and results in incorrect mathematical results or incorrect information in a data base.

3. With the costs of labor increasing and the cost of hardware decreasing, it is becoming more necessary and more economical to add logic with the purpose of identifying the failed replaceable part.

Some of the hardware ARM features that are incorporated in SPERRY UNIVAC Series 1100/60 and 1100/90 can be summarized as follows:

- Through checking – 100% single bit error detection in data path – as much control logic checked as possible
- Instruction Retry – hardware to automatically retry a failing instruction when a failure is detected at any point in instruction execution
- Error Logging – hardware to indicate error information sufficiently detailed so that an intermittent failure can be repaired at a convenient time
- Error Correction Codes – all storage including main, buffer and control storage are to implement an error detecting and correcting code

With regard to error detection and recovery, hardware features such as through-checking, ECC storage bits, automatic instruction retry are the first threshhold of reliability. These are supported by such software capabilities for error-logging, dynamic reconfiguration, device-retry and online maintenance routines. Combined they provide for user transparent "on-the-fly" detection of and recovery from system errors.

From a maintenance standpoint, both systems feature automated system integrity and automated maintenance features through a System Support Processor (SSP).

By using the SSP, faulty central group components can be removed from a configuration for maintenance. By using the SSP the CE personnel can automatically exercise a failed component and rapidly locate faults. In a configuration with sufficient redundant components, the above two functions will only result in a degraded mode of operation, not total system failure.

Both the Series 1100 System ARM capabilities provide an interface to the Sperry Univac Remote Support Center.

This center provides customers the ability to directly communicate software or hardware problems to Sperry Univac, to receive problem resolutions on a realtime basis.

The Remote Support Center, located in Roseville, Minnesota, is staffed with trained experts in hardware and software. The Remote Support Center is manned 24 hours per day, 7 days a week for hardware problems. Sperry Univac customers contact the Remote Support Center by calling a toll-free "800" number to obtain immediate support for both hardware and software problems.

The Remote Support Center is composed of three groups which work together to provide hardware and software support. These groups include:

1. CHECKPOINT    CHECKPOINT provides immediate technical response to Sperry Univac customers requests for assistance on 1100/60 hardware and operational problems. The CHECKPOINT system provides a comprehensive remote maintenance function for the SPERRY UNIVAC Series 1100 Systems. This capability is provided by a group of CHECKPOINT specialists using the information in the CHECKPOINT data base and Total Remote Assistance Center (TRACE) Data System and the capabilities offered by the TRACE Computer System with its diverse diagnostic maintenance application programs.

2. TRACE    TRACE provides hardware technical support and assistance to Sperry Univac Customer Engineering. TRACE Systems Specialists operate support applications on the TRACE Computer System to provide remote analysis and resolution of hardware problems, working in conjunction with local Customer Engineering personnel. The Remote Support Center TRACE facility supports 1100/60, 1100/80 and 1100/90 Systems.

3. MCSS    Marketing Central Software Support (MCSS) provides remote software support to SPERRY UNIVAC Series 1100 customers. The Remote Support Center MCSS software personnel will assist you in identification of software problems, determine the actions to be taken, and monitor the problem through its resolution.

Finally, the Series 1100 have ARM features specific to their distinct architecture. The 1100/60 incorporates such options as fault injection, and dual instruction processing. The 1100/90 has additional capabilities for the testing of individual central group cards and the use of a Motor Alternator.

# 2 SYSTEM SOFTWARE – CAPABILITIES AND VALUES

The Series 1100 system software has many features of power, productivity, flexibility, and usability; but the central fact is that it is a *system*. All of the components, even those which are systems themselves (the Executive System for example), fit perfectly together in combinations to suit the needs of users. This system of matching components and systems is used with all the hardware systems of the Series 1100, from the entry level to the largest multiprocessor configuration. Furthermore, the system applies across time and it will not be necessary to go to different system software in order to grow.

One of the design features of OS 1100 that will be a definite user benefit is the interface between the operations personnel and the system. This operations interface has grown from the early computing days when the operator had to be an integral part of the programmer's run until the advent of a total Operating System where the operator must monitor the system console for action-by-exception only.

The family and continuity concepts have been described in Section 1 of this manual, but have also been touched upon here because they apply to software as fully as to hardware. This characteristic of SPERRY UNIVAC Series 1100 software is unique in the industry, and is of significant value to a user.

## 2.1 INFORMATION MANAGEMENT

Information and database management capabilities are provided for batch, real time, and timesharing users. The information management systems are:

- MAPPER 1100 – The highest level, end user tailored, application development system

- ADVISE 1100 – A very high level interface for query/update and application development

- UDS 1100 – The subsystem which performs all data management functions within OS 1100

Key capabilities of the Series 1100 Information Management Systems are:

- End user orientation

- Online tutorial facilities

- Tremendous productivity increase for application development

- Flexibility for "what if" simulations and unanticipated questions

- Common data management allows the sharing of data between all system components

## MAPPER 1100

MAPPER 1100 is Sperry Univac's highest level, fourth generation, application development system. It is tailored for end users.

MAPPER is the primary application generator for Sperry Univac's Manufacturing Division, where it has been in use for more than thirteen years, since 1975 on the Series 1100. The Sperry Corporation now employs MAPPER in-house on a worldwide basis on approximately 50 Series 1100 computer systems with more than 10,000 active MAPPER video screen terminals.

MAPPER 1100 has been officially marketed since 1979. It is the most successful software product in the history of Sperry Univac. In 1981 it already was the primary sales argument for approximately every second Series 1100/60 sale. The currently largest MAPPER customer is processing 2.5 to 3 million transactions (the number of "RUNS" plus manual functions) per day on Series 1100/80 systems.

MAPPER is probably the most competitive Information Management and Decision Support system in the industry. The following product description is extracted from the MAPPER brochure "User Perspective;; U7191.

*A Closer Look at the MAPPER 1100 System*

The MAPPER system is an interactive application generator for SPERRY UNIVAC Series 1100 computer systems. The MAPPER system has been conceptually designed as a development tool for end users.

The MAPPER 1100 system has an integrated relational data base. It is logically organized like a traditional filing cabinet.

The largest unit is a MODE, analogous to an entire filing cabinet. It contains TYPEs, which correspond to filing cabinet drawers. Each one of these TYPEs holds REPORTs (tables of data).

Like a file, these REPORTs contain the end user's data. REPORT data is typically organized in columns. All REPORTs of a TYPE have the same basic format. The MAPPER system maintains a data line in each REPORT that identifies the time, date, and user of the last update.

A MAPPER system can maintain hundreds of MODEs. Each MODE contains up to eight TYPEs. A TYPE can contain thousands of REPORTs. All REPORTs in a TYPE have a fixed line length of up to 132 characters. REPORTs contain typically up to 500 lines.

Access to REPORTs is regulated by security measures ranging from terminal and user signon identification to password protection of MODEs and REPORTs. Users can be restricted to specific MODEs with read or write access only specified.

The MAPPER system incorporates more than 100 readily usable and flexible functions. These functions serve as building blocks for complete applications and can be very simply employed by end users themselves. In fact, most users satisfy their requirements with just a few of the MAPPER functions. And the MAPPER functions can be individually assigned to every individual user, so their usage can be controlled.

MAPPER functions can be called individually and interactively in any sequence. They can also be grouped into "RUNs" where each RUN typically represents an entire application. Such applications can then be invoked with a single command. These RUNs can perform interactive dialogues with the user and can be modified in seconds or minutes.

The MAPPER functions are easily learned. The typical end user masters all necessary functions to add, compute, copy, print and otherwise manipulate data within one or two days.

Working at a computer terminal, a user can employ the more than 100 flexible MAPPER functions with their multitude of options in single character or full-screen operations. He can add, duplicate, move and delete data and complete REPORTs. He can create new TYPEs and REPORTs.

*Some User Operations*

- Search Operations
  - One or all REPORTs in a TYPE can be searched for specific data
  - The search data can be specified singly, in groups, or in ranges
  - Masks can be defined
  - Every field can be a search target
  - Search operations can be performed against computational results in specified fields (e.g., is shipping date – completion date = 3 days?)

- Data Joining Operation
  - Data in one TYPE can be compared and joined with data in another TYPE (e.g., data for a range of serial numbers exists in TYPE A. Data existing with the same serial number in TYPE B can be automatically extracted and joined with data in TYPE A)

- Computational Operations
  - Arithmetic operations can be specified in traditional mathematical notations
  - Computations within REPORTs can be performed horizontally and vertically; columns can be totaled, subtracted, and averaged; complex mathematical expressions can be computed with them

- Communications
  - A terminal user can electronically mail messages, results, or complete REPORTs to other terminals in the system as well as to terminals in remote systems. Data can also be sent to auxiliary devices such as diskettes and terminal printers
  - Data can be sent to the system's high speed printer
  - Electronic mail that is received can be paged through and saved for later use. The sender is automatically notified of mail arriving at its destination.

- Word Processing
  - All MAPPER terminals (any number) are provided with word processing capabilities. The need for separate word processing computers is thereby eliminated. MAPPER terminals are provided with word processing without the need for a diskette, cassette, or dedicated printer

- Most word processing computations are performed in the intelligent MAPPER terminal, but the text is maintained in the MAPPER data base. The user can freely switch between word processing and all other MAPPER functions

- Color Graphics
  - Color graphics terminals can be used like normal MAPPER terminals for all functions. In addition, application results or REPORT data can be displayed graphically in pie charts and graphs and can be plotted on color plotters

- Batch Interface
  - The user can submit data from the MAPPER 1100 system to the 1100 Operating System batch environment
  - The user can retrieve data from the batch environment
  - The user can start batch runs and receive their output at his terminal

- Help Function
  - The MAPPER 1100 system is self-documenting. This means that it provides complete tutorial online facilities. The user can selectively view any part of the MAPPER documentation, including examples, at the terminal without leaving his work session. A MAPPER user has normally no need to read the printed MAPPER documentation. MAPPER also monitors all user activities and, if erroneous inputs occur, diagnoses the error to help the user correct it. The MAPPER system even provides online examinations for different levels of skill

*Benefits and Simplicity*

The advantages of users developing their own applications with the MAPPER 1100 system are overwhelming:

- End users know the details of their application needs better than anyone else, so application development by them is faster. They can often implement an application in the same time it takes to write an application description for a programmer

- Since end users usually remain uncertain of what they want until they see it on a video display screen, the MAPPER system allows ad-hoc changes to be made in minutes or seconds

- End user participation reduces or eliminates the shortage of programmer personnel

*MAPPER Sales Arguments*

- The system is tailored for end users. They can typically learn to use it in a day or two

- It increases programmer's productivity by up to 1000 percent

- It has a simple and self-explanatory interface

- It requires only limited knowledge for end users to process their first application

- It gives the end user the ability to communicate with the system without having to memorize abbreviations, numbers, and functional procedures

- It sufficiently explains erroneous inputs so that the end user can correct them without assistance

- It has real-time response

- It provides documentation and tutorial aids online without requiring the user to leave his work session

- It incorporates simulation facilities to protect the data base against updates from test and training activities

- It incorporates word processing for all MAPPER terminals

- It supports color graphics terminals

- It incorporates an electronic mail system

- It incorporates a magnetic tape history facility that allows terminal users to recall database reports from years ago

- It incorporates a standard facility for file sharing, message switching and remote processing between multiple 1100 systems connected to the same communications network

- It is a complete and self-contained software system including security and automatic recovery

- It amplifies the intelligence of all terminal users

- It combines the advantages of a personal computer and a large mainframe with an integrated data base

- It is complimentary to dedicated application packages

**ADVanced Information SErvices for 1100 Series Computers (ADVISE 1100)**

ADVISE 1100 is implemented as a set of modules which can be used to retrieve and update information in a Universal Data System (UDS 1100) or to develop applications for that purpose at a very high level. ADVISE 1100 is part of the "open system" concept of the Operating System for Sperry Univac's 1100 Series Computers (OS 1100). The intent of the open system concept is to integrate all aspects of software. One of the most important considerations of this integration is a common command language syntax. This avoids the confusion of having to master many different languages in order to address the various processors which provide services for file handling, editing, procedures, etc. The CODASYL committee activities in this area have produced a working set of specifications for a Common Operating System Command Language (COSCL). The new OS 1100 command language, Interactive Processing Facility (IPF 1100), is based on the COSCL specifications. This means that there is a single command style for invoking all operating system services. ADVISE 1100 uses the same command style. As a result, a user will perceive ADVISE 1100 commands as extensions to IPF 1100, making no special distinction between the two. ADVISE 1100 commands broaden the scope of the single language to include the ability to issue conversational query and update requests rather than be forced to invoke special processors for this type of service. Moreover, ADVISE 1100 includes commands for data definition and manipulation using relational and hierarchical concepts, so that entire applications can be developed at a very high level through the added use of commands for condition testing and branching.

The open system concept further infers that processors should not duplicate functions. This is important not only to avoid duplication, but to provide the foundation for the integration of all processors. Through the establishment of internal standards for such things as the use of registers, request packet formats and other inter-processor information sharing devices, this integration is enabled. ADVISE 1100 is one of the processors which conform to these internal standards. This means that, internally, ADVISE 1100 will call upon other OS 1100 conforming software modules to perform various functions rather than to attempt to provide those functions with its own modules. For instance, "views" of data will be provided through the Display Processing System (DPS 1100) when such services are requested by the user via ADVISE 1100 commands. Also, data definition facilities of UDS 1100 will be called upon for data definition services when ADVISE 1100 commands which include definitional aspects are invoked by the user. The involvement of DPS 1100 and UDS 1100 in these cases is transparent to the user, however. In fact, for the accomplishment of some of the steps involved in various ADVISE 1100 commands, IPF 1100 itself will be invoked (transparently) by ADVISE 1100 services.

ADVISE 1100 can operate either in language mode (the user enters command statements) or menu mode (the user fills in forms). A user can switch from one mode to the other at any time. Novice users will find the menu mode initially attractive, but can be expected to switch to language mode for faster interaction with the system as their skills increase. Also, the language mode can be used with abbreviated commands by experienced users.

Certain ADVISE 1100 commands are used (probably interactively) for retrieving and updating data, and are quite suited to such use by a casual user of the system. Another group of commands is more involved in the control of the ADVISE 1100 environment, and will be used by those concerned with system activities. Still other commands are for use by applications-oriented individuals for the building of procedures (or sequences of ADVISE 1100 commands) as applications, which may even invoke programs produced through more conventional means (e.g., COBOL).

What ADVISE 1100 really does, then, is to enable various software tools to be employed where they are properly used to accomplish work on a Series 1100 system. These software tools are transparently invoked by the user through the single interface, ADVISE 1100.

**Universal Data System (UDS 1100)**

UDS 1100 is the subsystem which performs all data management functions within the Operating System for the Series 1100 (OS 1100). This system software provides users with a range of data structures from which to choose including the new (and most suitable for IMS) relational database RDMS 1100, the hierarchical database DMS 1100 and conventional program language files PCIOS. UDS 1100 contains facilities for the definition of data within these various structures. Performance measurement tools are also included. Provisions are made for distributed processing and hardware-assisted data management. Complete, integrated recovery (message and data) is also provided.

The relational database model RDMS 1100 is employed by MAPPER 1100, ADVISE 1100 and by the relational data manipulation commands within conventional programming languages under the Universal Compiling System such as COBOL. In addition, UDS 1100 provides a facility to describe relational views of existing DMS 1100 network structures for the benefit of the above.

UDS 1100 supports the CODASYL (Conference On Data System Languages) data base model, data description language and data manipulation language in the form of the Data Management System (DMS 1100) for those users with existing applications, and in the form of the ANSI (American National Standards Institute) version when that organization accepts the CODASYL specifications as standard extensions to languages (e.g., COBOL).

With the inclusion of all the data models described above and access methods ranging from the non-procedural MAPPER 1100 system to traditional programming languages, it is intended to provide Series 1100 users with the widest choice of alternatives available anywhere.


## 2.2 COMMUNICATION MANAGEMENT

Communication Management Systems (CMS 1100) is the software required to interface and manage all communications with terminals linked to a Series 1100 system for both a centralized and/or distributed data processing network.

CMS 1100 is designed as a general purpose communication interface for the Series 1100 system with common support for all online user modes – for transaction, interactive, remote batch processing.

The method of generating a CMS 1100 system is designed to provide maximum flexibility with ease of use. This method allows the configuration of terminals and networks to be a separate operation from system generation and initialization so that the entire terminal network configuration can be generated, checked out and corrected without ever once generating a full system. This method also provides the capability to add to, subtract from, or replace entirely the network configuration dynamically, reinitialize CMS 1100, and proceed with the new configuration in effect. Another ease of installation and use feature is that multiple copies of CMS 1100 may exist in a given system allowing support of the system's production environment with the "standard" CMS 1100, as well as live testing of a new "development level" of CMS 1100. Finally, CMS 1100 maintains a logging facility to provide information about the communication environment it is saving.

By maintaining a user transparent interface to CMS 1100, the user can move the network control from the central processing unit to the front end processor as communication requirements expand. In addition, networking capabilities will be provided to terminals connected through the non-programmable communication controller. For example, a terminal connected to an 1100 via a non-programmable communication controller can establish a session with a terminal connected to the 1100 via the front end processor (DCP) network. This will provide uniformity in operation and functionality.

CMS 1100 utilizes a modular, top-down, structured design which follows the basic structure design defined by the Distributed Communication Architecture (DCA). A prime objective of CMS 1100 is to provide the Series 1100 communication interface for DCA. It provides the I/O interface for the Distributed Communication Processor (DCP) as a "node" in a DCA/TELCON network.

DCA is the communication network base for Distributed Data Processing (DDP). CMS 1100 is the communication interface for the Series 1100 system to a DCA based distributed data processing network.

## 2.3 TRANSACTION PROCESSING

All transaction-type or realtime application programs have many functions in common, such as preprocessing or scanning input messages in order to identify the transaction program which should process the message, activating that program, buffering messages for input, output, or for passing data between programs, accessing files, and so forth. The creation of software to perform these functions is a task of considerable time and cost. Furthermore, the code generated may not be of optimal efficiency, because the generation of highly efficient code usually requires step by step refinement over a period of time.

The Series 1100 provides the transaction processing user with processing efficiency with its Transaction Interface Package (TIP 1100).

### Transaction Interface Package (TIP 1100) and High-Volume TIP (HVTIP)

TIP provides the Series 1100 user with an online, communications oriented capability which is an identifiable section of the Operations System. TIP is an operational host for the efficient functioning of user transaction programs, and is specifically designed to provide a flexible and efficient system for processing a large volume of transactions where fast response is important.

TIP is especially valuable to the transaction processing user because it gives him all the software he needs, except for the transaction processing programs themselves. These real time application programs can be greatly simplified because of the services TIP provides.

Because TIP provides to the user interfaces and services to employ all the hardware and software resources of the Series 1100 system, new programs can be added and existing ones modified without affecting other user programs. And because of the way in which user programs are interfaced with TIP, enhancements and evolutionary additions can be made to TIP without requiring changes in the user transaction programs.

TIP functions with DMS 1100, allowing the online transaction user access to the data base or the use of DMS's data management routines for identified TIP files.

Since TIP does not limit any function of the 1100 Operating System, any application that runs under TIP can realize the 1100 Operating System's full benefits.

*Summary of TIP 1100 Benefits*

- Maximize computer use through a mixture of transaction processing with demand and batch operations
- Minimize installation time and costs by means of a generalized transaction interface under the 1100 Operating System
- The ability to use higher-level languages (COBOL, FORTRAN) efficiently
- Full guard-mode protection for all user programs
- Application independence, which means flexibility in initial installation and future growth
- Internal performance statistics
- Batch-mode checkout capability
- A user training mode, so that your end user can train on the actual system without endangering its files

- Online debugging aids
- The ability to time operations on either an elapsed-time or absolute-time basis
- The ability to interface DMS 1100, to maintain files which are part of the DMS data base
- Growth capability throughout the full line of SPERRY UNIVAC Series 1100 Systems

## 2.4 TIME SHARING

The Interactive Processing Facility (IPF) has all of the essential qualities of a state-of-the-art interactive facility and provides features and capabilities which will meet the current and future needs of management, end-users, and data processing specialists to achieve their productivity goal.

Distributed data processing functions are provided by incorporating the capabilities of DDP into the command language. Commands for creating, copying, and transferring files, and for transferring jobs between hosts in the system are provided.

A full range of language processors and development tools for program development are also available to the IPF user. In addition to all of the standard compilers, a powerful editor, interactive screen generator, and interactive debugging system are available.

Essentially, all of the 1100 system's resources are available to the end-user through the IPF Command Language Interface.

It provides a common interface to various subsystems of the 1100 operating system; such as the Data Management System (DMS 1100), Program Development Aids, Language Processors, and Distributed Data Processing facilities.

Since IPF transcends so many of the 1100 system resources, the end-user will have at his disposal virtually all of the 1100 OS features through one common command language.

In addition to being a consistent, easy-to-use interface, the IPF Command Language provides a level of functionality which will satisfy a broad range of users.

The inexperienced user will want to be guided through his usage of the system, with help easily available at any time.

The more experienced user will wish to bypass any tutorial help and utilize only those functions which will help him accomplish his task as quickly and efficiently as possible. Regardless of the end-users expertise, the 1100 system facilities can be easily accessed through IPF.

Whether the user is accessing information from a system at his location or from a system at a remote location, little knowledge of the IPF Command Language is required. The powerful facilities of the IPF Command Language allows the user to initiate many 1100 facilities and applications merely by naming them.

Thus, the end-user does not have to concern himself with knowing extensive system-oriented commands.

## User Assistance

A number of user assistance capabilities have been provided to various levels of IPF 1100 users to assist them in the use of IPF and in accessing system facilities.

- The first form of assistance is for the beginning user who has been introduced to IPF 1100 for the first time. This assistance is provided through Computer-Aided Instructions (CAI) courseware developed under ASET. This courseware is intended for the training period when the user is beginning to use IPF 1100. One of the lessons taught by this courseware is how to use the other user assistance mechanisms provided.

- A traditional type of user assistance is to offer help in answering the user question: "How do I go about accomplishing . . .?" This type of assistance involves determining the user's problem and displaying to the user enough information to allow finding the right command or command argument to get the job done. The HELP processor in IPF is the mechanism which will solve this problem.

- Another form of assistance often needed by experienced but infrequent users is tutorial assistance in completing a command. In this case, the user remembers the command name but not all of the meanings of possible arguments and/or options. This assistance displays to the user the command, all of its arguments, its defaults and further explanations of the meanings of arguments and legal ranges of values.

- Another assistance capability provided in current software is in-depth error explanation. In this case, a computer response (error or not) can be explained to the user at the user's request. This response may be provided in multiple levels of increasing detail.

The IPF 1100 response language provides clear, concise messages and command responses. Responses from IPF 1100 utilize English vocabulary (whenever possible) as well as computer terminology as necessary and are easy to modify by you to suit individual site, regional or national requirements. Use of full or partial screen responses and various forms of emphasis such as blink, intensity, and underscore are provided.

## Program Develoment

Program development and execution takes on new meaning under IPF. Not only does IPF provide its own commands to control program execution, but it provides an interface to many other aids and facilities which will make the job of application development and maintenance considerably easier.

Under IPF, any user has at his disposal all the programming languages supported by 1100 OS, as well as the interactive application development aids which will be discussed in a moment.

Additionally, a full screen editing facility is embedded in the IPF command language and may be intermixed at any time with other IPF commands.

The further ability of IPF to provide pre-scanning of command and language syntax as well as pass data and information between various job processes, means that application development and maintenance will require far less time and effort than in the past.

PADS, the Programmers Advanced Debugging System is a powerful application development aid designed to provide a uniform way to debug programs written in any supported language.

Uniform program debugging among the languages is supported in many ways. A single set of commands is available for all languages and a program's source language does not have to be specified to PADS. Modules written in different languages but run as a unit may be debugged together.

PADS supports a wide range of user skills and requirements. Powerful but simple interfaces are provided for functions like exception capturing, data display, and program tracing. Users need not be aware of machine processes to have full high-level language debugging capability. Programmers who are knowledgeable about the machine may use essentially unlimited trapping of data and instruction references, tracing of program execution, temporary patching of data and code, and displaying of data.

The Display Processing System (DPS 1100) assists the programmer/analyst in the design and execution of an interactive interface to a Series 1100 computer by a CRT user.

The design of all input and output screen formats is done at the terminal, interactively. The actual formats to be used in the application are entered through the terminal as well as other information such as field attributes.

The DPS 1100 allows the application program to use the capabilities of a terminal without knowing any of its physical characteristics. All static data and input/output are removed from the program thus providing terminal independence. This feature results in a simplification of the task of the application programmer.

Edit 1100 is a complete editing facility which provides a full complement of both general editing commands as well as facilities for full screen editing.

The Edit 1100 functions extend the IPF command language by providing a complete range of general editing commands; such as changing occurrences of one string to another, moving lines or columns from one location to another, merging all or part of one file to another, and even commands to undo the previous commands.

In addition to having these editing facilities immediately available for use, Edit 1100 allows the editing of multiple files (up to 4) concurrently as well as providing the ability for full screen editing on the UNISCOPE and UTS intelligent terminals.

Since Edit 1100 is embedded in IPF 1100, all ease-of-use features such as the procedure capability, user assistance and response modules are also available when operating under the editor.


## IPF 1100

The Interactive Programming Facility of IPF 1100 is a total system. IPF can support the Timesharing, Batch as well as the Transaction environment. It interfaces to other subsystems of the OS 1100 system such as MAPPER 1100 and allows for advanced query capabilities and applications development via its interface to the query subsystem. The latter can be used for writing non-procedural interactive display oriented, or language oriented implementations.

Timesharing under IPF is a most comprehensive timesharing system, while to the end user, easy to learn and use. Timesharing can range from the first-time user to the more comprehensive programmer. To all users, Timesharing under IPF will greatly assist their program development, complete with debugging aids. IPF will allow programmers to accomplish their tasks in less time, with greater ease, and with assurance of operation. Sperry Univac is adhering to all standards, or recommended standards (ANSI/ASCII) for all processors and, of course, the Command Language.

## 2.5 BATCH PROCESSING

### Local Batch

In spite of the increasing use of transaction and timesharing processing, batch processing still uses a significant portion of system resources at most computing sites. The efficiency of batch processing is therefore of great importance.

Many system architectures in the industry favor one type of processing at the expense of others, perhaps emphasizing timesharing and doing batch less efficiently, or concentrating on batch performance and de-emphasizing realtime. The Series 1100 systems incorporate fundamental design principles which optimize the allocation of system resources to user programs based on the behavior of a program during a timeshare and the mix of programs then currently active. As a result, 1100 Series systems perform batch processing with outstanding efficiency.

Listed below are some of the Series 1100 capabilities that make for efficient batch processing. Keep in mind that these features are likely to improve other modes of processing as well. They are not listed in any particular order of importance.
- Multiprogramming
- Multiprocessing
- High level of system (vs operator) scheduling of workload
- Dynamic allocation and compaction of main storage
- Run Priority Structure based on:
  - Application Priority
  - Utilization of Resources
  - Time of day work is needed
- Time Slicing
- Run Segmentation
- Multibanking
- Common Banks
- Reentrant Processors
- Separate Exec and User Register Sets
- Quota (for specifying resources limitations per run)
- System Tuning via SIP/PAR
- Error Retry

**Remote Batch**

In some system architectures, remote batch must be programmed and/or job control language coded differently from local batch. With Series 1100 systems, a job may be run locally or remotely without change. This is because job control and facilities usage is identical regardless of the mode of job submission. All the benefits and efficiencies of local processing are available to the remote batch user.

## 2.6 SYSTEM RESOURCE MANAGEMENT

The individual elements of the 1100 Operating System are structured internally toward one major goal: maximum productivity of the system for the user. Features of the Executive, the many languages, application programs, and supporting software which make up OS 1100, are important to the user only in the context that they produce useful work.

For example, the Operating System uses its resource management capability to process the total workload given it. Included in the resource pool is the operator himself. The Operating System makes use of the operator in whatever way will make the workload process most efficiently. The balancing of human resources versus computer resources has always been a design parameter dependent on computer expenses versus human salaries, and computer error rate versus human error rate.

OS 1100 has taken advantage of the ever decreasing cost of computer hardware and the lower error rate of the computer system. The resource use of the human operator has concentrated on reporting the "exception" information only with the daily standard operating procedures being non-operator oriented. The operator can thus concentrate on job input and job output without bothering about job execution.

A description of how some of the OS 1100 elements benefit the user is given below.

**Executive Features**

The Operating System of the Series 1100 is universally acknowledged to be the most advanced and powerful tool at the user's disposition for handling programs in Realtime, Demand, and Batch in multiprogramming and multiprocessing environments.

The following descriptions will give an overview of the most interesting features of 1100 Operating System Executive which efficiently manage the system resources:

*Control Language*

All Operating Systems are complex in order to handle all the facilities and possible applications of a system. The user however can interface with the Operating System only through a control language. In order to resolve this dichotomy, the 1100 Operating System provides the user with a simple, yet powerful and comprehensive control language to build a Run-Stream. The Run-Stream is a set of commands prepared by the users in order to direct the compilation and the execution of programs under OS 1100. The control language is designed to be as simple as possible for the normal user but with a large number of commands to satisfy sophisticated users as well.

*Symbiont Operation (relatively analogous to spooling)*

The 1100 Operating System has a standardized capability to relieve the executing programs from having to deal directly with low speed peripherals, without, in any way, reducing the functionality of these peripherals.

All the paper peripherals are buffered through high speed mass storage or, optionally through tape devices. The symbionts responsible for transferring data from slow speed peripheral to high speed devices and vice versa and operate independently of user programs. A set of system routines called symbionts provides these capabilities.

This mode of operation insures a very efficient usage of peripherals because, as long as input or output exists, the slower peripherals will work at full speed. The programs benefit from this mode of operation because the input/output delay is considerably reduced. The OS 1100 contains symbionts for both onsite and remote devices and is designed to allow inclusion of symbionts for non-standard peripherals.

*Run Scheduling*

In a multiprogramming environment, it is not efficient to leave run scheduling to the operators. The 1100 Operating System provides the user with automatic run scheduling which handles multiple priorities and large backlogs.

The OS 1100 scheduling is based on run type, priority, time of submission, time to be executed and facility requirements. For instance, Demand Runs (timesharing) may be opened immediately, while Batch Runs may be waiting until their turn arrives. Also, the starting time, deadline time and the executing sequence can be specified for the run.

*Dynamic Storage Allocation*

Since the computer storage is one of the most valuable components of the system, in order to receive the maximum return in terms of system performance the user should strive to use this storage completely. The Dynamic Storage Allocation is the Sperry Univac solution to the user requirement.

Dynamic allocation of the storage is one of the strongest functions of the 1100 Operating System. It has been a component of the Executive system from the very first design to enable optimized usage of Main Storage. Allocation of storage is done at high resolution (64 or 512 word granule), and is based on current space requirements for the programs to be allocated. As a result, wasteful prepartitioning has never been necessary, the user need not be concerned at all about storage allocation for his program, and storage fragmentation is eliminated.

*Time Slicing*

In a multiprocessing and multiprogramming environment the most efficient way to make the maximum use of CPU time and to have more programs executed in parallel is to give time slices of CPU to all the programs.

Programs for each mode of execution, i.e. Operating System, Real-time, Demand, Batch, are queued in a switch list for each priority. Operating System and Real-time programs receive all the CPU time that is required because of their time critical nature. Demand and Batch programs receive time slices of the CPU according to their position in the Queue.

Every time the currently active program releases control for I/O operations or is interrupted by the timing routine, the position in the switch list is readjusted and the next program in the Queue ready to be executed is activated.

This method of CPU time distribution is used in order to give high priority and short CPU Time to Demand and Batch programs with large numbers of I/O requests and low priority with a long CPU time for programs with high CPU usage.

*File Management*

The OS 1100 File Management philosophy is predicated on the following premise:

- All users will need files for saving information such as data or program and would like to have their file handling problems resolved by the computer through a simple interface

The 1100 Operating System will assist users in handling files in the following situations:

- OS 1100 performs an analysis of facilities (tapes and disks) required for run and, when possible, assigns the facilities to the run with the appropriate message for the operator
- During the execution of a run, the OS 1100 will provide a simple interface for handling all the I/O functions for the user program
- When the run is closed, the OS 1100 will return all the facilities used during the run to the facilities inventory of the Executive

**Language Processors and Libraries**

Sperry Univac has been in the forefront both in development of high level languages and by participating in a number of committees chartered to reach agreement on industry-wide standards. We are committed to the concept of industry standards because we feel our customers benefit from them, and because adherence to industry standards simplifies our development effort as well.

An internal standard has been developed for all new language processors with respect to the characteristics of the products and their interfaces with other parts of the 1100 environment. This insures compatibility, commonality and parallelism across all new language processors.

Some aspects of the 1100 standards and their resulting capabilities are:

- *ASCII Code* – The emphasis on code sets is switched from FIELDATA to ASCII in the new processors. Additional alphanumeric characters, along with new special symbols and control characters, provide a more powerful language. The new ASCII hardware and Executive modifications all complement this language feature.

- *Reentrancy and Reuseability* – The new processors are designed to fully capitalize upon all the features of the 1100 Executive System. This means that the processors are reentrant and reuseable and generate reentrant code. These features contribute to significant improvement in the total System efficiency.

- *Common I/O and Libraries* – The capability of interchanging data files between different language processor executable elements is highly desirable. Sperry Univac's approach is to encourage this interchangeability between as many language processor elements as possible. Not only does this mean common data formats and access methods, but the full advantage of common banks as employed by our operating system. Common banks are used in the formulation of a common universal math library.

- *Optimization* – All compilers for new languages contain an optimization module which will insure efficient code generation. Smaller and faster run-time units are the result. During the last few years, the area of optimization has received much research and study at Sperry Univac. The techniques we have developed for FORTRAN, and other languages provide the best optimizing compilers in the industry. Since the optimization phase of the compilation process requires additional time, compilers are parameterized to include optimization as an option specifiable at compilation time.

- *Customization* – Our new processors are used on systems which can vary greatly in availability of memory and other computer facilities. The use of the system and the relative importance between batch and demand, real time and batch, etc., varies greatly as well. Therefore, instead of tailoring the processors to certain types of systems or users, we have designed the processors so that – through customization – they can be tailored to specific installations and users.

## Accounting and Billing

In a system which is at the disposition of many users it is very important to have an accurate and easy Accounting and Billing for the system facilities. The 1100 Operating System has two files which contain information of all run activities.

The first file is the Account File in which is accumulated all the information on system components used from Runs with the same account identification. The second file is the Master Log file in which are registered all the events which have occurred during system operation.

The information on both files can be used for billing system usage. The Account File can be used for billing a total usage of the system from one group of users. The Master Log file can be used for detailed reports on work done from each run.

In an installation where different types of usage can occur the site manager needs an automatic tool for a distribution of the system resources among the users. The Quota System is an integral part of 1100 Executive system and may be optionally configured.

The Quota System provides the site manager with the capability to define, monitor and enforce quotas for the 1100 System for specific runs during a particular time span. With the Quota System, the site manager can adjust the usage of system resources among the users.

While in use, the Quota System provides accounting information on the usage of all system resources.

## System Generation

The 1100 Operating System Executive is written specifically as a set of parametric programs with the capability of dynamically generating or suppressing the program coding at system compilation time. This technique is used in all the executive components to provide a coding that produces extremely efficient storage allocation and minimizes execution time.

As a consequence of this capability, it is possible to generate an operating system exactly tailored for each 1100 Series installation.

A set of packages is provided by the 1100 Operating System for helping the System Analyst in the generation and maintenance of the Operating System components.

- SSG       Symbolic Stream Generator is a batch processor for the easy and automatically tailored compilation of OS 1100.
- FLIT       Fault Location by Interpretative Testing is a 1100 Series simulator for the testing of the newly generated Operating System without need for a hardware boot.
- CS 1100   1100 Communications Simulator is a simulator of the communication environment.
- SIP/PAR   Software Instrumentation Package and the associated performance analysis routines help the system analyst in tuning the performance of the overall system.

## System and Program Debugging

Today's sophisticated user is taking advantage of all the possibilities offered by the Operating System, by developing more and more sophisticated applications.

To help users in the testing of software, hardware, and applications, the 1100 Operating System offers a large number of debugging tools.

- *Test Package (Fireup)* – This test package is a set of programs designed to exercise all the 1100 Series hardware configurations and all software features, including compilers.
- *EDTERR/RECERR* – Customer Engineers have at their disposition a program which will print out from the Master Log file all the hardware malfunctions, recoverable or not recoverable, detected during the running of the 1100 Operating System. This program is a very useful tool to improve efficiency and to direct the CE during preventive maintenance.
- *Dump* – The 1100 Operating System has internal coding for saving on mass storage all the information captured during a system failure. A processor "FLIT" is provided to help the system analyst do offline editing of the Mass Storage Dump.
- *Diagnostic (DIAG) Routines* – The user has at his disposition in the 1100 Operating System Library 14 subroutines to help him in dumping memory, registers, or files during the application development phase.
- *Snoopy Debugging Aid* – Snoopy is a powerful debugging program allowing the user to trace instruction by instruction all or part of his application programs. Snoopy provides for the Demand user an extensive repertoire of conversational commands which extend this debugging power.

- *Flow Analysis Program (FLAP)* – FLAP is a program for analyzing the efficiencies of the application programs. FLAP performs a summary of the percentage of execution for the program parts monitored. FLAP is a very useful tool for analyzing those parts of production programs with high frequence of usage for which the user would like to improve the coding for better execution time.

## 2.7 SECURITY

The inherent design of OS 1100 included features which emphasized Security. The advent of the Terminal Security System (TSS) reinforced this emphasis. The OS 1100 has the capability of protecting each user, each program, each file and itself against unauthorized disclosure, modification, or destruction, whether accidental or intentional.

### Users

Terminal Security System is an executive feature which allows an installation to control access to the system from Batch and Demand runs. TSS will verify the user-ID and password provided by the user against the identifications in the TSS file.

This file is established by the site manager and contains all the user-ID's and passwords allowed to access the system, and the action to be taken when a violation occurs.

TSS can also be used for selected demand users to generate automatic run card initiation and lock the user into Conversational Timesharing (CTS) mode.

### Files

The 1100 Operating System will allow the user to have his files private or public with Read and/or Write keys.

OS 1100 will also prevent any user, except the site manager, from having access to other user keys and will remove any temporary files as soon as they have been released.

### Programs

The design of OS 1100 does not allow a program, when it is executing, to go out of its environment. Any attempt will cause the system to abort the run and release the memory space.

### Terminals

Every user terminal in the system is identified by a six-character site-ID. Hard-wired or dedicated-line type terminals can be guaranteed to have a unique site-ID for each terminal.

In the case of dial-up terminals, the user has in the Communication Control Routine (CCR) the possibility of controlling and verifying the site-ID used by a particular terminal.

## 2.8 PROGRAM PRODUCT QUICK REFERENCE

The following is a list of Series 1100 Program Products with a brief description and several features and key benefits that should appeal to your customers and prospects.

### Products

### Key Features and Benefits

**ADVISE 1100**

ADVISE 1100 is a very high level language interface for query/update and application development.

See Section 2.1 for more details.

- Can be viewed as extension to IPF 1100
- Employs hierarchical and relational database of UDS 1100

**APL**

APL 1100 is a high level, interactive language that uses procedures ranging from the most rudimentary form (i.e. 2 + 2) to quite complex, requiring dozens of statements in some other languages. The language has the attractive characteristic that the beginner programmer can get started doing meaningful work very quickly. APL procedures are interpreted and executed as they are entered at the terminal. This language is widely used in the university environment for educational use.

- Several levels of security, in addition to the 1100 Operating System.
- Designed for its ease-of-use in a wide range of business, scientific, educational and engineering applications.
- Interfaces with CTS and HVTS Time-Sharing Systems.
- Data files may be shared with other ASCII processors.

**APT 1100**

Automatic Programmed Tools 1100 (APT 1100) is an advanced, Problem-Oriented Language for geometric and Numerical Control (N/C) applications. Included are milling machines, drilling and boring machines, lathes, machining centers, automatic wiring machines, welding and flame-cutting machines. The APT system includes a programming language which provides a vocabulary for describing the geometry, motions, and machine functions necessary to produce a "part" using N/C machines. It also includes the interface to produce the input medium for the specific N/C device.

- Operates in either a batch or time-sharing environment.
- Uses the power of the 1100 Operating System, Text Editor and file manipulation capabilities during design maintenance phases.
- Adaptability to meet local engineering requirements.

**APT 1100, Lathe Module**

Lathe Module is an optional extension for the APT 1100 system when there is a significant program requirement for Numerical Controlled Lathes.

- Improves productivity when a large number of lathe programs are required.
- Provides the ability to define a series of simple shapes for processing the required part.
- Provides a roughing feature for the finished product.

## Products

### ASET 1100

Author System for Education and Training (ASET 1100) includes an Author Language for specifying tutorial strategy within individual lessons; a Delivery System for managing the interactive delivery of these lessons to students at ter-minals; and a Reporting System for advising authors and administrators as to the progress of students and of the system. It includes a Tutorial Mode itself which allows untrained authors to develop lessons. ASET can be used for:

- Education/Training applications
- Design aid for online application systems
- Data collection application

### BBASIC

BBASIC, used under the umbrella of CTS (Conversational Timesharing System) is a program which may be initially run to line-by-line ENTER, SCAN, and CHECK the validity of UBASIC statements prior to submission to the UBASIC compiler. A comprehensive error message will be immediately returned to the user if a line was entered in error.

### BCOB

BCOB, used under the umbrella of CTS (Conversational Timesharing System), is a program which may be initially run to line-by-line ENTER, SCAN, and CHECK the validity of COBOL statements prior to the submission to the ASCII COBOL compiler. A comprehensive error message will be immediately returned to the terminal user if a line was entered in error. BCOB allows conversational input that *prompts* the programmer from the IDENTIFICATION DIVISION through to the DATA DIVISION. For ease of use, extensive abbreviating is provided.

### BFTN

BFTN, used under the umbrella of CTS (Conversational Timesharing System), is a program which may be initially run to line-by-line ENTER, SCAN, and CHECK the validity of ASCII FORTRAN statements prior to the submission to the FORTRAN compiler. A comprehensive error message will be immediately returned to the terminal user if a line was entered in error. BFTN provides extensive input abbreviations.

## Key Features and Benefits

- The author can prepare lessons with little or no computer knowledge.
- Drill and Practice Mode to help the learner master and reinforce skills.
- Tutorial Mode to stimulate student dialogue.
- Inquiry and Dialogue Mode to access needed data.

- Offers simultaneous use by many terminal users.
- Checking of complete BASIC program statements *before* submitting to the UBASIC compiler.
- Increases programmer productivity in the program design and test phase.

- Increases programmer productivity by allowing many online users to conversational construct, edit and statement-debug COBOL programs before submission to the COBOL compiler.
- Supports the full CTS command set and inline editing.
- DMS 1100 Data Manipulation Language can also be checked for statement validity.
- Ease-of-use enhancement that provides program contruction using a prompting mechanism.

- Time-sharing users may simultaneously construct, edit and statement-debug FORTRAN programs before submission to the ASCII Compiler.
- Ease-of-use feature that provides a one-statement compile, map and execute.
- Programmer productivity increases with
  - Automatic statement formatting and tabbing
  - Extensive abbreviations on input
  - Inline statement editing

| Products | Key Features and Benefits |
|---|---|

## Products

### CKRS

Checkpoint/Restart System has been developed to provide assurance to the user that his run or program can be safely restarted due to hardware, software or program failure. It "snapshots" a run or program and creates a checkpoint that may be used for restarting at a later time if desired. The checkpoint may be initiated within the user's program or at the Operators Console. Restart is by the console operator.

### CMS 1100

Communications Management System 1100, is a real-time program interface for routing communications data from communications hardware devices to the 1100 Operating System. The hardware device may be either a GCS or DCP Front End Processor.

### ACSII COBOL

The ASCII COBOL Compiler System is a high level, easy to use and easy to learn language processor. COBOL is basically machine independent, and is therefore said to be a "portable" language used mainly in the business environment. Sperry Univac's ASCII COBOL continues to provide a standard COBOL as set by the American National Standards Institute (ANSI-1974) as well as providing numerous extensions.

### DATA

DATA processor provides the user with a variety of online or batch data handling capabilities at the file level. It is used to introduce, update, and correct data files from the RUN control stream.

## Key Features and Benefits

- Program recovery in case of system failure.
- Program recovery in case of program failure.
- Execution of long programs can be spread out over several sessions.
- Full recovery includes positioning of data files.

- Supports a simple communications star network of interactive terminals.
- Supports large networks of mixed terminal types, remote job entry, and applications.
- Supports interconnected networks connecting multiple hosts.
- System support of concurrent multiple CMS programs for the purpose of testing, separable networks and increased network security.

- Efficient COBOL environment using the CODASYL-based (Conference on Data Systems Language) asynchronous processing module.
- Extension commands used to create and access DMS 1100 data bases.
- Multiple data formats including ASCII single and double-precision floating-point.
- Many debugging features.
- Generates executable programs that may be used simultaneously by multiple users.

- Create, Update and List files.
- Construct complete or partial runstreams to be stored and subsequently executed by one or more RUNs.
- START constructed runstreams, online or batch, as another job or ADD portions of a runstream to an existing runstream already in execution.

# Products

## DATA DICTIONARY

The Data Dictionary System (DDS) provides statements to define a full description of any or all of the data base type entities such as:

- The business administration function
- The data the business function generates and uses
- The application entities
- The relationships of the application entities to each other
- The attributes of the entities

DDS provides a single source of information for all groups associated with the computer; from the operator through to the end user including top management. DDS is able to issue reports in the terminology of the receiving group, making information personalized.

DDS is a part of the UDS 1100 concept.

## DFP

The Define File Processor provides a data file description *external* to the program processing the file. This allows program flexibility, in that file information usually imbedded within a program is now kept as a separate entity. Using DFP, processors such as FORTRAN, COBOL, PL/1, APL, SORT and RPG are now file format independent and can thus share common files.

DFP may also be used in conjunction with the tape labeling system to enter information such as file identifier, expiration date, accessibility code and data structure.

## DMS 1100

Data Management System 1100 is a system based on the specifications recommended by the CODASYL Data Base Committees for data base processing. It provides a variety of data base storage structures, high level language interfaces and a selection of accessing techniques. It also includes several levels of data base recovery and security.

DMS 1100 is an integral part of UDS 1100.

# Key Features and Benefits

- Describes and controls activities pertinent to system design, development, implementation and operation. For instance, a systems designer using the DDS will know the relationship to existing systems.
- Describes user data entities, processing modes, relationships, applications/users and user defined inputs.
- Defines report entities to extract in report form, description reports, relationship reports and security reports.
- Any change to the DDS entities will automatically be reflected in the reports generated.

- Changing complete files, or the programs data file description without the usual requirement to recompile the program.
- Adds flexibility to Tape Labeling usage and maintenance.

- Non-redundancy of data, making data more available and more easily maintained.
- Data base usage statistics.
- Provides different views and constraints of user data according to usage.
- Provides a broad range of language interfaces.
- Includes all requirements to build a complete and comprehensive Information Management System.

## Products

### DPS 1100

Display Processing System 1100 is a comprehensive system that will construct and manage display-oriented transactions in an online environment.

DPS allows screen formats to be designed, developed and tested, before or concurrently with the development of the program(s) which will use the screen. Major functions of DPS include:

- Interactive screen generation – A programmer (or user) may "paint" the screen the way he wishes to view it when in production; defines the fields as alphabetic, numeric, alphanumeric, etc.; defines field justification, floating monetary sign, comma placement and mandatory input or output fields.

- Screen handling – retrieves the screen from a file and transports it to the terminal; recovers the screen with input data from the terminal edits the data as previously defined and passes it to the requesting program.

### EDIT 1100

EDIT 1100 is a display editor for the IPF 1100 system and also available to the demand user. It is designed for use with all text editing functions whether they be for programs, data, or documentation text.

### FLIT

Fault Location by Interpretive Testing is a powerful tool for development, checkout, installation and maintenance of software.

FLIT does this by controlling the execution of the program being tested. For instance, a terminal operator may request a data element by name to be viewed and possibly changed; request that the program stop upon hitting a certain condition or request that only a given number of instructions to be executed.

## Key Features and Benefits

- Significantly decreases program development time for transaction programs.

- Provides an end-user interface for screen design.

- Allows for the inclusion of screen attributes and security.

- Allows a terminal user to browse (roll/scroll) through selected output screens at the end of the session.

- Easy to use.

- Includes use for non-screen devices.

- Offers a full complement of powerful, editing commands.

- Offers a full screen editing capability which significantly reduces data transmission time.

- Execute, debug and correct programs interactively, while the program is in execution.

- Reduce time to checkout new versions of the Operating System by running the new version in a simulated configuration.

- Accumulate program profiles for the executing program.

- In System Mode FLIT provides a complete simulated Series 1100 computer system on which trial operating system boots can be made.

- In Program Mode FLIT provides the ability to directly run and control a Series 1100 program.

- In Diagnostic Mode FLIT provides the ability to "resurrect" failed programs from the diagnostic information produced at program termination.

- In Panic Mode FLIT analyzes Operating System panic dumps.

## Products

### FMPS

Functional Mathematical Programming System is a collection of computer programs containing the most advanced mathematical optimization techniques. For example, to select a financial portfolio to maximize profits; produce a cheaper cattle feed; or deciding on a schedule to reduce shipping cost. In general, FMPS may contribute to profitability in many specific areas of activity.

### FMPS-GAMMA

GAMMA is FMPS' model generator and report writer. GAMMA is an easy to use vehicle to supply input to the FMPS system in the form of tables and lists. From these tables and lists a model is generated and presented to FMPS which is used to produce an optimized solution to the problem.

GAMMA is also used to generate reports directly from the input model or to generate summary reports extracted from the resultant FMPS' optimized solution.

### ASCII FORTRAN

The ASCII FORTRAN Compiler system is a high level, easy to use and easy to learn language processor. FORTRAN is basically machine independent, and is therefore said to be a "portable" language used mainly in the engineering and educational environment. Sperry Univac's ASCII FORTRAN continues to provide a standard FORTRAN as set by the American National Standards Institute (ANSI-1978) as well as providing numerous extensions including a structured programming construct.

Although FORTRAN is commonly used for solving problems in mathematics, engineering and science, it is also used as a vehicle for teaching computer programming to students without extensive mathematical backgrounds.

### GIFTS 1100

GIFTS 1100 (Graphics-oriented Interactive Finite-element Timesharing System) is a series of programs used primarily by mechanical engineers in the graphic design of structures. With GIFTS 1100, a user can design a visual image that can be altered and tested with ease. The model can be viewed from any angle and allows enlargement of any portion of the model for closer scrutiny.

There is also no need to learn to program structure analysis routines as GIFTS 100 interfaces with many existing products such as ICES/STRUDL.

## Key Features and Benefits

- Provides for both linear programming and mixed-inter programming to best minimize cost or maximize profits.
- Save and restart long running programs in case of program or system failure.

- A straight-forward mechanism for describing and generating the model in question in FMPS format.
- FMPS results and calculations on results may be reported in an easily readable form.

- Program execution time is decreased with extensive optimization features.
- Programmer productivity is increased by the load-and-go and interactive debugging features.
- Resource utilization improved by simultaneous use by multiple users.
- Interface to DMS 1100 Data Management System.
- A structured programming construct which improves clarity and reduces the number of required statements.

- Low memory required by using independent functional modules.
- Reduced time spent on calculating and checking of coordinates by issuing a few simple parameters and having the system generate mesh.
- Display of the resultant model may be edited, the analysis re-run and the model displayed again.
- A "HELP" command is available if an explanation of a command is needed.

# Products

## GSA 1100

The General Syntax Analyzer is a front-end tool that can be used in the construction of a broad range of processors, text editors and other applications that requires the scanning of a language type input. This is accomplished by the processor builder supplying language and structure specifications to the different processor building blocks of GSA. The resultant tables are then merged with the GSA modules to produce the actual user processor.

## ICES

The Integrated Civil Engineering System is of modular design, made up of various subsystems dealing with design and problem solving in the area of structures, roadways and geometrics. ICES provides a Problem-Oriented Language to be used by engineers in order to "state his problem" to the system in familiar and convenient terms. It also provides the flexibility to be used in other branches of engineering science and management.

## IGDS

Interactive GAMMA Data-Manipulation System (IGDS) is for use with GAMMA, the model generator/report writer of the FMPS system. IGDS allows for interactive creation and manipulation of the data (GAMMA tables and lists) that eventually forms the problem model. It is very effective when the user wants to try different combinations of the model requiring many iterations.

## IMS 1110

The Information Management System 1100 is an interactive transaction processing system with integrated file management facilities. It allows a user to create action programs for an online transaction processing environment with minimal programming effort. Files referenced by action programs can be conventional, already existing files or even DMS 1100 data base files.

The UNIQUE facility provides an Inquiry/Update capability for general file processing. It is a series of action programs supplied as part of the system. With UNIQUE, users have access to files without the need for programming their request. The UNIQUE language is a powerful set of commands designed for ease-of-use offering the terminal user the ability to display and update his files and produce, at a moment's notice, exception, or ad hoc reports. IMS 1100 is totally accommodating to users of IMS/90 from the OS/3 and VS/9 series of computers and as such provides the IMS/90 user an easy migration path to the Series 1100 computers.

# Key Features and Benefits

- Creates all types of language processors and scanners.
- Can be used to update or customize existing processors for increased functionality.
- Ability to compose error, warning, and other messages that are normally printed upon user termination from a processor.

- Allows the user to develop tailored subsystems in addition to the subsystems available under the ICES system.
- Allows the non-computer-oriented engineer to effectively utilize the system by using a command language that is easily understandable.
- The user can easily create and manipulate table data used by an ICES system.

- A viable tool to supplement a total management information system.
- Easy creation, modification and interrogation of FMPS' tables and list.
- Password security at a table or list level.
- Efficient editing using the full screen feature.
- Facilities movement of data retrieved from DMS 1100 or other files to the GAMMA tables and lists.
- Speeds up the delivery of the final result.

- Supports a multiple programming environment using COBOL, RPG-II or the Assembly Languages.
- Includes a comprehensive Data Management Support system providing access to standard data files, defined files, or DMS 1100 files.
- Access to a Defined File may include a Defined Record composed of data items from *one* or *more* files.
- UNIQUE offers an easy-to-use Inquire/Update access to defined files *without* programming.
- Provides for complete data security and data integrity.

## Products

### IPF 1100

Interactive Processing Facility 1100 is a full capability user interface that satisfies user's functional, performance, ease-of-use, and ARM requirements. It allows the user to interface with the system in accordance with his individual level of sophistication. In addition to the command/response language, an execution environment for support of the language and system processors as well as user-developed applications programs is provided.

With IPF 1100 the user is lifted to a high level of system interface. Easy-to-use commands perform functions or multiple functions that permit the user to fully utilize the system. For instance, with these simple commands he may build, edit, and execute a program, *concurrently* with a task or tasks he had previously started.

### IRU

Integrated Recovery Utility, is an integral part of the Series 1100 Integrated Recovery System. Simple commands are provided for the user to initiate a variety of integrity features and capabilities involving data base roll back and data base reconstruction.

### LOG ANALYZER

Log Analyzer (LA) is an easy-to-use, easy-to-install user program that will assist a customer in monitoring the resource utilization of a Series 1100 system. System and user activity data analyzed by LA is dynamically collected by the 1100 Operating System. LA will put out this data in the form of comprehensive reports to pinpoint bottlenecks that can be used to substantiate reconfiguration or additional equipment acquisition.

### MACRO

MACRO is a powerful text transformation language used for extending an existing language to enhance its functionality or to translate one language to another.

## Key Features and Benefits

- The command language is keyword-oriented, increasing user and system performance.
- Flexible use of delimiters, list constructs, abbreviations, and continuation.
- A user modifiable response language consisting of concise language messages.
- Supports both Timesharing and Batch operations.
- Standard commands for a local communication environment or a Distributed Data Processing environment.
- An efficient and standard file access method used by EDIT 1100, the compilers, system processors, and applications programs.
- Information may be efficiently passed between language processors.
- Selectable security levels.
- Productivity increase by use of the full screen editor.

- Reliable recovery techniques for TIP or TIP/DMS files.
- Save and restore TIP or TIP/DMS files.
- Controls user access to selective TIP or TIP/DMS files, legs of duplex files or even partial file access.
- Compare complete or partial records between files or files with like attributes.

- Facilitates better project control of development groups or individual users.
- Increases system efficiency by allowing the site administrator to track key tasks/runs and to direct optimization efforts.
- Provides advanced knowledge of operational resource requirements.
- Promotes the use of historical trend analysis for enhanced long-range planning.

- Custom extensions may be made to an existing program language.
- Dialect from a given language may be translated to another language of similar dialect.
- Translation of one language to a completely different language.
- Generates reports by text searching.

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| Products | Key Features and Benefits |
|---|---|

## Products

### MAPPER 1100

MAPPER 1100 is Sperry Univac's primary, end-user tailored, Application Development System.

It is perhaps the most competitive Information Management and Decision Support System in the industry.

See Section 2.1 for more details.

### M/S PACK ASCII

Comprehensive Mathematical and Statistical Library compiled by ASCII FORTRAN providing many of the most freuently used tools of numerical and statistical analysis.

### OPTIMA 1100

OPTIMA 1100 is an integrated Project Management System for project planning and control based on networking techniques. Output is in the form of standard reports for the user.

### PADS 1100

Programmers Advanced Debugging System is a language-independent debugging tool. PADS is designed for interactive debugging of programs written in COBOL, FORTRAN, or PL/1. Initial release is for COBOL only.

### PAR

Performance Analysis Routines is a performance measurement reporting system of data collected by the Software Instrumentation Package (SIP) embedded in the Operating System.

SIP is a measurement tool that provides a total system performance analysis capability, gathered optionally for different levels of analysis. SIP does this with minimum impact on system performance.

## Key Features and Benefits

- End-user tailored.
- Taps the intelligence of all terminal users.
- Up to 1000% productivity increase for programmers (development/maintenance).
- Word processing.
- Color graphics.
- Electronic mail.
- Message switching and remote processing with multiple computer systems.
- Combines the advantages of personal computer and mainframe integrated database.
- Employs relational database of UDS 1100.

- Speeds up and simplifies solutions to problems encountered in many areas of scientific research.
- Subroutines and functions callable from user programs.

- Completely integrated Project Monitoring System to track schedules and cost.
- Provides the flexibility to be Activity Driven or Event Driven.
- Capability of handling single or multiple networks and up to 12 different calendars for one run.

- Provides the capability to trap a program if a certain condition is met or location is reached.
- Provides the capability to inspect and change values of program variables and storage locations.
- Provides a Track and Display mechanism to follow the logic of program execution.
- Provides a Help facility to assist in learning the PADS command language.

- Provides easy identification of the most common system performance bottlenecks.
- Reports the performance effects of configuration changes.
- Reports of performance increases from improved peripherals.

## Products

PAR is a stand-alone software package provided for analyzing and generating reports from the data gathered by SIP. PAR provides a selectable set of predefined reports, as well as the capability to be programmed in a user language to perform arithmetic operations on the data and produce additional reports. The capability to produce performance graphs is also provided.

### PCCS 1100

PCCS 1100 provides a means by which application programs developed in High Level languages such as COBOL and PL/1 may utilize the Series 1100 communications system. This capability enables COBOL and other languages that interface with PCCS 1100, to meet the ANSI standard for message communications.

Programs using this mechanism may communicate to/from other communication programs, terminal users, remote batch systems and certain host processors. Terminal user's also have the capability of communicating with each other.

### PCIOS

Processor Common Input/Output System (PCIOS) is used to produce compatible data files between High Level Processors, Utilities and Query Systems. PCIOS supports a variety of popular access methods. Each access method is provided by a common module shared by all languages which support that access method. Therefore, files written by an application developed in a selected programming language may be read/ updated by applications developed in a different language.

PCIOS is an integral part of UDS 1100.

### PL/I

The PL/I Compiler System is a high level language processor which implements the 1976 standards of the American National Standards Institute. It is a general purpose programming language that was originally designed to include the best features of ALGOL, COBOL, and FORTRAN. As such it provides the programmer with the most features for handling a variety of applications in a variety of ways. It can be used effectively for both scientific and business data processing applications.

### QLP 1100

Query Language Processor is a conversational, language-oriented processor which provides generalized facilities for inquiry and update of the DMS 1100 data base.

## Key Features and Benefits

- Allows a non-data base application program to interface with the 1100 Series Communications System.
- Provides for password security.

- Data files are sharable across most programming languages and sort utilities.
- Supports all common file access methods.

- Possesses the qualities of both higher and lower level languages.
- Versatility reduces total cost of applications development and implementation.
- Increases overall execution efficiency by using the multitasking capability.
- Conserves memory by using the program autoload function.
- Reduces program load activity by using the system "sticking power."
- Interfaces to DMS 1100.

- Provides an "ease-of-use" inquiry and update capability to DMS 1100 files.
- Uses simple language statements.
- Allows for batch or online conversational execution.

# Products

## QLP 1100—PCIOS I/F

The Processor Common Input/Output System Interface to QLP 1100. With this facility QLP 1100 commands may be used against standard file formats, in addition to DMS files.

## QUIP

Quota Input Processor provides the installation manager with an easy to use interface to control the utilization of system resources by individual users or groups of users.

## RDMS 1100

RDMS 1100 is the relational database management system under UDS 1100. It is being employed by MAPPER 1100, ADVISE 1100 and by the relational data manipulation commands within conventional programming languages under UDS such as COBOL.

## RPG II 1100

The Report Program Generator II provides an industry compatible RPG with extensions for ease of programming and maintenance.

## RDP 1100

The Requirements and Development Processor (RDP) is a computer aided software engineering tool intended to serve as the basis for orderly, integrated, and well documented software development. This tool is utilized during the definition stage and carries through the development and utilization stages as well.

## SENTRY

The Security Control Processor is used to create and maintain a security data base. This data base is then used by the Series 1100 Security System to control user access to files and certain privileged functions. Validation of statements is provided as well as the capability to obtain various security type reports.

# Key Features and Benefits

- Allows for all QLP commands, report facilities, procedures, request and macros which are pertinent to a non-data base environment.
- All PCIOS file access methods are allowed.
- Allows QLP 1100 to be implemented to access either PCIOS or DMS 1100 files.

- Limits the extent to which a particular account is allowed to utilize the system.
- Defines users to certain accounts, any privileges granted, limits of system utilization and accumulated usage of the system to date.
- Sets limits on system resources that a particular run can use.

- Integral part of UDS 1100.

- Increases programmer productivity by simplified programming and Auto Report facility.
- Compatible source statements with competition.
- Supports IMS 1100 Action Programs.
- Provides an integrated editor for program creation and maintenance.

- Control of application development projects.
- Saves resources.
- Enhances techniques of structure implementation methods.

- Creates and maintains a security data base.
- A user security profile exists for each user of the system.
- Regulates and monitors user I.D.'s, files, software services and use of privileged functions.

# Products

# Key Features and Benefits

## SORT/MERGE

Sort/Merge offers a varied group of easy to use sorting capabilities with little knowledge of the resources configured in the system.

- Versatile means of sorting records of any size and formats, on any input/output storage media.
- Automatic "scratch" facility assignments.
- Allows for user-own code on first and final passes of the sort and merge operation.

## SPELL 1100

The Spelling Checker is a processor that is designed to check for spelling and typographical errors in computer based documentation. It is used with input text for various Sperry Univac documentation processors as well as accommodating plain text in a language other than English.

- Provides an integral tool towards producing a document of high integrity.
- Offers the option to complement the dictionaries provided with the system with private dictionaries or rebuild the provided dictionaries.

## SUFICS 1100

The Sperry Univac Financial Integrated Control System is an English-based programming language designed for financial planning applications.

It is used for setting up a financial model of all or part of an organizations operations.

Since SUFICS is interactive it allows management to ask "what if" questions and get a quick response that in the past, remained unanswered. Application areas for SUFICS 1100 models are numerous and include most areas of Financial Planning, Control and Analysis; Product Planning, Market Planning and Manpower Planning; and Econometric Modeling. Whatever model is developed under SUFICS, it is easy to test the sensitivity of performance to variations in what-if-assumptions. These assumptions can then be used to determine the effect on net income, return-on-investment or any other measure of operating performance or profitability.

- Test assumptions and intuition in planning, control or financial resources without risking capital.
- Design financial reports from all levels of an organization.
- Ascertain "effects of change" on the total organization.

## TSS

Terminal Security System is used by authorized individuals to create and maintain information in the security file. This file is ultimately used by the 1100 Operating System in validating User I.D.'s and passwords and performing other security related functions.

- Allows for the creation and maintenance of the security control file.
- Allows for a user-defined contingency action should a security violation attempt occur.
- Allows the user to be placed into a selected mode of operation upon appropriate signon.
- Displays a message-of-the-day each time a user signs on the system.

## UBASIC

The Sperry Univac Beginners All-purpose Symbolic Instruction Code Compiling System provides instructional support and problem-solving capabilities with an easily learned language for instructional, mathematical, engineering and many other areas.

- Can be used as a stand-alone compiler or as a compiler within CTS 1100.
- Immediate per line response to the terminal user verifying the correctness of the input statement.
- Supports two-dimensional arrays, built-in intrinsic functions and user-defined functions.

2-30

# Products

## UDS 1100

UDS 1100 is the subsystem which performs all data management functions within OS 1100. It includes RDMS 1100, DMS 1100 and PCIOS files.

See Section 2.1 for more details.

## UNADS

The Sperry Univac Automated Documentation System is a powerful and easy-to-use document composition system used by industry, government and the military. Output from UNADS is also used to drive various typesetting and Computer Output Microfilm equipment, such as the COMp80 microfilm recording system and the APS-4 CRT Photo-typesetting System. Simple input commands and text information may be created or changed by the EDITOR or CTS 1100. UNADS is enhanced with the SPELL 1100 by using it to check for spelling and typographical errors.

## UNIDAS 1100

UNIDAS 1100 Document Accessing System is a comprehensive, modular, computer-oriented document and information retrieval system. UNIDAS is useful whenever fast online access to large numbers of articles, reports, contracts, laws, general directives, or abstracts of publications are required. It supports and controls document data bases using DMS 1100 and operates in either Batch, Time-sharing or Real-time modes. Security is provided to ensure protection against unauthorized access to selected modules of the system as well as unauthorized users.

## UNIFACS 1100

UNIVAC Financial Accounting System is a generalized and totally integrated system, complemented by modular applications which can be used independently or in conjunction with others in the system. It is a batch processing DMS 1100 data base system implemented in ANS'74 COBOL. Applications include Accounts Receivable, Accounts Payable, General Ledger/Budgeting and Payroll/Personnel Systems.

## UNIS 1100

The UNIVAC Industrial System is an integrated modular system used for solving management information and control problems in the manufacturing industry. Powerful interactive subroutines allow for the construction of a production control system according to specific user needs.

# Key Features and Benefits

## UNADS

- Provides an easy-to-use composition-oriented command language.
- Powerful macro definition facility reduces keyboard overhead.

## UNIDAS 1100

- Create or expand data bases from individual documents.
- Online or Batch retrieval.
- Document searches by Concept, Content or Key.
- Use of simple English statements and expressions by non-technical users.
- Multi-level security.

## UNIFACS 1100

- Eliminate the design and programming usually necessary to develop a comprehensive financial accounting system.
- Applications may be implemented independently giving users more flexibility.
- Individual applications can "talk to each other" through a common control file.
- Takes advantage of a proven data base security system using the DMS 1100 Data Management System.

## UNIS 1100

- Provides functions to maintain and retrieve records from master data files.
- Processes Bill of Materials.
- Compiles parts usage list.
- Multilevel inventory control improves stock availability, reduces capital investment and improves the speed and accuracy of stock information.
- Calculates economic reorder quantities and the value of the stock on hand.
- Improved adherence to planning completion dates to reduce lead time and tied up capital.

## Products

### UTS COBOL (1100 OS)

A COBOL compiler executed on the 1100 system to compile programs for the UTS 400 or UTS 4000. Compiled programs may then be "downline loaded" to a UTS 400 or UTS 4000 local device for subsequent execution. Requires UTS host utilities.

### UTS 4000 EDIT PROCESSOR

A stand-alone program which may be used for creating programs and data files at the terminal. The program(s) may then be upline recalled to the host for subsequent compilation.

### UTS HOST UTILITIES

The Universal Terminal System Host Utilities are programs that execute on the host for the downline load or upline recall of UTS programs.

### UTS SOFTWARE

Universal Terminal System software is provided to use with the 1100 Operating System. Included are the MAC80 (assembly) and PLM (PL/1 type) language processors, TIP transaction programs, utility library routines, and stand-alone utilities. Used only on the UTS 400.

## Key Features and Benefits

- Provides a familiar high level language to program intelligent terminals.
- Offers the usage of many terminal functions.
- Provides program portability to either a UTS 400 or UTS 4000 terminal.

- Offers features similar to CTS.
- Provides cost effective design and maintenance of source programs.

- Provides a simple vehicle for transporting programs to/from the host and the UTS terminal.
- Simplifies the Host/Terminal program debugging process.

- Provides capability for full usage of Host/Terminal application interaction.

# 3 SERIES HARDWARE

## 3.1 SERIES 1100 RELATIVE PERFORMANCE

The following chart is intended to be used only as a general guide to relative system performance. Due to the variety of configurations and processing environments, there can be no guarantee that an individual user will realize the relative performance shown in this chart. It is the customer's responsibility to determine how a 1100 will perform in his operation.

| SYSTEM | MODEL | RELATIVE PERFORMANCE |
|--------|-------|----------------------|
| 1100/61 | B1 | 1.0 |
| 1100/61 | C1 | 1.2 |
| 1100/61 | C2 | 1.5 |
| 1100/61 | E1 | 1.8 |
| 1100/61 | E2 | 2.1 |
| 1100/61 | H1 | 2.7 |
| 1100/61 | H2 | 3.2 |
| 1100/62 | E1 | 3.4 |
| 1100/62 | E2 | 4.1 |
| 1100/62 | H1 | 5.1 |
| 1100/62 | H2 | 6.2 |
| 1100/63 | H1 | 7.4 |
| 1100/63 | H2 | 9.0 |
| 1100/64 | H1 | 9.7 |
| 1100/64 | H2 | 11.6 |
| 1100/80 | | 2.9 |
| 1100/81 | | 4.3 |
| 1100/82 | | 7.8 |
| 1100/83 | | 11.5 |
| 1100/84 | | 14.9 |
| 1100/91 | | 11.6 |
| 1100/92 | | 21.7 |
| 1100/93 | | 31,3 |
| 1100/94 | | 40.4 |

Figure 3-1. Series 1100 Systems

## 3.2 1100/60 HARDWARE OVERVIEW

The 1100/60 is a general purpose processing system featuring the latest advances in systems design, packaging techniques, and programming technology.

The Central Processor and Input/Output Unit are functionally independent units housed in a single cabinet, resulting in low floor space, cooling and power require-

ments. Main storage can be either integrated with the central processing cabinet, or externally housed in a separate cabinet. Unit or single processor system expansions include the addition of main storage; a high speed buffer to increase performance; an Extended Instruction Set, designed to enhance the performance of high-level languages and system software; and expansion to a completely redundant, tightly coupled multiprocessor system containing up to four central processors. Multiprocessor system expansions include the addition of main storage, buffer storage, the Extended Instruction Set feature and additional central processors up to a maximum of four.

**System Configuration**

An 1100/61 Unit Processor System Central Complex is composed of a Central Processing Unit (CPU), an Input/Output Unit (IOU), a System Support Processor, optional buffer storage and main storage which can be either integrated with the central processing cabinet or externally housed in a separate, stand-alone cabinet. Unit Processor systems with internal main storage may be configured with from 524K words minimum to 1048K word maximum. External main storage unit processor systems can be configured with 1048K words minimum to a maximum of 4195K words for "C" models and up to a maximum of 8388K words for "E" and "H" models.

Unit processor systems may be expanded by adding 2K or 8K words of buffer storage and the Extended Instruction Set feature. Additional central complexes composed of a CPU, an IOU and 8K words of buffer storage may be added to a maximum of four in an 1100/64 configuration.

An entry level 1100/62 multiprocessor system provides a fully redundant central complex composed of two Central Processing Units, two Input/Output Units, two 2K word buffers, and two System Support Processors. Integrated main storage can be configured with 1048K words to 2097K words and configurations utilizing the external main storage may be configured with from 1048K words to a maximum of 8388K words.

The system may be expanded to 8K words of storage in each buffer and the Extended Instruction Set feature in each CPU. Additional central complexes may be added up to a maximum of four on the 1100/64 configuration.

**The Central Processor Unit (CPU)**

The 1100/60 design incorporates LSI Microprocessor chips and features microprogrammed control and arithmetic chips. Paralleled Arithmetic Logic Unit (ALU) chips are used to gain design flexibility, reduced size, and reliability. The 1100/60 instruction set is microprogrammed, utilizing a separate random access control store as the storage media. Reliability is enhanced through use of duplex checking, extensive parity generation and checking, control store error correction and instruction retry.

An optional Extended Instruction Set (EIS), designed to increase the efficiency of high level business oriented languages and system software, may be added to the central processor. It consists of a new set of instructions for data manipulation, data conversion, decimal arithmetic, and editing. System processors like ASCII COBOL, PL/I, DMS 1100 and PLUS coded compilers have been modified to utilize the new instructions. Transition oriented data base/data communication processing and batch oriented business application should see improvement. However, performance gains will vary with the characteristics of the customer's processing mix.

An optional Performance Monitor feature provides a CPU with the capability to collect system profile hardware data and software performance data. The hardware data will provide utilization of individual hardware modules such as CPU busy and individual I/O channel activity, as well as interdependencies between them. The software related data will provide system or user software state information. Software utilities are provided to reduce the data collected and generate reports designed to assist in tuning a system for maximum performance.

## The Input/Output Unit (IOU)

The 1100/60 IOU controls all transfers of data between the peripheral devices and main storage. Transfers are initiated by the CPU and executed by the IOU under a special channel program control. The IOU includes independent control paths to the CPU and data transfer paths to main storage. Input/Output is through either byte channels, or word channels. The basic IOU contains one block multiplexer channel, and one word channel module which contains four word channels. Expansion features allow the addition of either two additional block multiplexer channels and one word channel module, or two word channel modules and one block multiplexer channel. This provides a maximum channel capacity of either two block channels and twelve word channels, or three block channels and eight word channels.

## Buffer Storage

Buffer storage on the 1100/60 H models consists of 8192 words of high speed storage dedicated to interfacing its associated CPU with main storage. 1100/60 E models have 2048 words of buffer storage. This buffering of the interface between the CPU and main storage enables the system to achieve significantly higher performance.

## Main Storage

The 1100/60 Integrated main storage unit contains 524K words of semiconductor storage, expandable in increments of 262K words to a maximum of 1048K words per unit. Multiprocessor configurations may expand to 2096K words of integrated storage.

The 1100/60 external main storage unit contains 1048K words of semiconductor storage expandable in increments of 1048K words to a maximum of 4195K words per unit. 1100/61 C1 and C2 models can be configured with a maximum of one main storage unit. The 1100/61 E and H processors and all multiprocessor systems can be configured with 2 main storage units for a maximum main storage capacity of 8388K words.

## System Support Processor (SSP)

The SSP is a separate miniprocessor dedicated to performing support functions for the central processing complex. The principle functions of the SSP are to diagnose and maintain the central complex, handle the system console(s), and control partitioning of the system.

## The System Console

The system console of the 1100/60 consists of a UTS 20 CRT and a 200 character per second bi-directional printer. Up to three system consoles and one system maintenance console may be supported by each System Support Processor.

The 1100/60 partitioning capability may be used to electrically isolate a component or group of components for maintenance, or, in the case of multiprocesser systems, to divide the system into two operating entities.

Partitioning of central complex components (CPU, IOU, Buffer, Main Storage) is a standard feature of 1100/60 systems. Partitioning of peripheral subsystems is accomplished by adding optional partitioning features to the system.


### 3.3 SPERRY UNIVAC 1100/60 AVP SYSTEM

Your SPERRY UNIVAC VS/9 customer has a great deal invested in his system; time, money, experience and applications.

That's an investment that he wants to protect, because the alternative is both costly and disruptive. Even bargain-price hardware is no bargain if he has to suffer through the confusion and waste that is all too often involved in complete conversion.

The SPERRY UNIVAC 1100/60 Series Attached Virtual Processor (AVP) has been developed to protect his investment and avoid the waste of conversion.

The 1100/60 Series AVP offers a number of significant advantages to your VS/9 customer:

- It meets the need for increased functionality at the lowest possible cost.
- Its new, easy-to-use software can greatly improve data-access capabilities and productivity.
- It protects the investment in current hardware. He can continue to use all his existing peripherals on the AVP, or can elect to utilize the latest technology peripherals available with the 1100/60 Series.
- It protects his investment in current applications. As you know, all application programs have a finite life cycle, after which they must be extensively updated, or rewritten. The 1100/60 Series AVP will allow application programs to run their normal life cycle and when the time comes to resystematize, it can be done under OS 1100 instead of VS/9.
- AVP compatibility with present virtual system means no disruption to current data processing. Therefore your customer will not have to "freeze" all current application development because he is faced with an immediate conversion effort. Additionally, the resources that would normally be required to address the conversion are now available for other projects.

The AVP has been designed specifically to execute the VS/9 Operating System, running under the control of the 1100 Operating System. The system consists of a newly designed, Series 90 compatible processing unit operating in a multiprocessor environment with an 1100/60 Series processor. Application programs can be executed on the AVP without the need for modification.

With the AVP, your VS/9 customer has the opportunity to enjoy the benefits of the latest advances in architectural and circuit technology at the level of power and performance that will meet his present and projected needs. It gives him processing resources and functionality far beyond those available in VS/9 – resources and functionality that he can take advantage of according to his own timetable.

## Full Service Capability

To combine compatibility with increased functionality and power, the AVP system blends both Series 90 and Series 1100 hardware and software. As mentioned, VS/9 and OS 1100 operate separately and simultaneously in the system, except for input/output functions; the interface for these is provided by the 1100 control program called APCS (Attached Processor Control Software).

The AVP can be configured with any of the 1100/60 Series processors offered which provides a choice of processing levels to meet your customer's specific requirements.

## Communications Orientation

Remote access to the AVP can be provided with either the Multichannel Communications Controller (MCC) or the Distributed Communications Processor (DCP/40). Once again, your total communications environment is maintained. If more processing and storage capacity is needed the MCC and the complete terminal environment can be directly attached to the AVP and processing can be continued as before.

To expand the communications facilities, your customer should move to the DCP/40. It provides remote users with all the VS/9 facilities currently available and with the entire range of services and facilities available with OS 1100.

Thus, operating from a single remote terminal your customer can utilize existing VS/9 procedures, as before, or begin to use the new and expanded features provided by OS 1100. Now applications, delayed due to restrictive hardware capacity or software capabilities of the VS/9 system, can be implemented with the combined VS/9-1100 facilities made available by the AVP.

## AVP System Details

SPERRY UNIVAC's 1100/60 Attached Virtual Processing System is comprised of:
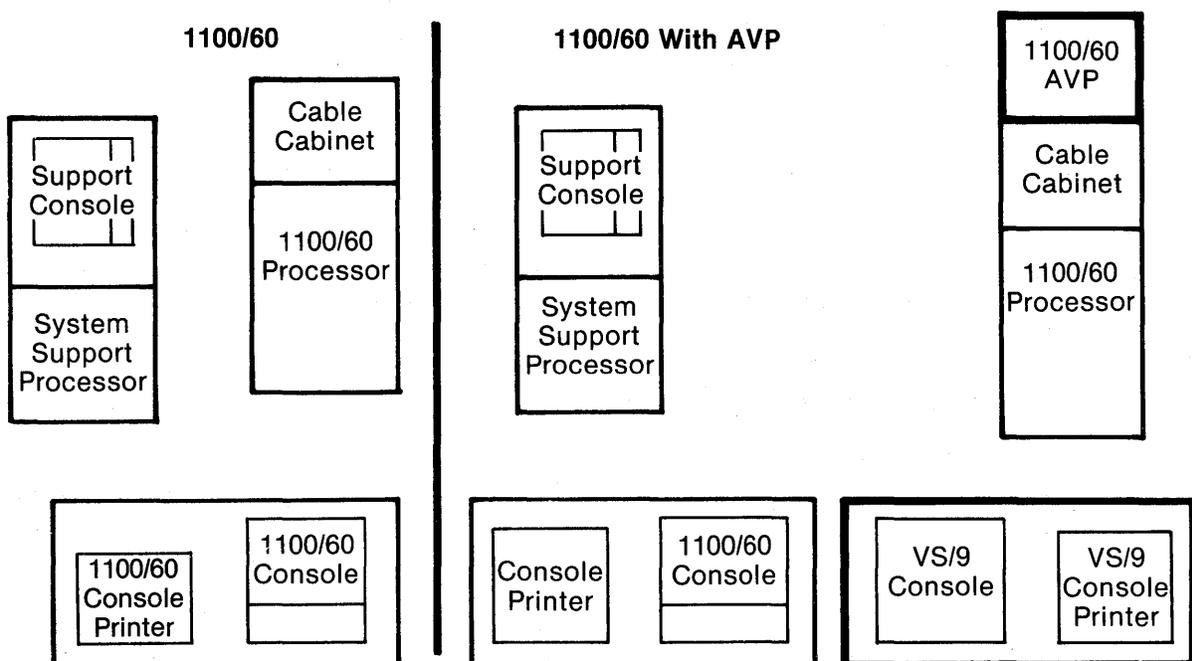
- Sperry Univac's newest 1100 central processor, the 1100/60
- A special design processing unit built to specifically handle VS/9 instructions and functions

## 1100/60 AVP Configuration
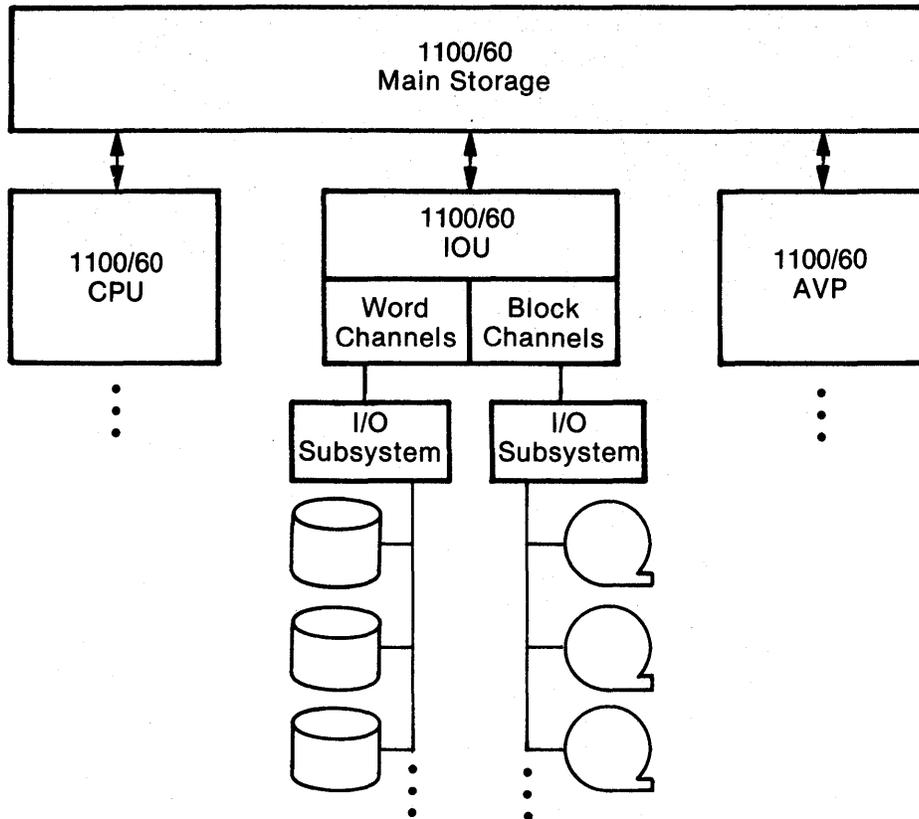


As the name implies, this AVP Processing unit obtains its main storage, I/O channel and device support from a standard 1100/60 central box and standard 1100 peripheral configurations.

**Functions Requiring Hardware in the Target System Have Remained as Hardware**

The Basic Design premise that Sperry Univac has elected to apply to this system is patterned after that used by the 90/80 emulation system. That is, *"Functions requiring hardware in the target (VS/9) system will remain as hardware."*

Thus, special function hardware in the AVP such as:

- Virtual Memory Addressing Mechanism
- Memory Protect
- CPU Hardware Timers are the logical duplicates of those same areas in the 90/80

## Motivations

The motivation behind this and other decisions can best be explained by:

- Performance (that is pure microcode/software support of these functions would yield large overheads)
- The least changed will require the least control

1100/60 AVP Configuration Detail
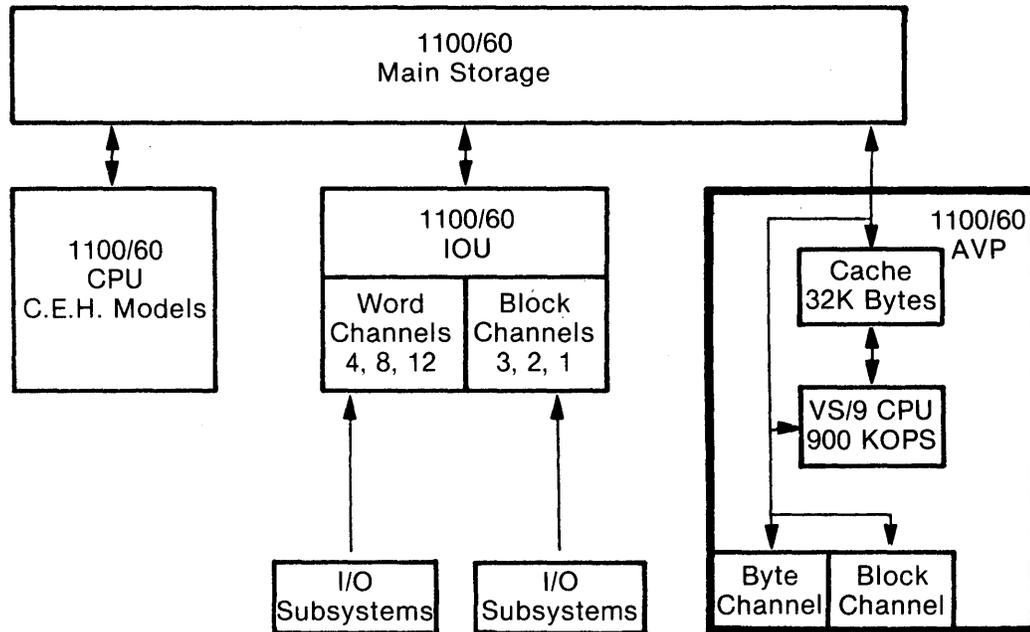


Extending these basic concepts still further:

- A 32K byte cache buffer is provided as standard hardware so as to minimize the occurrence of main storage access contention with the 1100/60 processor
- A local (internal to the AVP) byte mux channel is available to eliminate the more complex impact of VS/9 communications support
- An optional local block mux channel is also available to support special purpose non-Sperry Univac devices that may currently reside on 90/60-70, 80 systems

## 1100/60 AVP Conceptual Operation

1100/60 Main Storage Space
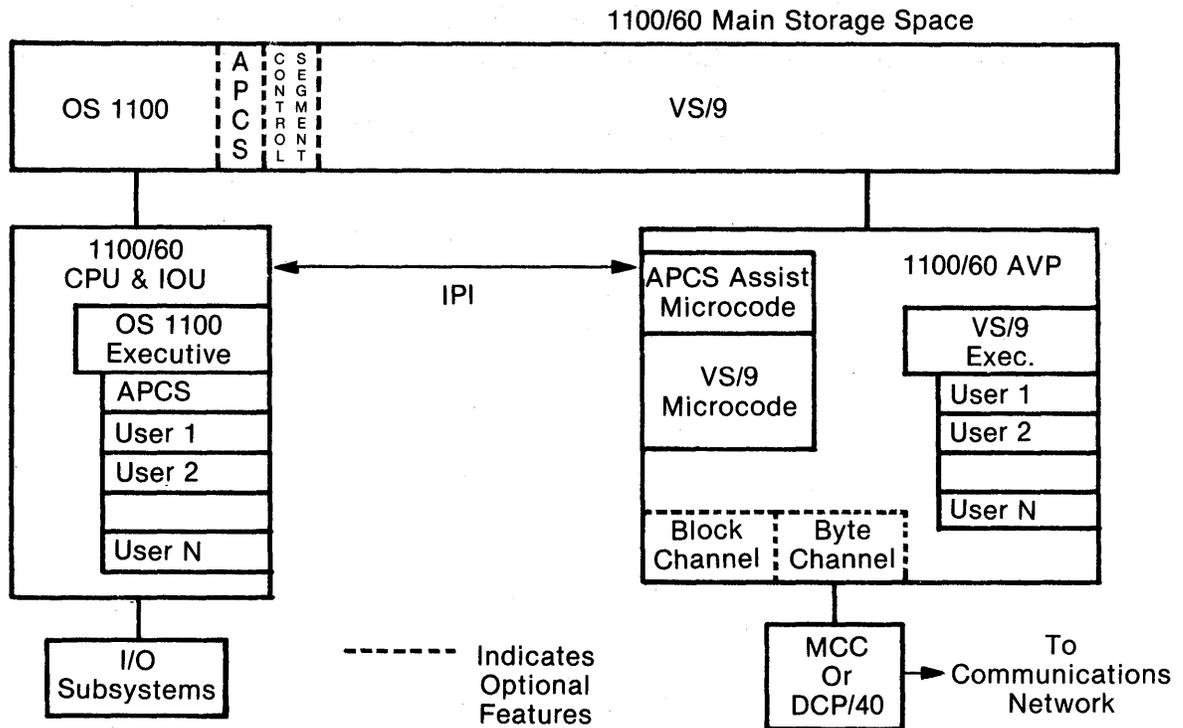


### 3.4 1100/80 HARDWARE OVERVIEW

**1100/80 Configurations**

The basic (entry level) 1100/80 consists of a central processor, Input/Output Unit, 4KW of buffer, 524KW of semiconductor backing store, a Systems Maintenance Unit, a Motor Alternator and a Transition Unit.

The basic 1100/80 Input/Output Unit comes with a byte mux channel, a block mux channel and a word channel module (4 word channels). No channel expansion is allowed without first upgrading the system to a standard 1100/81 (8KW buffer).

Backing store on the basic 1100/80 may be expanded by one 524KW expansion to a maximum of 1048KW in one storage cabinet. Further backing store expansion requires upgrade to a standard 1100/81.

A standard 1100/81 may be expanded to a maximum of 2096KW of backing store with an 8KW buffer. The buffer may be expanded to 12KW, allowing up to 3145KW of backing store; or 16KW, allowing up to 4194KW of backing store. Backing store may be expanded in 2096K word increments beyond 4194KW to a maximum of 8388K words.

An 1100/82 requires a minimum of 8KW of buffer storage and 1048KW of backing store. To achieve the full performance potential of an 1100/82, 16KW of buffer storage should be configured. With an 8KW buffer, a maximum of 2096KW of backing store may be configured. The buffer may be expanded to 12KW, allowing up to 3145KW of backing store; or up to 16KW, allowing a maximum of 8388KW of backing store.

An 1100/82 may also be configured as a two cluster system with a minimum of 24KW of buffer (12KW in each cluster) and 1572KW of backing store. With 24KW of buffer, the maximum backing store configuration is 3145KW. A two cluster 1100/82 may be expanded to 32KW of buffer, allowing up to 8388KW of backing store.

## 1100/80 CPU

The 1100/80 CPU is designed with ECL logic, built with MLP techniques, cycles at a 50 nanosecond rate, and efficiently timed to run instruction overlap with the buffer memory.

The CPU has the 1100 instruction set, the 1100 floating point instruction set, and the 1100 byte instruction set. Sperry Univac also makes available, on an optional basis, the 494 instruction set to be used with PROMEGA, and an optional Scientific Accelerator Module (SAM).

The 1100/80 has up to a four processor capability per system, and executes all of its instructions and fetches all of its data through interfaces with the buffer memory.

The Scientific Accelerator Module is a feature for 1100/80 Series Processors (Type 3032-00) which significantly increases the execution speed of floating point and certain fixed point arithmetic instructions.

This feature is field installable on any 1100/80 Series processor and requires no special software. Installation involves replacement of portions of the arithmetic section of the processor, and a power supply replacement.

The following table summarizes the instruction time for instructions enhanced by the SAM.

| Instruction | Standard 3032-00 | Enhanced 3032-00 (SAM) |
|---|---|---|
| Fixed Multiply | 1400 ns | 700 ns |
| Fixed Divide | 5555 | 1650 |
| Single Floating Add/Subtract | 700 | 400 |
| Single Floating Multiply | 1700 | 800 |
| Single Floating Divide | 4850 | 1450 |
| Double Floating Add/Subtract | 950 | 600 |
| Double Floating Multiply | 2350 | 1050 |
| Double Floating Divide | 9850 | 2550 |

The performance increase realized by a user of an 1100/80 with SAM(s) installed on the CPU(s) will vary considerably with the mix characteristics of the user. Business

environments will benefit very little (1–2% increase in System MIPS) from the SAM. Individual scientific programs with high usage of enhanced instructions should run 30–50% faster in a system equipped with SAM(s), and the overall MIP rate increase in a benchmark of programs with high usage of the enhanced instructions should be in the 10–15% range.

## 1100/80 IOU

The IOU processor receives its requests from the CPU, controls its channel operations through small efficient channel programs stored in memory, and receives and sends data only through a single interface with the buffer memory.

Each IOU is divided into a basic IOU and an IOU expansion. The basic IOU has four channel modules – three are provided with the unit and the remaining one is optionally chosen. The basic three channel modules are a byte mux channel, a block mux channel and a word channel. The optional module can be chosen as another byte mux, another block mux, or one of the 1100 word channel options.

The IOU expansion provides four more optionally chosen channel modules; any of the options can be selected – a byte mux, a block mux, or one of the word channel options.

A system console is included with each IOU. Each IOU interfaces one or two CPU's.

### Byte I/O

The byte I/O channel module is a new feature of the 1100/80. A byte mux transfers one byte-at-a-time, interleaving bytes from each unit record device such as a console, card reader, or a printer.

The capability for up to eight control units to be attached to each byte mux channel is provided. The transfer rate of the byte mux is up to 200 kilobytes/second.

The block mux transfers a block of bytes from each device, interleaving these blocks of data from each device such as tape and disks units.

The capability for up to eight control units to be attached to each block mux channel is provided. The transfer rate of the block mux is up to 1.5 megabytes/second. All of Sperry Univac's current byte-type disks and tape units can be connected directly to the block mux without the use of an MSA.

### Word I/O

SPERRY UNIVAC's 1100 word I/O has been extremely successful and was enhanced with the 1100/80.

Each word channel module is offered with four independent word channels – and each word channel is dedicated to a single control unit. This dedication allows us to offer a high access rate to the data base before queueing is noticed. The transfer rate of a word channel is up to 500K words per second.

The word channel also is useful for the 432/1782 drum subsystem that customers may wish to carry over to the 1100/80.

Sperry Univac is offering the 5046 and 5056 word control unit with their "intelligent" capability to provide our customers with a direct connection betwen byte-type disks and the word channels of the 1100/80.

Sperry Univac has chosen to bring the communications into the 1100/80 through the word channel module. The CTMC or the GCS will operate through the word module, as well as the C/SP and DCP devices.

## Storage

The 1100/80 main storage is made up of a backing storage and a buffer storage.

All programs and data are loaded into the buffer for execution. Essentially, four words at a time are fetched from the backing store into the buffer, where the buffer then allows the CPU to execute at its own rate.

This design runs most efficiently when a high percentage of the instructions needed by the processor are already loaded into the buffer from some previous use. The efficiency, in fact, varies from millisecond to millisecond, depending on this percentage. We call this percentage "hit rate" and refer often to the "hit rate" potential for certain programs running in certain environments.

Obviously any given program will vary in hit rate depending on the number of other programs simultaneously running in the mix. The buffer-backing storage linkage was designed with OS 1100 in mind and the software runs unchanged with regard to the buffer design.

As the buffer is enlarged from the basic configuration, an increase in hit rate will result because there are more buffer "slots" for instructions to reside inwaiting (or aging) for the next request from a CPU or an IOU.

As more CPUs and IOUs are added, more buffer is needed to offset the obvious increase in requesters. System studies as well as actual measurements substantiate the relationship of an 8K buffer per CPU for optimum system performance. The requirement for backing store is more application dependent, but the possibility of adding up to eight million words insures that the enormous processing power potential is not limited by the unavailability of storage.

The buffer storage is organized into four-word blocks with a corresponding 4-word wide path to backing storage so that a single fetch results in the transfer of all four words in a block at once, with 650 nanoseconds. Writes are accomplished on a single or partial word basis, as they occur.

## Console

The standard 1100 series console is used on the 1100/80 with modifications to allow a byte interface rather than a word interface to the IOU. A UNISCOPE 200 CRT is utilized on the 1100/80 system console.

The optional use of up to five additional printers is also allowed.

## ARM Components

Availability, reliability, and maintainability have been main design goals for the entire computer industry ever since the first commercial computer was sold by Sperry Univac.

The entire 1100/80 system, with its use of ECL logic and Sperry Univac's decision to use this logic well within its design parameters and margins, contribute to ARM.

The error correction capability in the memory, the computer aided design and the resultant multi-layered board construction, and, of course, the evolutionary changes in maintenance have all been included based on the need to increase ARM.

*Transition Unit*

The transition unit is the electronic heart of the system. All central components are interconnected through this device. The processors and I/O units send "heart beats" to this unit informing of their continued operation. Cessation of this periodic pulse can initiate an automatic re-boot of the system through a chosen I/O path. Back up paths are available should the first choice fail.

*Maintenance System*

A separate minicomputer facility is being used to perform maintenance on the 1100/80. This processing system monitors the CPU's and IOU's via a scan set network to read any of these registers, thus obtaining direct system information. The maintenance system can initiate diagnostic programs, evaluate their outputs, and perform maintenance on processors without the need for additional system memories, or can perform maintenance on memories without the need of system processors.

The successful TRACE interface is connected to the maintenance system and can be queried without the system being impacted.

*Motor Alternator*

Sperry Univac is supplying a 400 Hertz motor alternator to aid in the isolation of the system from the undesirable effects of minor surges and lapses.

## SAU/CTS

The efficiency of a very large scale Multiprocessing System depends on the flexibility of access to mass storage as well as main memory. Because both word and byte oriented peripherals are used with the 1100/80, a Subsystem Availability Unit (SAU) and Channel Transfer Switch (CTS) control access to peripherals on their respective channel types, and report status to the operating system.

## 3.5 1100/90 HARDWARE OVERVIEW

### Introduction

Sperry Univac's announcement of the 1100/90 System sets new standards for system performance, throughput, expandability and ARM (Availability, Reliability, Maintainability). The 1100/90 System is intended to provide a compatible growth path for current 1100 Series users, particularly for users of the 1100/80 System, but also for 1100/40 users and even some fast growing 1100/60 users. Providing a growth path means increasing functionality. The functionality improvements of the 1100/90 are obtained by changing or adding to the current 1100 Series architecture definition. The 1100/90 System design implements the most extensive architectural enhancements in the history of the 1100 Series.

The 1100/90 range of systems offers the 1100/80 user 3 to 4 times the performance for around 1.3 times the central complex price (when equivalent main storage is configured).

## Architectural Genealogy

```
                        1107
                         |
                         v
1965                    1108    ────▶  1106; 1100/10,20
                         |
                         v
1971                    1110    ────▶  1100/40
                         |
                         v
1976                    1100/80 ────▶  1100/60
                         |
                         v
1982                    1100/90
```
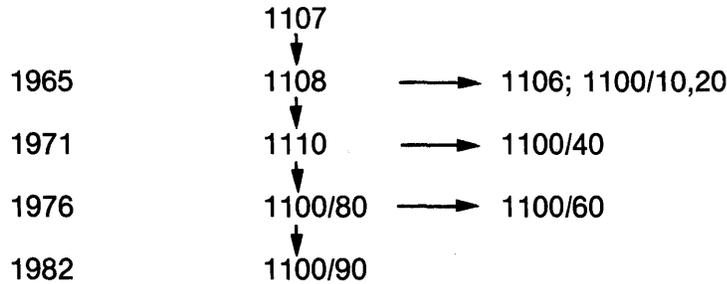
All of these systems down the main vertical line have been industry leaders in terms of performance, multiprocessing features and "mixed mode" processing capabilities.

OS 1100 binds these systems together into a compatible family, with each evolutionary step offering more features to improve performance, throughput and ARM. The 1100/90 system has made major improvements in ARM characteristics, far surpassing the 1100/80 system and even surpassing the advanced 1100/60 on a feature basis.

This leads to the following situation — the Business Batch performance improvement is 4 fold but the MIP rate improvement is 2.5 fold, and yet if the EIS is not taken advantage of (by not recompiling the programs), the performance improvement and the MIP rate improvement both become 3.2 fold. The 1100/91 is to be rated for competitive analysis at 7.5 MIPS.

## System Configuration

### Major Features of the 1100/90

| | |
|---|---|
| Instruction Processors | 1-4 (freestanding) |
| I/O Processors | 1-4 (freestanding) |
| Main Memory | 2MW-16MW (4 cabinets) |
| Cache Memory | 16KW integral to each IP |
| Maintenance Processor | SSP (freestanding) |
| Partitioning Control | SSP/SAU/BCTS |
| Cooling | IP Cooling Unit (freestanding) |

The high density logic packaging in the IP requires liquid cooling. A Processor Cooling Unit (PCU) provides the coolant circulation hardware, the heat exchanges for the transfer of heat from the cooling liquid to the customer's chilled water supply and the electronics to control the coolant level and temperature and various environmental status conditions. Each PCU has the ability to cool one or two IP's depending on the PCU model. For single processor systems, the "dual" model can provide a backup capability with automatic switch over. The IP is the only component that requires liquid cooling — all others are air cooled. Each IP has its own buffer (SIU in 1100/80) and a full 4X multiprocessing capability is part of the original design.

## Architectural Extensions

The architectural extensions implemented in the 1100/90 IP are the most extensive in the 1100 Series history. A full 15% of the IP logic is given to these architectural extensions. Collectively they are known as "extended mode". Initially the 1100/90 System will only support a compatible "basic mode" with extended mode features gradually being introduced into the software. Some changes are made to the instruction word format in extended mode to support the new features.

A major objective is to increase the user address space from the current limit of 262K words (18 bit addressing). This is achieved in part by the use of 32 base registers, each of which can describe a 16 million word address segment. With 16 of these registers available to the user (the other 16 being for the EXEC) the active user address space is expanded to 268 million words of memory. 24 bit indexing is also defined, allowing indexing of up to 16 million words. The base registers are analogous to and compatible with the basic mode bank descriptor registers.

To assist with reducing software development costs and speed up the process, a Virtual Machine facility has been included to provide hardware support for the interpretive and testing environment. It is mainly intended to aid user program development and can also be used to debug new EXEC release levels. It enables the program under test to operate at close to machine speed rather than the large reduction in speed currently caused by FLIT. Finally, the "extended mode" includes a remap of the instruction repertoire, deleting some old unused instructions (but replacing any deleted with one of equal functionality) and adding new instructions to deal with stack control – an important feature of the extended architecture.

As with previous systems, our customers demand an easy transition path to the new features. A "basic mode" which is 1100/60 object code compatible (is equivalent to the 1100/80 except for replacing the byte instructions with the more efficient and comprehensive EIS) is provided from which system software and customer applications can gradually migrate to "extended mode". Note that "basic mode" also includes the UPI interface, replacing all I/O instructions, and the Virtual Machine Control facility.

In summary, the architectural extensions made with the 1100/90 will provide valuable assistance with the processing and operational needs of our customers over the coming years.

An optional hardware performance monitor is provided allowing system profile performance data to be collected which can be used to generate system utilization profiles and trends for user operational purposes. This data will provide an important complement to the system log and the SIP package and yet will require negligible system overhead.

## Main Storage Unit

Each MSU can have from 1 to 4 million words of storage and there can be up to 4 MSU cabinets in the system for a total of up to 16 million words. The 65K dynamic RAM storage chip is used. Within an MSU there are 4 independent memory banks and 4 way interleave is provided for optimum performance for the larger MP systems. Two way interleave is also provided for smaller MP systems. The MSU provides interfaces to all IPs, IOPs, and SSPs in the system, and includes the IP buffer update logic. It also includes a day clock, a maintenance exerciser, and the autorecovery timer.

**Input/Output Processor**

The IOP provides connectivity between peripheral subsystems and IP and memory. The IOP provides enough channels to satisfy maximum I/O performance to one IP and enough interfaces for redundant connections to all subsystems required for a second IP and IOP.

The IOP consists of a central control module and a variable number of channels modules with improved capacities as follows:

|  | 1100/90 |
|---|---|
| Word Channel Modules | 1–5 |
| Word Channels per Module | 8 |
| Bandpass per Module | 4M wps |
| Block Multiplexer Channel Modules | 1–6 |
| BMCs per Module | 4 |
| Bandpass per Module | 5.5 MB/sec |
| Byte Multiplexer Channel | — |
| IOP Transfer Rate (max.) | 37.5M wps |

There are 1 to 4 IOPs in a system, and each provides interfaces to all IPs, MSUs, and SSPs, providing for a tightly coupled 4X MP configuration.

The block multiplexer channel satisfies the U.S. Government FIPS standard for I/O interface. ESI continues to be an option on word channels for GCS connection.

Four new capabilities are provided in the block multiplexer channel compared to the 1100/80 IOU:

- Status tabling to reduce the number of I/O interrupts
- Device path selection
- Busy control unit handling for file sharing
- Automatic sense data retrieval

**System Console**

The ergonomically improved UTS 20C is used as the system console display and attention has been placed on better overall functional capability and physical arrangement of the system console.

The basic console consists of a console controller, a modified UTS 20C display station, a keyboard and a system panel. Space is provided for a second UTS 20C without keyboard. The console and the various work surfaces come with either a sit height or a sit/stand height. The basic console has an 0798 200 CPS bidirectional console printer associated with it. It may be expanded by adding a third or fourth display and up to four auxiliary consoles each of which can consist of UTS 20C display, keyboard and 0798 console printer.

The console attaches to the system via the block multiplexer channel and an option permits dual channel connection.

The system panel allows the assignment of system components to one of the two possible system support processors (SSPs). It is also used to designate the IPL paths and provides indicators and audible alarms for indicating malfunctions or environmental conditions. The system panel works in conjunction with the System Console and the SSP to provide overall system control.

## System Support Processor (SSP)

The SSP consolidates the functions of the system maintenance unit (SMU) and system transition unit (STU) used in the 1100/80. The SSP is based on the BC/7-900 and offers more capacity and features than the 1100/60 SSP implementation, including larger memory and streaming tape/fixed disk rather than diskettes. The SSP provides a maintenance/control interface (MCI) to all IP, IOP, MSU and SAU (subsystem availability units). It has 24 MCIs available. Each 1100/90 system requires 1 SSP (2 for 1100/92 and upwards), and 2 are supported to provide a system backup as well as providing for independent applications. Since the console is connected via the IOP, and that various other control functions have been made part of components other than the SSP, a failure in the SSP will not result in an overall systems stop.

## Subsystem Access Unit (SAU)

The optional SAU is functionally the same as the SAU supported on the 1100/80 with the major difference being that the SAU responds to commands issued from the SSP rather than having manual switches (this is akin to the 1100/60 SSP-SAU interface). The SAU performs subsystem partitioning functions which consists of enabling/disenabling SPI (shared peripheral interface) and BCTS (byte channel transfer switch) ports.

A further enhancement to the SAU is a multiple SSP interface which allows for configuring at the site level for users of multiple systems whereby peripheral sharing and partitioning can be accomplished across all the systems.

## Subsystem Power Controller (SPC)

This is a new optional component which performs the remote power control function for control units connected to given IOP. Each IOP has a single SPC interface and when the IOP is DC powered on, the SPC correspondingly powers on and proceeds to sequentially power on all control units connected to the IOP. Since each SPC is dedicated to a single IOP, a maximum of 4 SPCs can be configured in an 1100/90 system.

## Availability, Reliability, Maintainability (ARM)

The 1100/90 has the most advanced ARM characteristics of any 1100, far surpassing the 1100/80 and even the more recent 1100/60. A goal of the design was to achieve 100% through-checking. Through-checking is the detection of any single bit error in the data path. This goal is achieved in all the central complex units. Not only is the data path checked, but a singificant percentage of the control logic is also checked. A variety of techniques are used, including parity, error correcting codes and duplication with comparison.

Stall detection is also provided for all central complex units to prevent stall or stop due to control logic failure. All will have the capability to report an error once detected.

It is also possible to test the error detection logic by setting any detector to the state it would assume if an error had occurred. This is called error injection and is a function of the SSP. After a failure has been detected, it is possible to logically remove the faulty component. This capability is called fault tolerance and includes SECDED (single-bit error correction, double-bit error detection) codes for main storage in the MSU and the IOP control and local store.

Concurrent maintenance can be performed on multiprocessor systems by making maintenance a partitioned application.

Instruction retry is also implemented in the IP, whereby errors that occur during fetch cycles can be retried. Certain interface errors are also retryable. Should an error occur in the IP buffer the logic will automatically remove the failing area of the buffer from use. This feature is referred to as palliative degradation.

All of these features will allow the system to continue operation despite the presence of a failed component providing the component is covered by such fault tolerance features. Once an error has been detected, it is important to quickly determine which component is faulty. Error detection will generally locate the error to within 10 to 20 chips. There are over 250 individually reported error detectors within the IP. Further isolation is provided by "in unit card test" from the SSP. Scan compare, which is used to compare a machine's state to a known good one, is achieved by the USC which is much faster than the SSP and makes this maintenance function more useful.

Various ease of installability features are used to achieve an installation time goal of 3 days or less for a minimum system, and 6 days or less for a maximum systems.

### Physical, Environmental and Power

The 1100/90 central complex components will operate from a 400 Hz power source, either Sperry Univac or customer supplied. The motor alternator of the 1100/80 could power the 1100/90 as well if it has sufficient KW. The 1100/90 will allow an uninterruptable power supply (UPS) to be used at the customer's discretion.

Spacing savings on the floor layout are mainly related to not needing the freestanding SIU space of the 1100/80 since the buffer is an integral part of the 1100/90 IP. The use of 64K-bit chip for memory in the MSU also contributes to some space saving. The IPCU for cooling has to be within 50 feet of the IP.

Naturally, the fact that the IP is liquid cooled means that the air cooling requirements for the system are reduced for the 1100/80.

### Peripheral Carry Over

In general, all peripherals currently usable with the 1100/80 can be carried over to the 1100/90 or shared between them in cases of mixed sites. This is because the IOU and IOP are fundamentally the same on the peripheral side. No modifications are needed to peripherals being carried forward or shared.

# 4 PERIPHERAL CAPABILITIES

Peripheral subsystems attached to Series 1100/60, 1100/80, and 1100/90 systems are through the Input/Output Unit (IOU) on byte, block, or word channels.

The standard Series 1100 peripheral subsystems to be emphasized for new system sales include:

| | | IOU Channel Interface | | |
|---|---|---|---|---|
| Type | Subsystem | 1100/60 | 1100/80 | 1100/90 |
| • Disk | 8430/8433/8450/8470/8480 | Word | Word | Word |
| | Cache/Disk | Word | Word | Word |
| • Diskette | 8407 Auto Load Diskette | — | — | Block |
| • Tape | UNISERVO 14 | Block | Block | Block |
| | UNISERVO 22 & 24 | Block | Block | Block |
| | UNISERVO 30 Group | Block | Block | Block |
| • Paper | 0716 Card Reader (optional on 1100/60 systems) | Block | Byte | Block |
| | 0770 Printer and/or | Block | Byte | Block |
| | 0776 Printer | Block | Byte | Block |
| | 0777 Printer | Word | Word | Word |
| • Communications Interface (host controlled) | General Communication Subsystem (GCS) | Word | Word | Word |

Refer to the Series 1100 Configuration Guide to identify the requirements for interfacing older and/or destandardized peripheral subsystems.


## 4.1 DISK SUBSYSTEMS

### 8430/8433/8450/8470/8480 Disk Subsystem

Sperry Univac offers five disks with the ability to intermix these disks on a single subsystem. This disk subsystem gives the customer a choice of efficient ways to substantially increase throughput. In addition, provisions for incremental growth allow the customer to expand his potential disk capacity.

Features of the 8430/8433/8450/8470/8480 Disk Subsystem include:

- IMPROVED SYSTEMS PERFORMANCE

  *Rotational Positioning Sensing* – This subsystem provides Rotational Position Sensing (RPS) in the seek operation. The control unit will receive a six byte address and one byte of sector information fromt he channel. The control unit will seek the proper device and head and present device end when the proper angular position is reached. If the channel does not respond, the control unit will present status on subsequent revolutions. RPS allows the channel and control unit to be released during most of a record search time, thereby increasing their availability for other operations. The RPS byte defines one of 128 sector positions around the circumference of the disk pack.

  *High Capacity* – The 8480 and 8470 subsystems provide a non-removable disk device which is equivalent to the largest provided in the industry. For the 8470 there is multiple device attachment of smaller removable disk and optional fixed head features to provide extra performance, better modularity, and granularity.

- ENHANCED RELIABILITY

  *Error Correction Code* – As data is transferred from the channel to disk storage via a write operation the Control Unit computes 7 bytes of error correction code and writes them on the track after each Count, Key and Data Field of the record. This information is used by the Control Unit to check the validity of the data during read operations. If an error is detected and determined to be correctable the proper information is sent to the processor where in the data is corrected.

  *Enhanced Command Retry* – The subsystem provides a powerful tool in having the capability of allowing command retry recovery to be interspersed with other I/O operations of a like priority. Thus, a batch program that encounters an error will not tie up the channel in recovery attempts causing real time or higher priority I/O requests to be delayed. For example, during the command retry sequence the control unit can select various head offsets to accomplish data recovery from marginal conditions. These recovery attempts are limited to one revolution to allow the channel, control unit and disk unit to become free for higher priority work.

- INCREASED AVAILABILITY

  *Dual Access Subsystem* – All Sperry Univac disk units may be configured as Dual Access Subsystems. By adding a second control unit and the appropriate dual access features for the disk subsystems, the user will open a second data path to his main storage subsystem thus improving the effectiveness of his I/O operations. The second data path is also a desirable feature for multiprocessor systems which require an alternate data path ensuring the availability of that information to either host processor. An additional benefit of the dual access subsystem is a contingency data path in the unlikely event of a control unit failure.

*Storage Control Unit*

The 5056 Storage Control Unit is a high performance microprogrammed unit available to interface with 8470 Disk Storage Subsystem. This control can intermix 8430, 8433, 8450, 8470, and 8480 disk drives.

For those users whose applications demand both speed of access and large capacity, they may intermix the disks to gain for their system the optimum flexibility.

One 5056 Storage Control Unit, configured with appropriate features, can attach:

- Up to thirty-two 8470 Disk Drives or up to thirty-two 8450 Disk Drives.

- Up to sixteen 8470 or 8450 and up to sixteen 8430 and/or 8433's.

- Up to eight 8480 cabinets. (Four drives per cabinet).

Data is transferred between the processor and the subsystem at rates up to:

- 806,000 bytes/second for the 8430/8433

- 1,260,000 bytes/second for the 8450

- 2,098,000 bytes/second for the 8470 and 8480

By the addition of a second control unit, the subsystem can be configured as Dual Access. This allows a second path to data, and is particularly useful for systems with a high input/output requirement and in multiprocessing computing environments.

*Storage Control Unit Buffer*

A channel buffer is provided in the channel interface section of the 5056 SCU to compensate for the typical variations in data transfer rate that can be maintained by 1100 Systems channels. The buffer contains storage for 1024 36-bit words of input/output data word transfers.

# General Characteristics of
## SPERRY UNIVAC 8430/8433/8450/8470 Disk Subsystem

| CHARACTERISTIC | 8430 | 8433 | 8450** | 8470** | 8480 |
|---|---|---|---|---|---|
| Cabinets per subsystem | 2-16 | 2-16 | 2-32 | 2-32 | 2-8 |
| Disk packs per cabinet | 1 | 1 | 1 | 1 | 4 |
| R/W head-accessor mechanisms | 1 | 1 | 1 | 1 | 1 |
| R/W heads per disk pack | 19 (one per surface) | 19 (one per surface) | 30 (two per surface) | 32 (two per surface) | 32 (two per surface) |
| Tracks per disk surface | 411 | 815 | 1120 | 1250 | 1250 |
| Recording surfaces per disk pack | 19 | 19 | 15 | 16 | 16 |
| Addressable tracks per surface | 404 (plus 7 spares) | 808 (plus 7 spares) | 555 (plus 5 spares) | 625 (plus 5 spares) | 625 (plus 5 spares) |
| Addressable tracks per disk pack | 7,676 (plus 133 spares) | 15,352 (plus 133 spares) | 16,650 (plus 150 spares) | 20,000 (plus 160 spares) | 20,000 (plus 160 spares) |
| Words per record (36-bit) | 112 | 112 | 112 & 448 | 112 & 448 | 28, 56, 112 & 448 |
| Records per track | 20 | 20 | 29 & 9 | 40 & 14 | 73, 58, 40 & 14 |
| Capacity per disk pack (36-bit words)* | 17,194,240 | 34,388,480 | 54,079,200 or*** 67,132,800 | 89,868,800 or*** 125,816,000 | 358,400,000 or*** 501,760,000 |
| Minimum access time (milliseconds) | 7 | 7 | 4 | 4 | 4 |
| Average access time (milliseconds) | 27 | 30 | 23 | 23 | 23 |
| Maximum access time (milliseconds) | 50 | 55 | 46 | 46 | 46 |
| Disk pack speed (rpm) | 3,600 | 3,600 | 3,600 | 3,600 | 3,600 |
| Data transfer rate (per second) | 806,000 bytes 179,111 words | 806,000 bytes 179,111 words | 1,260,000 bytes 280,000 words | 2,097,000 bytes 466,000 words | 2,097,000 bytes 466,000 words |
| Dual access feature | Available | Available | Available | Available | Available |

*Simulated FASTRAND Drum Mode.
**Fixed head option available in additon to the movable storage, 54 tracks plus 6 spares at 8.3ms access (minimum).
***112 or 448 word prep factor.

**Cache/Disk Systems**
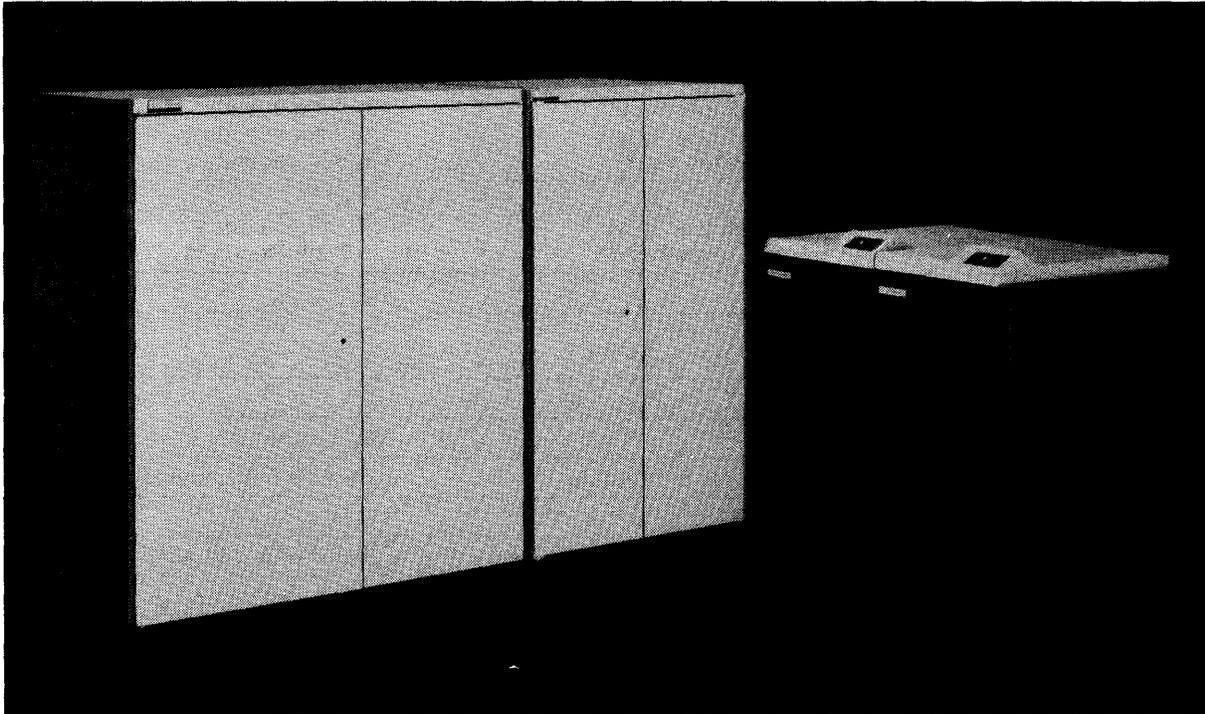


The SPERRY UNIVAC Cache/Disk System is a mass storage subsystem that for most applications will provide the host computer system with extremely fast response to mass storage Input/Output requests. The cache/disk system uses both disk storage and solid state storage to provide rapid access to a large quantity of online data storage. The cache/disk system can be used in three different modes of operation: cache/disk, solid state disk, or a combination of both depending upon specific user requirements. A microprogrammed control processor directs the flow of data between disk units and the main storage of the host Series 1100 System, using the cache as an intermediate high-speed buffer.

The cache/disk system includes a 5057 Cache/Disk Processor (microprogrammed control processor), a 7053 Storage Unit (used for cache or solid state disk), and the large capacity 8480, 8470 and/or 8450 Disk Units. A basic system can have up to four 8480 disk cabinets, eight 8470 Disk Units and eight 8450 Disk Units. Optional features are available to run 16 disk units of a single type. Up to four 7053 Storage Units of 3.6K words (16.5 megabytes) each are available for cache. This provides a maximum cache capacity of 14.4 million words (66 megabytes) using four 7053 Storage Units.

SPERRY UNIVAC Cache/Disk System
System Performance Characteristics

| | |
|---|---|
| I/O to solid state disk service time | Less than 0.2 ms plus data transfer time |
| I/O hit in Cache Service Time | Less than 1 ms plus data transfer time |
| I/O miss in Cache Service Time | Less than 2 ms plus disk seek time, latency and data transfer time |

## SPERRY UNIVAC Cache/Disk System
## 8450/8470 Disk Units Characteristics

| | 8450 Disk Unit | 8470 Disk Unit |
|---|---|---|
| Positioning time:<br>  Minimum<br>  Average<br>  Maximum | 4 milliseconds<br>23 milliseconds<br>46 milliseconds | 4 milliseconds<br>23 milliseconds<br>46 milliseconds |
| Rotational Latency Time:<br>  Average<br>  Maximum | 8.3 milliseconds<br>16.7 milliseconds | 8.3 milliseconds<br>16.7 milliseconds |
| Number of recording disks | 8 | 9 |
| Number of recording surfaces | 15 | 16 |
| Number of recording heads | 30 | 32 |
| Tracks per cylinder | 30 | 32 |
| Cylinders per disk unit | 555 plus 5 alternate | 625 plus 5 alternates |
| Tracks per disk surface | 1,120 | 1,260 |
| Tracks per disk unit | 16,650 plus 150 alternates | 20,000 plus 160 alternates |
| Fixed head tracks (optional)* | 54 plus 6 alternates | |
| Data capacity, movable heads (448 word prep):<br>  Track<br><br>  Cylinder<br>  Disk unit<br><br><br>  Maximum capacity<br>  (16 disk units) | 4,032 words (18,144 bytes)<br><br>120,960 words (544,320 bytes)<br>67,132,800 words (302,497,800 bytes)<br><br>1,074,124,800 words<br>(4,833,561,600 bytes) | (Not available for cache/disk mode.) |
| Data capacity, movable heads (1792 word prep):<br>  Track<br><br>  Cylinder<br><br>  Disk unit<br><br>  Maximum capacity<br>  (16 disk units) | (Not available for cache/disk system use.) | 7,168 words (32,256 bytes)<br><br>229,376 words (1,032,192 bytes)<br><br>143,360,000 words (645,120,000 bytes)<br>2,293,760,000 words<br>(10,321,920,000 bytes) |
| Data capacity, fixed heads (optional)*<br>  448 Word prep<br>  1792 word prep | 217,728 words (979,776 bytes)<br>(Not available for cache/disk system use.) | |
| Data transfer rate | 280,000 words per second<br>(1,260,000 bytes per second) | 467,000 words per second<br>(2,097,000 bytes per second) |

NOTES:
* Fixed head feature on 8470 Disk Units is not available with the 1100/80 System.
1. Prepping 8470/8450 Disk Units operating in a non-cache mode via the 5057 Cache/Disk Processor is the same as for any fixed disk, i.e., allowable prep sizes are 28, 56, 112, and 448 word/record.
2. 8470 fixed disk prepped removable can be prepped 448 words or 1792 words. 8450 fixed disk prepped removable can be prepped 448 words.

| Data segment | 1792 words (8064 bytes) |
|---|---|
| Segments per module | 512 |
| Number of words per module | 512 x 1792 words = 917,504 words (4,128,768 bytes) |
| Number of words per 7053 unit | 4 x 917,504 words = 3,670,016 words (16,515,072 bytes) |
| Data transfer rate | 1.1 million words per second (5 megabytes per second) |
| Error detection and correction | Double-bit error detection and single-bit error correction |
| Number of words per subsystem* | 4 x 3,670,016 words = 14,680,064 words (66,060,288 bytes) |

*Maximum capacity in SSD mode is 13,762,560 words (61,931,520 bytes)

## 4.2 8407 DISKETTE SUBSYSTEM

Fully automatic diskette loading, operational flexibility and uncompromising performance mark the caliber of the SPERRY UNIVAC 8407 Diskette Subsystem. Capable of a feeding rate of up to 12 diskettes per minute (not including data transfers), the 8407 automatically senses the type of diskette (single-sided recording or double-sided recording) and the recording mode (single-density or double-density) when the diskette is in the single read/write drive. Once that determination is made, the 8407 configures the subsystem for that diskette, communicates the configuration to the host interface, and is ready to write, read or move diskette on command.

The 8407 has one input bin and one output bin for up to 20 diskettes each. The unattended capacity of the 8407 therefore ranges from 5MB, when using only single-sided, single-density diskettes, to 20MB, when using only double-sided, double-density diskettes. Intermediate capacities are possible when diskette types are intermixed.

In addition to industry-standard modes of diskette recording, the 8407 offers a Spiral Format mode. In this mode, each logical track in a succession of contiguous tracks is time-offset from its adjacent tracks to permit a nearly continuous sector stream as the read/write head is stepped from one track to the next. This technique avoids the full rotation latency inherent in standard recording schemes, and results in a significant increase in the track transfer rate for some sequential applications.

The 8407 enhances host system performance by performing such functions as alternate track assignment, read/write retry, and data set label analysis. The combination of those functions along with resident diagnostics and constant error checking throughout the logical circuits of the machine provides many hours of minimum attention and productive operation.

**Functional Characteristics**

- Input Hopper: 20 Diskettes
- Output Hopper: 20 Diskettes
- Diskette Drive: 1 Diskette
- Load/Unload time per diskette:
  - 60 Hz: 5 Seconds
  - 50 Hz: 6 Seconds
- Access Time (loaded diskette):
  - Minimum: 18 ms
  - Average: 175 ms
  - Maximum: 327 ms
- Head Motion Time:
  - Track to track: 3 ms
  - Settling: 15 ms
  - Loading: 50 ms
- Diskette Rotation:
  - Rate: 360 rpm
  - Latency:
    Average: 83 ms
    Maximum: 167 ms
- Diskette Rotation:
  - Rate: 360 rpm
  - Latency:
    Average: 83 ms

    Maximum: 167 ms
- Recording Formats:*
  - Tracks: 74 usable (2 spares) per side all formats
  - Single-sided, single-density:
    26 sectors/track; 128 bytes/sector
  - Single-sided, double-density:
    26 sectors/track; 256 bytes/sector
  - Double-sided; double density:
    26 or 15 sectors/track; 256 or 512 bytes/sector respectively
- Data transfer rate:
  - Single-density: 31.25 KB/sec. burst
  - Double-density: 62.5 KB/sec. burst

*Spiral format technique may be used with any of the recording formats.

## 4.3 UNISERVO MAGNETIC TAPE SUBSYSTEMS

Three UNISERVO Magnetic Tape Subsystems should be emphasized for new systems sales. These include:

- UNISERVO 14 Magnetic Tape Subsystem
- UNISERVO 22 and UNISERVO 24 Magnetic Tape Subsystems
- UNISERVO 30 Group Magnetic Tape Subsystems

### UNISERVO 14 Magnetic Tape Subsystem

The UNISERVO 14 Magnetic Tape Subsystem contains a basic cabinet which houses a control unit and two tape units capable of 9-track phase encoded recording at a density of 1600 bits per inch (bpi). A maximum subsystem configuration contains one basic cabinet and three auxiliary cabinets, with eight tape units. Each auxiliary cabinet always provides the distribution circuits for either one or two tape units. The subsystem can intermix recording modes provided the appropriate optional features are included. The dual density version permits 9-track phase encoded (PE) and non-return-to-zero-inverted (NRZI) recording at densities of 1600 bpi for PE and 800 bpi for NRZI when this feature is included. Also, 7-track NRZI recording at densities up to 800 bpi can be added when this feature is included.

Industry-new features incorporated into the standard UNISERVO 14 Magnetic Tape Subsystem include: the automatic load and threading features, and the capability of loading from either the standard reel or wraparound cartridge.

### UNISERVO 22 and UNISERVO 24 Magnetic Tape Subsystem

The UNISERVO 22 and UNISERVO 24 Magnetic Tape Subsystem contains a basic cabinet which houses a control unit and two tape units capable of dual density 9-track phase encoded recording at a density of 1600 bits per inch (bpi) and 9-track non-return-to-zero (NRZI) at a density of 800 bits per inch (bpi). A maximum subsystem configuration contains eight tape units in four cabinets. The subsystem can intermix UNISERVO 22 and UNISERVO 24's via the same control unit which is housed in the basic tape cabinet. Dual density permits 9-track phase encoded (PE) and non-return-to-zero-inverted (NRZI) recording at densities of 1600 pbi for PE and 800 bpi for NRZI.

Industry-new features incorporated into the standard UNISERVO 22 and 24 Magnetic Tape Subsystem include: the automatic load and threading feature, and the capability of loading from either the standard reel or wraparound cartridge.

This subsystem may be operated on the 1100/60 System in conjunction with paper handling peripherals. The subsystem will offer a dual channel feature and a second optional control module for dual access operation.

### UNISERVO 30 Group Magnetic Tape Subsystems

The UNISERVO 30 Group Magnetic Tape Subsystems consist of the UNISERVO 30, UNISERVO 32, UNISERVO 34, and UNISERVO 36 Magnetic Tape Units. A subsystem consists of 1 or 2 control units and from 1 to 16 magnetic tape units. A subsystem can be a mixture of UNISERVO 30, 32, 34, or 36 Magnetic Tape Units.

Control unit optional features include: dual channel operation, dual access, 9-track NRZI recording, 7-track NRZI recording, or 7- and 9-track NRZI recording, and 7-and 9-track translators. The following guidelines apply:

- Up to eight tape units may be connected to each control unit.
- Multiaccess is provided by two control units per subsystem.
- A maximum of 16 tape units per subsystem.

The UNISERVO 30 Magnetic Tape Unit records data at 200 inches per second on 9 tracks in NRZI mode at 800 bits per inch, and on 9 tracks in PE recording mode at 1600 bits per inch. A different version of this drive provides data recording at 200 inches per second on 7 tracks in NRZI mode at 200, 556, or 800 bits per inch, in lieu of 9-track 800 bits per inch NRZI and 1600 bits per inch PE recording.

The UNISERVO 32 Magnetic Tape Unit records at 75 inches per second on 9 tracks in PE mode at 1600 bits per inch, and on 9 tracks in GCR mode at 6250 bits per inch.

The UNISERVO 34 Magnetic Tape Unit records data at 125 inches per second on 9 tracks in PE mode at 1600 bits per inch, and on 9 tracks in GCR mode at 6250 bits per inch.

The UNISERVO 36 Magnetic Tape Unit records data at 200 inches per second on 9 tracks in PE mode at 1600 bits per inch, and on 9 tracks in GCR mode at 6250 bits per inch.

**Features**

### UNISERVO Magnetic Tape Subsystems Characteristics

|  | UNISERVO 14 | UNISERVO 22 | UNISERVO 24 |
|---|---|---|---|
| Recording Density (PE) | 1600 bpi | 1600 bpi | 1600 bpi |
| (NRZI) | 200, 556, 800 bpi | 800 bpi | 800 bpi |
| Transfer Rate (PE) | 96,000 fps | 120,000 fps | 200,000 fps |
| (NRZI) | 12,000, 33,360, 48,000 fps | 60,000 fps | 100,000 fps |
| Tape speed | 60 ips | 75 ips | 125 ips |
| Tape width | 0.5 inch | 0.5 inch | 0.5 inch |
| Tape length (max.) | 2400 feet | 2400 feet | 2400 feet |
| Block length | Variable | Variable | Variable |
| Interblock gap | 0.75 inch (7-track) 0.6 inch (9-track) | 0.6 inch (9-track) | 0.6 inch (9-track) |
| Interblock gap time (7-track) | 17.0 ms (nonstop) 25.0 ms (start/stop) | — | — |
| Interblock gap time (9-track) | 7.0 ms (nonstop) 12.6 ms (start/stop) | 8.0 ms (nonstop) 10.0 ms (start/stop) | 4.8 ms (nonstop) 7.7 ms (start/stop) |
| Rewind time | 3 minutes (2400 feet) | 2 minutes (2400 feet) | 2 minutes (2400 feet) |
| Dual density | Feature available | Standard | Standard |

Legend:
  bpi = bits per inch
  bps = frames per second
  ips = inches per second

## UNISERVO Magnetic Tape Subsystems Characteristics

| | UNISERVO 30 | UNISERVO 32 | UNISERVO 34 | UNISERVO 36 |
|---|---|---|---|---|
| Recording density (PE) | 1600 bpi | 1600 bpi | 1600 bpi | 1600 bpi |
| (NRZI) | 200, 556, 800 bpi | — | — | — |
| (GCR) | — | 6250 bpi | 6250 bpi | 6250 bpi |
| Transfer rate (PE) | 320,000 fps | 120,000 fps | 200,000 fps | 320,000 fps |
| (NRZI) | 40,000, 111,200, 160,000 fps | — | — | — |
| (GCR) | — | 468,750 fps | 781,250 fps | 1,250,000 fps |
| Tape speed | 200 ips | 75 ips | 125 ips | 200 ips |
| Tape width | 0.5 inch | 0.5 inch | 0.5 inch | 0.5 inch |
| Tape length (max.) | 2400 feet | 2400 feet | 2400 feet | 2400 feet |
| Block length | Variable | Variable | Variable | Variable |
| Interblock gap | 0.75 inch (7-track) 0.6 inch (9-track) | 0.3 inch (6250 bpi) 0.6 inch (1600 bpi) | 0.3 inch (6250 bpi) 0.6 inch (1600 bpi) | 0.3 inch (6250 bpi) 0.6 inch (1600 bpi) |
| Interblock gap time (7-track) | 3.75 ms (nonstop) 5.35 ms (start/stop) | — | — | — |
| Interblock gap time (9-track) | 3.0 ms (nonstop) 4.6 ms (start/stop) | 8.0 ms (nonstop) 10.4 ms (start/stop) | 4.8 ms (nonstop) 6.8 ms (start/stop) | 3.0 ms (nonstop) 4.6 ms (start/stop) |
| Rewind time | 45 seconds (2400 feet) | 1 minute (2400 feet) | 1 minute (2400 feet) | 45 seconds (2400 feet) |
| Dual density | Feature provided | Feature provided | Feature provided | Feature provided |

Legend:
bpi = bits per inch
fps = frames per second
ips = inches per second

Features of UNISERVO Magnetic Tape subsystems include:

- *Enhanced Reliability*

  "On the fly" error correction is standard for GCR mode and PE tapes. On 9-track NRZI tapes, single-track read error correction is provided by a second attempt of an operation after error detection and repositioning. This provides the ability to correct errors in either the forward or backward direction. This simplifies the error correction programming routines and assists in the recovery of unusual error conditions which otherwise would result in a nonrecoverable error. A programmable low gain read assists in the reading of tape records containing high noise levels.

- *Increased Availability*

  Two basic methods of operation are available. These methods of operation are:

  - Nonsimultaneous (single channel operation) – In this method of operations, one or more tape units are connected to a single I/O channel through the appropriate control unit. Only one function on one tape unit may be active at any single instant.
  - Simultaneous Dual Access Operation (two channel operation) – In this method of operation, two or more tape units are connected to two I/O channels through two control units. Two functions on any two tape units may be active at the same time.

## 4.4 PAPER PERIPHERAL SUBSYSTEMS

### 0716 Card Reader Subsystem

The 0716 Card Reader Subsystem includes a self-contained control unit and synchronizer that regulates flow of data and control signals to and from the reader mechanism. This unit, optional on the 1100/60, interfaces to the 1100/60 systems via a Block Multiplexer and the 1100/80 via a Byte Multiplexer channel.

The 0716 Card Reader Subsystem operates at a rate of 1000 cards per minute on a column-by-column basis. The read-check feature is standard to ensure correct input. Information read from the card is transferred to the processor in either image mode or translate mode, which includes EBCDIC, ASCII, or compressed code. Image mode and selection of any one of the translate modes are standard features. The optional dual translate feature permits an additional selection from the two remaining choices offered by the translate mode. A validity check feature checks for multiple punches in rows one through seven.

Two output stackers provide the means for error selection as a standard feature in addition to the capability of stopping on error. An optional feature, alternate stacker fill, provides the capability of stacking 4000 cards: when stacker A is filled, the reader automatically begins to fill stacker B. The stop-on-error feature may be used with alternate stacker fill. The stacker carousel wheel decelerates and stacks the cards at a rate which maximizes card handling care.

### SPERRY UNIVAC 0716 Card Reader Subsystem Characteristics

| | |
|---|---|
| Card reading speed | 1000 cards per minute |
| Input hopper capacity | 2400 cards |
| Output stacker capacity | 2 stackers – 2000 cards each |
| Read modes | Image Mode:<br>   160 6-bit characters per card<br>Translate mode:<br>   EBCDIC – 80 characters per card<br>   ASCII – 80 characters per card<br>   Compressed code – 80 characters per card<br>   Fieldata – 80 characters per card |
| Features | Validity check<br>Alternate stacker fill<br>Dual translate<br>End of file<br>Read buffer (required) |

## 0770 Printer Subsystem

### SPERRY UNIVAC 0770 Printer Subsystem Characteristics

| | 0770-00 PRINTER SUBSYSTEM | 0770-02 PRINTER SUBSYSTEM | 0770-04 PRINTER SUBSYSTEM |
|---|---|---|---|
| Printing speed (single-line spacing) | 800 lpm – 48 character set 1435 lpm – 24 character set | 1400 lpm – 48 character set 2320 lpm – 24 character set | 2000 lpm – 48 character set 3000 lpm – 24 character set |
| Maximum forms slew rate | 50 inches per second | 75 inches per second | 100 inches per second |
| Characters per print cartridge | 384 | | |
| Print positions per line | 132 or 160 | | |
| Single line space time | 8.75 milliseconds | | |
| Horizontal spacing of characters | 10 per inch | | |
| Vertical line spacing | 6 or 8 lines per inch under program control | | |
| Form width | 3.5 to 22 inches | | |
| Form length | To 24 inches | | |
| Form advance control | Vertical format buffer under program control | | |

## 0776 Printer Subsystem

The 0776 Printer Subsystem is a medium speed, freestanding, self-contained unit that interfaces with the 1100/60 Systems via a Block Multiplexer and the 1100/80 Systems via a Byte Multiplexer channel.

The 0776 Printer Subsystem is a family of printers that feature an easily replaceable print band cartridge. The family is comprised of three printers that print at a rate of 760, 940 or 1200 lines per minute using a standard 48-character set and 136 print positions. Other character sets, including a 24-character set used for high speed numeric applications and a 177-character set used for international applications, are available. More than 20 standard print cartridges are available in up to four print fonts. The entire 0776 Printer subsystem repertoire of print bands are usable when the expanded character set control feature is installed. The character set is located on a continuous metal band which travels on a horizontal direction across the front of the printed form. This printing method assures optimum print quality through close control of print registration. The metal band contains 384 characters which are usually grouped in repeating arrays. For example, a 48-character set is repeated on the band eight times.

The print cartridge case serves as the means for the operator to remove and replace the character set used on the printer in a manner similar to operations performed with magnetic disk pack covers.

## SPERRY UNIVAC 0776 Printer Subsystem Characteristics

|  | 0776-00 PRINTER SUBSYSTEM | 0776-02 PRINTER SUBSYSTEM | 0776-04 PRINTER SUBSYSTEM |
|---|---|---|---|
| Printing Speed (single-line spacing) | 760 lpm – 48 character set 1090 lpm – 24 character set | 940 lpm – 48 character set 1250 lpm – 24 character set | 1200 lpm – 48 character set |
| Maximum forms slew rate | 22 inches per second | | 50 inches per second |
| Characters per print cartridge | 384 | | Same |
| Print positions per line | 136 | | Same |
| Single line space time | 16.0 milliseconds | | 16.7 milliseconds |
| Horizontal spacing of characters | 10 per inch | | Same |
| Vertical line spacing | 6 or 8 lines per inch under program control | | Same |
| Form width | 4.0 to 18.75 inches | | Same |
| Form length | To 24 inches | | To 18 inches |
| Form advance control | Vertical formal buffer under program control | | Same |

## SPERRY UNIVAC 0777 Printer Subsystem
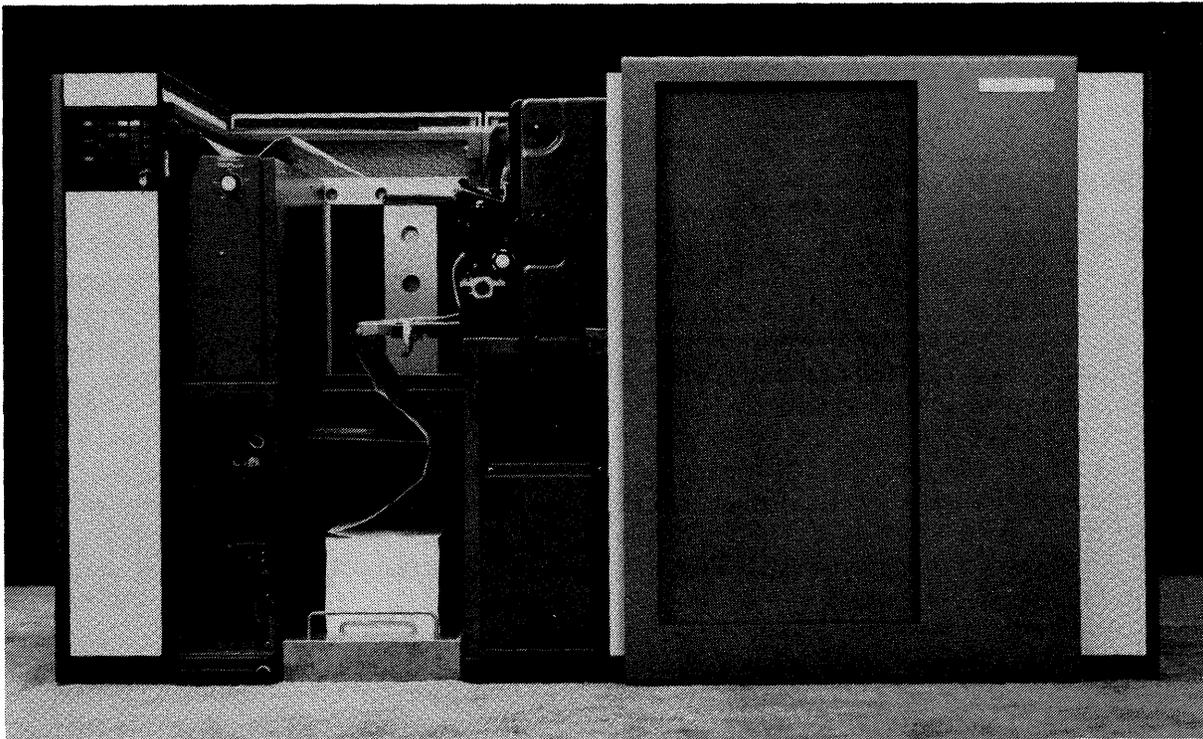


The SPERRY UNIVAC 0777 Printer is a nonimpact printer that uses an electrophotographic printing technique with a Light Amplification by Stimulated Emission of Radiation (laser) light source to produce printing of excellent quality. Data is printed page-by-page, rather than line-by-line as with conventional high-speed impact printers. This advanced, highly successful method of printing is quiet, reliable, and fast.

The printer subsystem operates at a print rate of 159 eleven-inch pages per minute, ranging from 10,500 lines per minute up to 21,000 lines per minute. The printing rate is independent of the text of the page. Line spacing of 6, 8, and 12 lines per inch and character spacing of 10, 12, and 15 characters per inch are available.

The printer subsystem is supplied with a variety of character sets. By use of the graphic character modification feature, extensions to the available sets are possible. The image information for each character set resides on a diskette in the control portion of the system and is loadable through an instruction sequence. Fifteen different 64-character sets can reside on the diskette. The basic printer subsystem is equipped with storage for two type fonts of 64 characters each. This storage is optionally expandable via a feature to include two additional fonts of 64 and 63 characters providing a resident, usable character set of 255 characters. Through the use of the resident character sets, it is possible to intermix 10, 12, and 15 pitch fonts within the same print lines.

Simple forms can be generated from internally stored graphic characters. At the same time data is being printed, a forms overlay feature permits printing of specialized forms under program control on all or selected copies. The overlay is optically projected from a drum that is driven sychronously with the forms. The overlay feature is enabled under computer control and produces formats up to 13.9 inches wide and from 2.0 inches to 13.0 inches long.

## SPERRY UNIVAC 0777 Printer Subsystem
## Characteristics

| | |
|---|---|
| Printing speed | 10,500 lines per minute at 6 lines per inch<br>14,000 lines per minute at 8 lines per inch<br>21,000 lines per minute at 12 lines per inch |
| Characters in print storage | up to 255 |
| Print positions per line | 136 columns with 10 characters per inch<br>163 columns with 12 characters per inch<br>204 columns with 15 characters per inch |
| Horizontal spacing of<br>characters | 10, 12, 15 characters per inch |
| Vertical line spacing | 6, 8, or 12 lines per inch under program control |
| Form width | 6.5 to 15.8 inches |
| Form length | 8 to 13.6 inches |

## 4.5 COMMUNICATION INTERFACE (SERIES 1100 CONTROLLED)

### General Communications Subsystem (GCS)

The SPERRY UNIVAC General Commmunications Subsystem (GCS) is a non-programmable communication interface under host control. It connects to an 1100/60 or 1100/80 word channel on the Input/Output Unit in Externally Specified Index (ESI) mode.

The GCS offers the user modular expansion, flexibility in choice of speeds, codes, and checking features, high data throughput, concurrent operation, compact cabinet of economy.

The GCS accommodates, via multiplexing, up to 32 half and/or full duplex communication lines. It can communicate with almost any mix of telegraph, low speed, medium speed and high speed data lines at rates up to 56,000 bits per second.

Time shared access from a wide variety of remote terminals is provided.

The GCS consists of a Communication Terminal Controller (CTC), from 1 to 32 Communication Terminators (CT), from 1 to 32 Communication Interfaces (CI), and the power supplies required to operate the subsystem, which are all accommodated in a free standing cabinet.

The interface between the GCS and the terminal device is any of the common communication facilities, i.e., the data sets.

```
┌─────────────────────────────────────────┐
│          1100/60, 1100/80                │
│          Input/Output Unit               │
├─────────────┬──────┬──────┬──────────────┤
│   Word      │      │      │              │
│   Channel   │      │      │              │
└─────────────┴──────┴──────┴──────────────┘
    │ │ │ │

ESI Mode          GCS

┌─────────────────────────────────────────┐
│                  CTC                     │
├─────────┬───────────────────┬────────────┤
│  CT₁    │                   │   CT₃₂     │
├─────────┼───────────────────┼────────────┤
│  CI₁    │                   │   CI₃₂     │
└─────────┴───────────────────┴────────────┘
```

Communication Lines
To Terminals
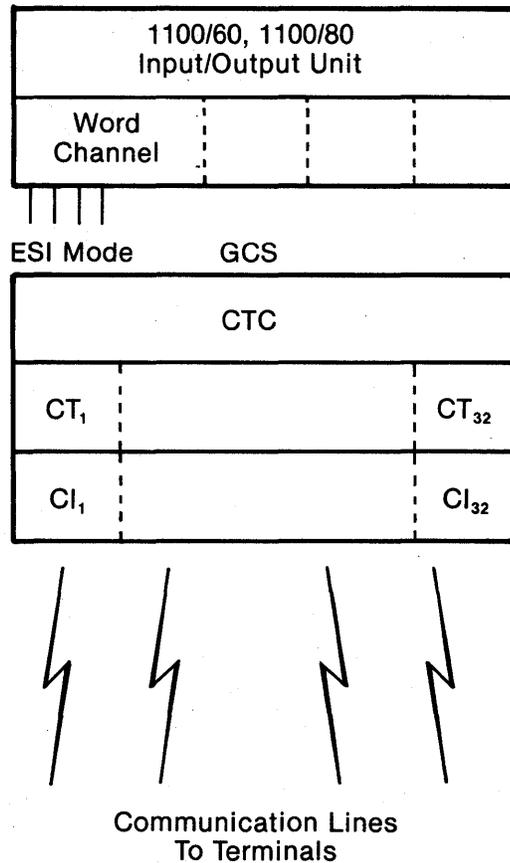
# 5 SERIES 1100 DCA/DDP

## 5.1 DISTRIBUTED COMMUNICATIONS ARCHITECTURE (DCA)

**DCA/Telcon System**

A programmable front-end processing interface to the Series 1100 system and its communication management interface (CMS 1100) is the DCA/Telcon system. It comprises the following components:

*Distributed Communications Architecture*

Distributed Communications Architecture (DCA) is a total system design plan for any communications network which includes computers, communications controllers, data links, and terminals.

DCA governs the design of communications systems for the existing Series 1100 systems as well as future SPERRY UNIVAC products. It is intended to provide the direction for all communications-oriented development for the next ten years and beyond.

The architecture coordinates the development of network related items such as:

- Host Interfaces
- Communications network controllers
- Communications network software
- Terminals
- Data communications links and protocols

*Universal Data Link Control*

Universal Data Link Control (UDLC) is the fundamental building block for all data communications in the Distributed Communications Architecture. It encompasses presently known variations of ADCCP, HDLC, and SDLC. UDLC is equally applicable to transaction, interactive, and batch transmissions. The design also accommodates multi-mode terminals on the same data communications circuit.

Efficiency higher than that provided by existing procedures is accomplished by bit orientation of data and control fields. This technique assures minimum overhead for control format and allows code independence of data.

**Telcon System**

The SPERRY UNIVAC Telcon System comprised of the Distributed Communications Processor series systems and the enhanced Telcon software system provide the system capabilities required to meet this need.

The SPERRY UNIVAC Telcon System is an intelligent communications system which implements Sperry Univac's Distributed Communications Architecture (DCA). DCA establishes a common compatible communications concept to unify all of Sperry Univac's data communications products. It encompasses many user network requirements, ranging from simple star networks of nonprogrammable terminals, through large networks of mixed terminal types and applications, up to fully distributed networks connecting multiple hosts.

DCA provides a network philosophy which integrates control into the network so that the network portion of the communications system does not rely on attached processors to keep it operational. Additionally, control is distributed among the network components, just as applications are distributed throughout the communications system, with similar advantages. Consequently, network control functions can be handled more efficiently, with greater network resilience, than if all control functions emanated from a single point.

The major Design Goals of the Telcon System are as follows:

- To implement Sperry Univac's Distributed Communications Architecture (DCA) incorporating the advantages of an architectural standard.

- To provide a common interface and communications functions for 1100 Series Systems, Series 90 Systems, and terminal products.

- To provide a network that accommodates digital and Public Data Network (PDN) carrier services.

- To provide a network capable of full operation independent of host system type but designed primarily to support Sperry Univac host and terminal systems.

- To provide host system offloading by performing communications functions heretofore performed by host systems.

- Distribution of network functions enabling line savings, improved response times, and improved availability.

- Redundancy capabilities that protect against classes of failure.

- Host system independence such that the Telcon System continues operations during periods when an attached host system is not operating. It maintains communications with, and continues to support terminals as well as other host systems which are operating independently of an unavailable host system.

- Fail-soft recovery to alleviate critical or absolute failure of the network due to errors or malfunctions.

- User interfaces such that user own code may be incorporated into the software to accommodate application programs, non-DCA hosts, networks, or terminals not otherwise supported as standard features.

- Network management is exercised within the Telcon System. Control functions are available to monitor, modify, and control the network.

**Product Offerings**

The following is a brief overview of the major products which are embraced by Distributed Communications Architecture and the Telcon System.

- Distributed Communications Processor/40 (DCP/40)
- Distributed Communications Processor/20 (DCP/20)
- Telcon Software System

*Distributed Communications Processor/40*

The DCP/40 is a powerful state of the art communications processor which employs advanced microprocessor technology. It consists of multiple processing elements and utilizes integrated circuit memory and large scale integration.

The DCP/40 can be configured as a front end processor to Series 1100 and Series 90 systems as well as a remote network processor. In conjunction with the Telcon operating system, the DCP/40 can be used as a part of simple or complex network systems. Because the components of the system are modular in nature, it is possible to configure price competitive systems which fit most user requirements.

The DCP/40 can be expanded to include up to 256 ports for full or half duplex communications lines, direct channel connections to peripheral subsystems and host processors.

The main storage of the DCP/40 can be expanded from a minimum of 512K bytes to a maximum of 3.5 million bytes. It includes automatic error correction for single bit errors, and detection of double bit errors.

The DCP/40 incorporates program and data protection logic as well as highly advanced ARM and instrumentation capabilities.

*Distributed Communications Processor/20*

The DCP/20 is a low cost member of the family of Sperry Univac Distributed Communications Processors. The DCP/20, like the DCP/40, employs advanced microprocessor technology.

It consists of a single microprogrammed Arithmetic Logical Unit and utilizes integrated circuit memory and large scale integration.

The DCP/20, in conjunction with the Telcon Operating System, can be used in a variety of network structures. Like the DCP/40, it can be used as a front-end processor or a remote processor on Series 1100.

The DCP/20 can be expanded to include 48 Line Modules. The Line Modules provide the hardware interface to communications lines, peripheral subsystems and host processors.

The main storage of the DCP/20 can be expanded from 256K bytes to a maximum of 512K bytes in 128K byte increments. The storage utilizes integrated circuit technology. It provides automatic correction of single bit errors and detection of double bit errors.

The DCP/20 provides reconfiguration, resiliency, protection and instrumentation capabilities that support DCA ARM requirements.

DCP Feature Comparison

|  | DCP/20 | DCP/40 Primary Mode |
|---|---|---|
| Communications Processors | 1 | 1 |
| Communications Multiplexer | 1-2 IOP | 1-16 IOP |
| Communications Line Module Capacity* | 48 FDX/HDX | 256 FDX/HDX |
| Host Interfaces | 1-4 | 1-16 |
| Peripheral Interfaces | ** | ** |
| Local Storage Capacity | 512K Bytes | 3.5M Bytes |
| Local Storage | 500 nsec Read | 400 Read |
| Speed (nsec) | 500 nsec Write | 450 Write |

*The multiline asynchronous line module provides support for four circuits.
**Variable. The peripheral compliment depends upon space used by communications line adapters.

## Telcon Network Software

The Telcon Network Control Software has been designed to facilitate the transport of data among the many computers and terminals of today's information processing systems.

Standard system software provides the capability to transport data in several modes between network users. It provides complete support for high speed applications such as Remote Job Entry. It also accommodates interactive processing and transaction processing. Basic message routing is provided. User interfaces, scheduling and queueing routines are available to support complex switching applications. It facilitates Distributed Data Processing.

The system software provides complete control within the network, independent of the host processor. Its modularity and flexibility allows the communications processor to function as a front-end processor, nodal (switching) processor or remote concentrator.

## Telcon System Highlights

Designed and developed in accordance with the SPERRY UNIVAC Distributed Communications Architecture, the Telcon System incorporates state-of-the-art concepts in communications and software technology.

The Telcon System offers a complete solution to all network requirements ranging from simple star (point to point) networks to the most complex hierarchical, ring and distributed networks. Further it offers a clear evolutionary growth path as network requirements expand.

The Telcon System offers a comprehensive repertoire of features and functions which may be used to implement a communications network. The following attributes characterize the unique aspects of this system.

The Telcon System design takes the communications control burden off the central processor and puts it in the network for maximum efficiency and effectiveness. Further, the functions are distributed throughout the network to achieve the optimum utilization of all components.

*Network Availability and Resilience*

To assure the highest reliability and availability, the Telcon System offers the following features:

- Redundant Configuration – The network support redundant hardware and communications circuit configurations. This assures continued operation even in the event of equipment failures.

- Host Independence – The network is self-sufficient and can continue to operate even if the central processor is unavailable. It can maintain communications with, and continue to support terminals as well as other processors which are operating independently of the unavailable system.

- Diagnostics – The system provides both online and offline diagnostics for maintenance of the network processors and the attached terminals.

- Fail-soft Recovery – Hardware and software facilities are provided to help alleviate critical and absolute failure of the network due to minor subsystem errors. Recovery routines put the failed node back in operation as soon as possible after an outage.

*Network Management*

Extensive network control functions are available to provide the highest level of control to network administration personnel. The configuration of the network can be modified dynamically to accommodate changing environments.

*Network Independence*

One of the most important features of the Telcon System is the ability to accommodate processors, terminals and networks other than those designed under Distributed Communication Architecture. Many existing terminals will be supported by standard software. Other equipment an be connected to the Telcon System by means of a software "Adapt" module which meets standard interface specifications. This capability facilitates interconnection to public and private networks.

## 5.2 DISTRIBUTED DATA PROCESSING (DDP)

There are few words used more often in the computer industry right now than Distributed Data Processing. Seminars, magazines, and trade papers dwell on the topic at great lengths. No doubt you are well aware of the debates over the definition and the pros and cons of DDP. There are some very obvious changes taking place in the way users are processing data. There is a clear trend toward giving individual departments of an organization their own computer power. Today, these departments may use a remote batch terminal, a cluster of CRT terminals, or even a single interactive terminal. The decentralizing activities of a growing number of major organizations have augmented their centralized systems with smaller computers and intelligent terminals.

Most medium and large organizations are at least contemplating the DDP concept and the applicability of DDP to their organization. Key decision areas include applicability, timing, and resources.

When economic justification for distributing is verified, then the question of when to start arises. Anyone who begins implementing today should expect to do a great deal of work himself. This requires a competent staff before embarking on a distributed network.

Most companies moving ahead with distribution are doing so in a controlled fashion. The usual approach is to start with an application or two, on one or two nodes and shake down the procedures thoroughly. A great many operational wrinkles can be ironed out if distribution is approached on a small scale first.

The concept of DDP must be considered by most organizations but the step should not be regarded lightly. Problems of recovery, security, control, and degree of distribution must be addressed and the economic trade-offs of centralized versus decentralized processing should be thoroughly investigated. Current systems didn't develop overnight and neither will a new distributed system.

**Series 1100 DDP Strategy**

Series 1100 has long been a recognized leader in the use of centralized systems. We have a strong reputation in real time communications as well. Many of our users have been building their systems for a good number of years and have considerable investment in current processing systems.

At first glance DDP may seem to run contrary to the centralized appoach to processing, and perhaps carried to its extremes it does. But, in reality, distributed processing is just a different way of expanding an installation. DDP augments the headquarters system. Organizations take an application or two, move it to the department level and continue to do the bulk of the work centrally.

Sperry Univac's strategy for DDP supports this approach. That is, to provide the tools necessary to distribute, but the extent of distribution will be a user choice. Our DDP products will build on our reputation for excellent host systems and communications capability but will allow a user to expand in ways natural to the needs of his organization. The degree of offloading of data processing and control will be up to the system designer.

**Series 1100 DCA/DDP**

How does DCA fit in with DDP? DCA provides a foundation on which to build the long term DDP capabilities. DCA will help screen the distributed system user from the underlying complexities of communications which will be an integral part of most DDP systems. It will provide a conduit for the flow of processes and data between systems. Use of DCA in a distributed environment provides a uniform basis for the DDP products.
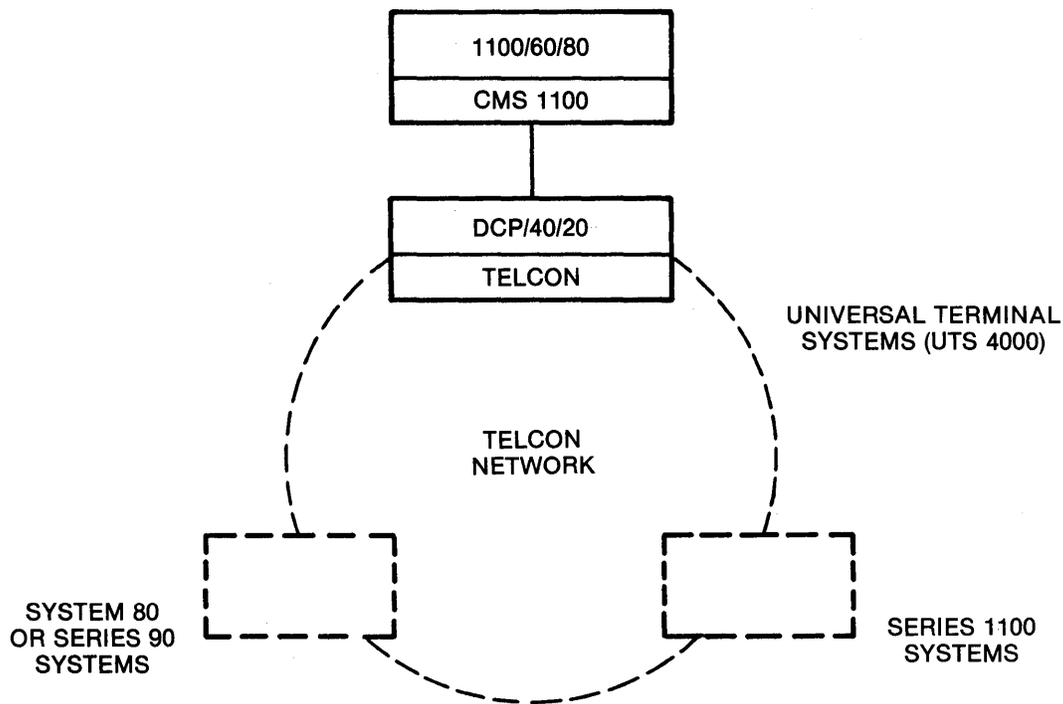
Figure 5-1. DCA/Telcon Network for DDP

In its simplest form, two processors connected by a communications link constitute a "network." A job can enter the network through any local card reader, remote batch terminal, interactive terminal, or transaction terminal at either processor. Once entered, it can either be executed locally or transmitted to the other processor for execution. Upon completion of execution, the output can be returned to the local or remote terminals attached to the execution processor transmitted to the other processor for output processing on its local or remote output devices.

In a more complex network consisting of many processors and communication links, jobs can be submitted anywhere in the network and routed to any processor for execution. The output generated by any job running anywhere in the network can be routed to any output device(s) in the network.

## Examples of DDP Networks

### Distributed Applications

The Telcon network offers full transparency "pass through mode" for all computing modes (batch, remote batch, interactive and transaction) on a Series 1100 system to/from any processor to any terminal in a Telcon network. CMS 1100 provides the communications management interface for the Series 1100 system to the Telcon network.

For an application, CMS 1100 permits file and job transfer for all computing modes (transaction, interactive, batch) between multiple Series 1100 systems in a Telcon network. CMS 1100 can support application file and job transfer between Series 1100 and SPERRY UNIVAC System 80 or Series 90 processors equipped with the communication interface and application interfacing the processor to the Telcon network.

For example, a terminal user on a local System 80 attached to the Telcon network can, use the full facilities available on a remote Series 1100 system. A transaction or

batch job may be submitted on the local system, transferred to the remote Series 1100 system for execution, with the output returned to the local processor or other processor or terminal in the Telcon network.

*Distributed Data Base Applications*

An application on a Series 1100 system may in all computing modes (transaction, interactive, batch) access programs, files and data bases in another Series 1100 system utilizing CMS 1100 to interface the application on each system to the Telcon network. Data may be stored in a DMS 1100 data base on a Series 1100 system with transaction-by-transaction access to another Series 1100 system DMS 1100 data base as needed.

This concept may be extended to include an System 80. An application may use data from IMS 90 and establish as needed, transaction-by-transaction access to a remote Series 1100 DMS 1100 data base through the Telcon network.

A Telcon network also permits an application on a System or Series 90 system to access, as required, an application on a Series 1100 system.

## Advantages of a DDP Network

With a networking capability, a job can be entered into the network at any location and transmitted to the location required to successfully run the job. For example, the job may require the processing power, the large storage, or the data base files of a high-speed large capacity computer located at another site rather than the smaller computer that may be available locally. Perhaps a job must be transmitted to a location that has a special processor hardware feature (such as an Array Processor) that is not available on the local system. In some instances, specific applications are only supported at certain sites within the organization. A major advantage of networking is that it permits jobs to be routed from other sites within an organization to the system where an application is supported.

A second advantage of networking permits a job's output to be distributed throughout the network. An organization with multiple computing sites may permit a report program to be run and copies of its output distributed automatically throughout the network. Thus, large reports can be made available very quickly over a wide geographical area.

Thirdly, the ability to connect processors together provides a vehicle to migrate from one hardware or software system to another. As new products become available, an organization has the option of installing the new product at a specific site in the network. Selected jobs may be routed to the new product to accomplish an ordered transition to the new product. This migration may be as minor as the transition to a new level of an existing application, or as significant as implementing the additional functionality available with a new Operating System or a new application.

# 6 SELLING SOLUTIONS

Your prospect for a Series 1100 System has a requirement for growth within the scope of his data processing operation. This growth forces a change in his current methods (for example, a change in hardware and software) and he'll be unimpressed with a purely feature-related sales approach. Procurement decisions for this class of equipment tend to be organization-wide, directly involving senior executives. Without question, if you are attempting to replace competition's equipment, your proposal will definitely receive the most careful scrutiny of top management. And for good reason, for you are attempting to dramatically alter a vital component of the organization; namely its capability to adequately process information in a timely fashion. To do this an EDP system is considered a necessity, not a luxury.

## 6.1 RETURN ON INVESTMENT (ROI)

The EDP expenditure will generally be regarded as an investment – and you must show the potential return will be better than alternate EDP approaches. Top management's scrutiny will be intensified by the fierce competition within most organizations for investment capital. Your proposal will not ony be weighed against other EDP proposals, but non-EDP investment alternatives as well!

Typically, data which is needed for evaluation is not presented in the prospect's request for proposal. You will have to investigate. But this will not place you at a disadvantage. In fact, investigation of the ROI implications of a data processing system presents an excellent opportunity for discussion with the prospect's senior management and the creation of a good working relationship. Of one thing you can be sure – the characteristics of the Series 1100 allow exceptional scope for ROI related solutions. From the data processing equipment standpoint, the Series 1100 offers excellent return on investment (capacity vs. cost).

What sort of opportunities should you seek?

Solutions which address the general corporate objectives and allow the prospect to run his business better such as, increase sales, improve customer service, increase employee productivity, or reduce operating expense, are obviously worth investigating. But a more fruitful source of investigation may be in those areas where conditions have recently changed, or are changing due to the economic, competitive, or political climate.

The two outstanding characteristics of recent years (and, presumably, of the medium-term future) are cost inflation and the high cost of capital. The only effective way an organization can keep pace with escalating labor costs is through improved productivity. Wherever a computer can increase productivity it can be justified as an integral part of the prospect's business. A computerized system, particularly one wherein the customer is protected against hardware cost increases, is much less prone to cost in-

flation than a non-computerized one. Thus, by computerizing more applications, an organization can expect to stabilize more costs in the future. This becomes particularly attractive where the basic system can be justified on existing applications, and the new ones costed purely on a marginal or incremental basis.

The high cost of acquiring capital also presents many opportunities for the imaginative sales representative. Solutions which liberate currently committed capital thereby improving the prospect's return on total investment are bound to be attractive. Areas where investigation is likely to be rewarding include:

- Cash flow improvements through reduction of uncollected revenues
- Reduced inventory size, through improved inventory management techniques (perhaps taking account of cost inflation)
- More productive use of manufacturing personnel and plant operations, through improved production planning, maintenance scheduling, etc
- Consolidation of multiple EDP sites

Just one more point before we get on to the products; the time in which the prospect can confidently expect his investment to be recovered may be more important than the rate of return itself.

In difficult times, many organizations develop a short-term perspective, such that an investment which provided a return of 35 percent, but paid for itself over one year, might be preferred to another which promised 75 percent return after a three-year payback period.


## 6.2 DATA BASE/DATA COMMUNICATION

Data is becoming a more and more valuable corporate resource. If there is anything that can bring the modern day corporation to a halt, it is to take away its data. The data base approach suggests that the data is treated as the end product. Programs are then a means of manipulating the data to produce the desired information. The advantages to this approach include:

- It permits much better control and centralization through a single data administrator function.
- It gives the installation the ability to *eliminate many sorts and merges.* This is because the integrated data base contains all the corporate data and the data base approach allows for a multiplicity of data structures essentially providing many different sequences of data within the same data base.
- The data base approach also tends to *reduce or even eliminate redundant data.* Most installations find that data is carried redundantly because of several different programs utilizing the same data, and sometimes the data does not agree. It then becomes a serious problem to determine which data items are correct.
- The installation can now concentrate on *optimizing total system performance* as opposed to individual program performance because, as you make changes to optimize the data base, you are optimizing the execution of all programs that operate against the data base. The data base approach also gives you much *greater flexibility* because it is much easier to make changes to programs or to the structure of the data, to add new data and new relationships, without forcing a rewrite of all programs. This is called data independence.

- *Programming time is normally reduced 20 percent to 40 percent* through the use of the higher level data base commands because the application programmers need not be concerned with the detail structure of the data base, but only with the logical processing requirements.

The Series 1100 approach to data base is called DMS 1100. It is based upon the work of the CODASYL data base standards committees. It goes back to the CODASYL data base task group in the late 60's. The DMS 1100 *implementation has followed these specifications very closely.*

Sperry Univac recognizes that the CODASYL approach is the best means of developing a complete data management facility.

DMS also provides for entry into the data base by end-user facilities such as QLP 1100. QLP provides access with a traditional English-like syntax into the integrated data base.

MAPPER can also be used effectively in conjunction with a DMS based system. Files can be copied out of the DMS 1100 data base and reformatted as reports. End-users and DP personnel can then use all the power and versatility of the MAPPER commands to access and manipulate their "personal" data base and generate reports.

The Transaction Interface Package (TIP 1100) provides *ready-made communication support* to enable rapid development of online applications. It provides a real time interface to the system; user written programs may interface to the data base in a real time manner as they are activated by TIP. TIP schedules user programs and performs message queuing. Programs may activate other programs through TIP or construct their own messages which would, in turn, be queued by TIP to activate other programs. This facilitates a modular approach to system design.

*Program development* is further eased by taking advantage of the *practice mode in TIP.* This permits program testing against live files giving the appearance of having made updates but, in reality, these updates were kept in a separate file and no action was performed on the live files to modify them. The TIP system is independent of the terminal device. TIP user programs may operate in any mode – batch, interactive, transaction.

Programmer productivity in an online environment can be significantly improved with the help of the Display Processing System (DPS 1100). It is estimated that screen programming with conventional COBOL programming methods can account for up to 40 percent of the development time of an online program. DPS 1100 nearly eliminates that portion of program development. DPS 1100 is a comprehensive system that will construct and manage display-oriented transactions in an online environment. DPS allows screen formats to be designed, developed and tested, before or concurrently with the development of the program(s) which will use the screen. The major functions of DPS include interactive screen generation and screen handling.

What could be more solution-oriented than the ability to put vital information at the fingertips of those who need it, with minimum disruption of day-to-day production?

For most installations, the transition to an online environment is a small investment when compared to the benefits derived. You, as a marketeer, can approach both the end-user and data processing professional with a plan your competitors will find hard to match. The key benefits of the online environment include:

- End-User Benefits
  - Rapid access to more timely data
  - Improved information accuracy through central data control
  - Reduced or eliminated delay due to required programming for special inquiries
  - Better productivity resulting from higher quality and more timely information
- Data Processing Benefits
  - Ease of online implementation
  - Improved end-user satisfaction
  - More effective employment of data processing equipment and personnel
  - Greater data security and control
  - Expanding pool of qualified data base talent by using CODASYL based system

The Series 1100 online environment is certainly the most solution-oriented software available. Your prospects will listen most attentively to a plan which includes the TIP, MAPPER, DPS, QLP, and CODASYL-based DMS 1100.


## 6.3 TIMESHARING

Program development has undergone significant changes in the last few years. In the past, program development was often a very, very expensive burden. Recently, however, many large-scale users have achieved savings in development cost so significant as to completely change their attitude towards new project justification.

The reason for this change is the current availability of timesharing or online programming systems.

The major advantage of timesharing over conventional methods is that it eliminates most of the delays and frustrations inherent in the process of submitting batch jobs to the computer center and waiting hours, perhaps days, for results.

A programmer can work almost continuously on one module or program, finish it and then move to the next, rather than working four or more together as is the common practice using conventional methods. This makes it easier for the programmer to concentrate on the job at hand and, where problems arise, concentrate more effectively in the solution of those problems. All these factors lead to a more efficient work pattern. Studies show that programmer productivity is often doubled by interactive program development.

Increased productivity results in a reduction in the elapsed time for development projects. In justifying solutions based on new development, the reduction in elapsed time is important both in regard to the potential payback period and overall credibility.

Perhaps even more important, experience has shown that the use of timesharing leads to better project control and better ability to meet deadlines. Projects assume better visibility, because progress can be measured in terms of completed programs. Timesharing also lends itself well to "blitzing" problem areas.

Project leaders using timesharing for program development have expressed more confidence in their ability to get the job finished properly and on time.

Since the advent of Series 1100, Timesharing has been an inherent attribute of the system. The very design of the EXECUTIVE considered the efficient management of interactive "timesharing" users. Since the mid-60's, we have evolved our timesharing to become more efficient while also becoming more and more user-friendly. The introduction of CTS 1100 (Conversational Timesharing) in 1972 made the system both more efficient and user-friendly. With CTS, we introduced the plain language oriented control, common text editors, syntactical scanners, and many other innovative features. Subsequently, we introduced HVTS (High Volume Time Sharing) which coexisted in a user-compatible mode with CTS. HVTS delivered an extremely efficient timesharing environment for FORTRAN, BASIC, and APL. Thus, HVTS/CTS combinations covered the whole spectrum of Interactive Timesharing, and supplied the user installation with more terminals with reasonable response time than any competitor.

Now Sperry Univac has surpassed the excellent attributes of our predecessor timesharing capability with the introduction of the Interactive Processing Facility (IPF) 1100 and associated processors. Implementation of IPF 1100 will follow a phased development plan with full functionality achieved through a series of product releases. Consult your Systems Analyst Manager to determine when the functionality your prospect needs will be available in IPF 1100.

The following summaries give a brief explanation of the various timesharing modes available on the Series 1100 Systems:


**Demand Mode**

In this mode the user interfaces to the 1100 system thru an interactive environment in which system control is established with standard Executive Control Language (ECL) Statements – @RUN RUNID, AC, PROJ etc.

The complete system facilities are available. These include the capabilities for program submission, updating, compilation, collecting and execution.

In addition, conversational systems such as BASIC and APL are available for this mode of user.


**Conversational Time Sharing (CTS)**

CTS provides the user with a higher level interface to the Series 1100 system.

The user is provided with a complete set of system control commands which are easy to learn, simple to use and do not require knowledge of Executive Control Language. This provides for efficient use of time sharing for problem solving, program development and debugging by reducing the amount of command input required from the terminal. A HELP processor provides the CTS user with an information retrieval system which contains information about the use of each CTS command.


**High Volume Time Sharing (HVTS)**

The HVTS provides an alternative timesharing system for the Series 1100 user. It is designed as its name implies, for the user with a large number of simultaneous general purpose timesharing terminals.

The HVTS system control commands are a subset of those provided with CTS (above) and as such are also easy to use and require no special Executive Control Language knowledge.

**Interactive Processing Facility (IPF 1100)**

IPF 1100 is a new, easy-to-use interface to OS 1100, as well as a new, enhanced software productivity environment for OS 1100 applications and applications development. IPF 1100 provides a complete system interface for timesharing, batch, transaction and guery processing. The existing Executive Control Language and CTS commands can also be processed by IPF 1100, thus protecting our current users investment.

Modules of IPF 1100 will include:

- Distributed Data Processing (DDP 1100) – Provides the IPF 1100 commands for:
    - Transferring Files;
    - Transferring Jobs; and
    - Program-to-Program Communications between a network of Series 1100 Systems.

- EDIT 1100 – A modern, full function text editor for IPF 1100. EDIT 1100 provides functionality well beyond the current editors of CTS, ED and EDT and is intended to replace them.

- Command Language – The command Language is the user interface to the system, based on the CODASYL specification for a Common Operating System Command Language, (COSCL), and is the single language for batch and timesharing. It is keyword or positional based for ease-of-use, and while offering a comprehensive set of commands still provides novice subsets.

- User Assistance – The User Assistance for IPF includes a HELP process, which explains IPF Commands, available to the user during the IPF session. A Response Module provides clear, meaningful responses and explains system messages.

- Procedures – Use of the procedural capability provides command level programming, and can be used to extend IPF functionality, tailor the end-user interface, provide EDIT 1100 procedures, automate tasks, and standardize methodology.

- Consult Mode – This optional feature for IPF permits a designated site consultant to view on his own terminal the flow of input/output on any other terminal, and used with a telephone conversation, can provide a valuable remote consultation and trouble shooting service.

- Mail – As an option to IPF, IPF commands can be invoked to send messages within a network on a store and forward basis, or permit two terminal users to talk between themselves using the terminals.

- CTS Command Analyzer – The analyzer provides compatibility with CTS for users of IPF, assisting in the migration from CTS to IPF.

## 6.4 NEW APPLICATIONS DEVELOPMENT TOOLS

The end-user of computing equipment has often been frustrated by his system. It may contain the wrong data; or it may supply him with a torrent of data; or he may be

forced to interface with computer professionals, who talk a strange jargon. At best, he has been forced to wait months while programs are developed, debugged, etc.

Today's software design allows a highly complex, sophisticated tool to be placed in the hands of the end-user. Thus he can use a terminal and user oriented software and personally relate to the system unhindered by artificial barriers.

This amounts to the end-user concentrating on getting a solution rather than concentrating on the means to that solution.

The most successful application development tool in Series 1100 history, MAPPER, allows the end user to concentrate his efforts on solving his problems.

MAPPER 1100 is a general purpose report processing system that allows a non-programmer to generate, update, reorganize and perform many other functions to the report processing data base.

MAPPER 1100 simplifies the task of handling data. It makes data inquiry, report writing, and data manipulation facilities available concurrently to many different users and types of applications.

The style of data representation is easy to understand and enables programmers as well as non-programmers to *visualize* the report structure and become the architects and executors of their own reports, to meet their own requirements.

MAPPER 1100 is an opportunity to increase productivity in the development of information systems by "expanding the resource capacity of user organizations *without* expanding the labor force."

The Query Language Processor (QLP 1100) is another interactive processor, providing the remote terminal user a means of directly accessing data – in standard system files (PCIOS) or a DMS 1000 data base.

At the simpler end of the problem spectrum, MAPPER and QLP offer "do it yourself" solutions, placing the system as a tool in his hand.

The more complex end of the problem spectrum has been the Series 1100's "bread and butter" for many years. There are many tools to assist the professional analysts and programmers in the most complicated application areas.

While interactive program development is on the increase and this growth suggests a strong emphasis, Sperry Univac believes that most customers need a judicious combination of batch and interactive processing. Thus, full support of batch, remote batch, and interactive processing as modes of application development is paramount.

Likewise, there are a variety of modes of execution under the 1100 Operating System. These include batch, remote batch, interactive and transaction processing. The Series 1100 systems thrive on this variety of production execution.

## 6.5 APPLICATION SOFTWARE PACKAGES

The use of application software "packages" offers two advantages for the potential Series 1100 user:

- One, for new applications, the package approach reduces the development and immediate implementation cycle of an application over custom, in-house developed, software.

Often the application package offers more functionality than required by the user. However, packages are most often modular by design so the user need only implement those modules he requires. In addition, this reduced implementation cycle allows the user to obtain the benefits of the new application sooner, at reduced risk, with a quicker return on the users investment in the new application.

- Two, for current applications, the package approach can offer more functionality at less cost than converting the current application to the new computer system.

This is particularly true if the application is in BAL or approaching the end of its useful life cycle due to growth in scope of the organization it serves.

Application packages that have contributed to Series 1100 sales in the commercial environment include:

## ASET 1100

Author System for Education and Training (ASET 1100) includes an Author Language for specifying tutorial strategy within individual lessons; a Delivery System for managing the interactive delivery of these lessons to students at terminals; and a Reporting System for advising authors and administrators as to the progress of students and of the system. It includes a Tutorial Mode itself which allows untrained authors to develop lessons. ASET can be used for:

- Education/Training applications
- Design aid for online application systems
- Data collection application

## FMPS

Functional Mathematical Programming System is a collection of computer programs containing the most advanced mathematical optimization techniques. For example, to select a financial portfolio to maximize profits; produce a cheaper cattle feed; or deciding on a schedule to reduce shipping cost. In general, FMPS may contribute to profitability in many specific areas of activity.

## FMPS-GAMMA

GAMMA is FMPS' model generator and report writer. GAMMA is an easy to use vehicle to supply input to the FMPS system in the form of tables and lists. From these tables and lists a model is generated and presented to FMPS which is used to produce an optimized solution to the problem.

GAMMA is also used to generate reports directly from the input model or to generate summary reports extracted from the resultant FMPS' optimized solution.

## GIFTS 1100

GIFTS 1100 (Graphics-oriented Interactive Finite-element Timesharing System) is a series of programs used primarily by mechanical engineers in the graphic design of

structures. With GIFTS 1100, you design a visual image that you can alter and test with ease. The model can be viewed from any angle and allows enlargement of any portion of the model for closer scrutiny.

## ICES

The Integrated Civil Engineering System is of modular design, made up of various subsystems dealing with design and problem solving in the area of structures, roadways and geometrics. ICES provides a Problem-Oriented Language to be used by engineers in order to "state his problem" to the system in familiar and convenient terms. It also provides the flexibility to be used in other branches of engineering science and management.

## IGDS

Interactive GAMMA Data-Manipulation System (IGDS) is for use with GAMMA, the model generator/report writer of the FMPS system. IGDS allows for interactive creation and manipulation of the data (GAMMA tables and lists) that eventually forms the problem model. It is very effective when the user wants to try different combinations of the model requiring many iterations.

## M/S PACK ASCII

Comprehensive Mathematical and Statistical Library compiled by ASCII FORTRAN providing many of the most frequently used tools of numerical and statistical analysis.

## OPTIMA 1100

OPTIMA 1100 is an integrated Project Management System for project planning and control based on networking techniques. Output is in the form of standard reports for the user.

## SUFICS 1100

The Sperry Univac Financial Integrated Control System (SUFICS 1100) is an English-based programming language designed for financial planning applications. It is used for setting up a financial model of all or part of an organizations operations.

Since SUFICS is interactive it allows management to ask "what if" questions and get a quick response that in the past, remained unanswered. Application areas for SUFICS 1100 models are numerous and include most areas of Financial Planning, Control and Analysis; Product Planning, Market Planning and Manpower Planning; and Econometric Modeling. Whatever model is developed under SUFICS, it is easy to test the sensitivity of performance to variations in what-if-assumptions. These assumptions can then be used to determine the effect on net income, return-on-investment or any other measure of operating performance or profitability.

## UNIDAS 1100

UNIDAS 1100 Document Accessing System is a comprehensive, modular, computer-oriented document and information retrieval system. UNIDAS is useful whenever fast online access to large numbers of articles, reports, contracts, laws, general direc-

tives, or abstracts of publications are required. It supports and controls document data bases using DMS 1100 and operates in either Batch, Timesharing or Real-time modes. Security is provided to ensure protection against unauthorized access to selected modules of the system as well as unauthorized users.

## UNADS

The Sperry Univac Automated Documentation System is a powerful and easy-to-use document composition system used by industry, government and the military. Output from UNADS is also used to drive various typesetting and Computer Output Microfilm equipment, such as the COMp80 microfilm recording system and the APS-4 CRT Phototypesetting System. Simple input commands and text information may be created or changed by the EDITOR or CTS 1100. UNADS is enhanced with the SPELLING CHECKER by using it to check for spelling and typographical errors.

## UNIFACS 1100

Sperry Univac Financial Accounting System is a generalized and totally integrated system, complemented by modular applications which can be used independently or in conjunction with others in the system. It is a batch processing DMS 1100 data base system implemented in ANS'74 COBOL. Applications include Accounts Receivable, Accounts Payable, General Ledger/Budgeting and Payroll/Personnel Systems.

## UNIS 1100

The Sperry Univac Industrial System is an integrated modular system used for solving management information and control problems in the manufacturing industry. Powerful interactive subroutines allow for the construction of a production control system according to specific user needs.

Additionally, a sales representative can enhance his chances for success by increasing his knowledge in the industry segments where he will market. This knowledge will allow the S/R to converse with the users of DP services like the controller, production manager, and so forth, in addition to the MIS director and the DP department.

# 7 1100 SERIES OPPORTUNITIES

## 7.1 INTRODUCTION

The SPERRY UNIVAC Series 1100, with its wide performance range and versatile software, addresses itself to virtually the entire spectrum of the medium to large scale market.

Opportunities exist for sales in all environments and application areas. Historically, the Series 1100 has been very successful in both the pure scientific and pure business environments. Because of its strength in both of these major computing environments, the following outstanding capabilities:

- multi-mode processing
- data base/data communications
- compatible growth in performance under one Operating System
- multiprocessing
- extensive library of system software

make the Series 1100 an excellent choice for any computing requirement.

Software products such as MAPPER, ADVISE, UDS, UNIS and TIP are important features of the Series 1100 which open the door to many sales. These products in particular are designed to complement each other and increase the usability of the system.

Opportunities for Series 1100 sales can be grouped into four general markets. These are competitive replacements, new applications, consolidations, and Sperry Univac equipment upgrades. Often these markets overlap to justify a Series 1100 sale.

## 7.2 COMPETITIVE REPLACEMENTS

Opportunities abound for replacing competitive systems with the Series 1100 system. Replacement situations arise where a user projects growth in his data processing workload in either scope or volume, that necessitates a change in his current system — both in hardware and software.

For example, a replacement opportunity arises in the following situations.

- A medium scale Burroughs 2700, 3500, 3700, 4700 user projects growth including data base/data communication applications requiring a 6800/7800 large scale class of system.
- An IBM GSD System 3 Model 15 user whose projected growth forces conversion to a DPD 4331-4341 DOS/VSE class of system.

- An IBM 370/125,/135,/138, or/148 DOS/VS whose new data base communication application and workload increase means moving to a 4341 class of system or greater using DOS/VSE and DL/1 or OS/VS1 and IMS/VS.

- An IBM 360/30-40 user wants to implement a new, data base oriented, manufacturing control system.

- An HIS Series 2000 user whose growth requirements call for the redesign of current applications plus new online applications on Series 60 Level 66 medium to large-scale class of systems.

In general, replacement situations to pursue include:

- A user that projects major new functions or applications for his next system.

- A user whose system's emphasis is changing from batch to transaction processing.

- A user that realizes re-systemization is a necessity to continue growth.

- A user that desires features or software that is not available on his current system.

During the past few years, the Series 1100's successes in replacing computers from our competitor's customer base include:

- Burroughs 2700, 3500, 3700, 4700, 4800 Series

- Xerox 560 Systems

- CDC 3000 Series

- NCR 100 and 8000 Series

- IBM 360/30, 360/40, 370/125, 370/135, System 3-Model 15 in the private sector, and 360/50, 360/65, 370/158, 370/165 in the public sector.

- ICL 1900 and 2900 Series

- HIS 400, 800, 2000, 3200 Series


## 7.3 NEW APPLICATIONS

New application areas are continuously arising in large corporations, educational institutions and government agencies. Changing technologies, new services, mergers, acquisitions and other reasons are responsible for the need for new applications. Most major new applications are being developed in a data base/data communications environment. The functional capabilities of the Decision Support and Development Systems (MAPPER, ADVISE, UDS) are definite pluses for you in any competitive evaluation.

The market segment for end-user oriented systems has the largest growth potential in the computer industry. It is in this area that Sperry Univac is exceptionally competitive. MAPPER was the primary sales argument for more than half of all 1100/60 sales in 1981. New Series 1100 systems have been justified for new applications like Medicaid, Welfare eligibility and claims processing, and manufacturing control.


## 7.4 CONSOLIDATION

Many medium to large firms are in the process of corporate consolidation, especially those firms which have expanded in the past several years by the acquisition of other

companies. Significant cost reductions can be achieved by removing redundant operations and by the adoption of standard, integrated procedures. Still more efficiency may be gained by improved corporate control of divisions through an integrated information system.

Many state and local governments are also contemplating or implementing consolidation and centralization of data processing facilities, more often for reasons of economy than for centralization of control.

Centralization of data processing may consist of the establishment of corporate-or agency-wide standards to be applied at all DP sites, or it may consist of physical consolidation at a single site, with terminals or distributed data processor systems at the former DP sites.

Contributing to the growth of centralized systems has been the move to data base oriented applications as a better way to organize, control and access corporate or government agency information. Industry studies indicate that 80 percent of the users of systems, in the 1100/60 class and above, are making the commitment to data base systems. UDS 1100 will greatly enhance our marketing position with the advent of the relational data base RMS 1100.

Consolidations provide good opportunities for the placement of SPERRY UNIVAC Series 1100 Systems. Consolidation on a Series 1100 system provides the user with the leading capabilities in the industry with our Decision Support and Development Systems to fit virtually any expansion need he may foresee.


## 7.5 SPERRY UNIVAC UPGRADES

The SPERRY UNIVAC Series 1100 offers existing users unparalleled opportunities for compatible upgrades. Whatever the new processing or redundancy requirements may be, there is an 1100 which fits those needs. Although there are no predefined growth paths which fit all situations, some general situations can be discussed.


### 1106 Upgrades

The 1106 user has three alternatives dependent upon the potential growth, in volume or scope, of the data processing workload projected for the System and its budget.

The 1106 user that projects new data base/data communications applications and an increase in volume becomes a prime candidate for an 1100/60 System. The 1100/60 Systems offer a substantial increase in computing power potential, often required for new data base/data communication applications, and a long range growth path within the 1100/60 Systems. This can be accomplished with only a modest increase in monthly cost. An impressive list of 1106 users have already chosen an 1100/80 or 1100/60 System alternative.

The 1100/60 offers a new technology system that provides our customers assurance for continued long-term investment in Sperry Univac Series 1100 Systems. An 1100/61 system with buffer storage is the logical upgrade alternative for the 1106 unit processor user. A buffer storage implementation provides the additional computing power required for data base/data communications applications. Similarly, the 1100/62 multiprocessor system offers the upgrade alternative to the 1106 MP user. For faster processing throughput the 1100/62, 63, and 64 systems are more appropriate.

## 1108 Upgrades

There are many 1108's still located at customer sites worldwide. Of these, most are purchased and should now be fully depreciated. Many of these customers will be ready to move up in the near future, and the 1100/80 is a natural choice for them. The 1100/80 will provide them with a large increase in processing power (1.5 to 8 times the compute power of an 1108 UP), long range growth potential, and state-of-the-art technology. The 1100/60 is also a viable upgrade for those customers especially with the advent of the 1100/63 and 64.

## 1110, 1100/40 Upgrades

Most of these users have already moved to the 1100/80 Systems. However, if you do have a user that projects expansion in data base/data communication applications and/or volume in current data processing workload, he is an excellent candidate for an 1100/80 System. The 1100/80 offers increased computing power potential and a continued easy growth path as computing demands increase. Some 1100/40 users will be considered for the 1100/90.

## 1100/10, 1100/20 Upgrades

Many of these users are in the mid to late years of long term agreements with Sperry Univac. Those users that are facing unforeseen growth in new online applications and in volume should consider an 1100/60 alternative.

## 400 Series Upgrades

It is Sperry Univac's strategy to migrate 494 users to the Series 1100 when they require additional power or capabilities. While it is expected that most 494 Series users will upgrade to an 1100/81, many factors (such as throughput and redundancy requirements) must be considered. Promega and 30-bit mode on the 1100/80 are transition aids for the 494 user.

SPERRY UNIVAC 418 users have in general chosen one of two upgrade paths. One, the user has left the communication network intact and has used the Series 1100 System as a "back-end" for data base application development. The second approach utilized has been to redesign the communication environment around the increased functionality available with the Series 1100 Decision Support System.

## 9400/9480, 90/30, Series 70 and System 80 Upgrades

A Series 1100 System is chosen by these users because their growth requirements were such that a system change was required, and the 1100 proved the best fit. Key factors in these sales included:

- The functionality of MAPPER under the Decision Support and Development concept, for interactive processing;
- The functionality of UNIS 1100;
- Compatible growth and performance potential;
- Price/performance of the Series 1100;
- Multiprocessing capability; and
- Distributed Communications Architecture (DCA) and DCP/Telcon network for Distributed Data Processing.

## 7.6 SERIES 90 UPGRADES

A very comprehensive migration program has been implemented by Sperry Univac to insure that our Series 90, VS9 users remain in the Sperry Univac family of customers. Called the Attached Virtual Processor (AVP) program, this program consists of hardware and software products which will be of special interest to users of SPERRY UNIVAC VS/9 Systems as upgrades to existing systems and as a migration system to allow them to plan and execute an evolutionary transition from VS/9 to Sperry Univac's mainstream, large scale, product line, the Series 1100.

### AVP Program Overview

The 1100/60 Attached Virtual Processor (AVP) is a CPU which operates in a multi-processor environment of an 1100/60 system. When configured into an 1100/60 system, the AVP provides for the execution of the VS/9 Operating System. Application programs that run under VS/9 on Series 90/60-70-80 systems will execute faithfully on the 1100/60 AVP without modification. This program execution is accomplished by maintaining storage space in the 1100/60 main storage and executing the instructions of the programs foreign to the 1100 in the AVP.

The 1100/60 system provides the assistance to perform most I/O operations. To provide this I/O assistance, an 1100 user program running under OS 1100 is required. This program, identified as the Attached Processor Control Software (APCS), also performs such functions as initializing the AP hardware, starting (initial program load) the VS/9 Operating System, and providing an operator interface to allow operator selections and control.

The operator communicates with the VS/9 and the APCS program via a separate console which consists of a standard keyboard/display with an optional hard copy printer.

Although most AVP I/O operations are performed through I/O devices attached to the 1100/60 channels, two multiplexer channels (one byte and one block) are available to the AP for local attachments.

The Attached Virtual Processor can be configured with any uniprocessor or 1100/62 or 1100/63 model of the 1100/60 Series in accordance with the customers requirements for performance. The range of performance for the VS/9 side of the combination is approximately from 1.0 to 1.3 of that of a 90/80-2. The performance of the OS 1100 side of the combination remains the same as the comparable 1100/60 model. The 1100/60 portion can be field upgraded through all of its uniprocessor performance ranges to meet the demand of the users growth requirements.

The major advantage of the 1100/60 AVP is that the VS/9 user is provided the cost savings of new technology hardware without the incremental costs normally associated with such a move, namely conversion and duplicate sets of hardware. No other main frame vendor can provide this to the VS/9 user. It has the added advantage of providing additional processing resources and systems functionality beyond that which is available in VS/9. These resources and functions can be utilized in accordance with each users specific demands and time table. It is anticipated that most users will initially dedicate the system to running their set of current VS/9 applications. Then, as data processing needs grow, new applications will be implemented on the 1100 side of the combination. In time there will be requirements to phase out older application systems and these will be re-systemized on the 1100. The 1100 hardware can grow to meet these requirements. Ultimately, a sub-set of the original VS/9 applications will be left. These can either be allowed to remain on the AVP or converted to 1100 Series.

The decision as to whether to convert them or not will be a business decision each user will make at some point in time after evaluating the economics of his particular situation.

The 1100/60 AVP is the logical follow-on for all VS/9 users. The 90/60-70 users will acquire 1100/60 AVPs as replacement upgrades for their current systems. The 90/80 users will acquire 1100/60 AVPs as second systems or as replacement upgrades and utilize the shared volume group concept to apply the added resources to their high volume applications similarly to the way many 90/80 users have already done.

In addition to the 1100/60 AVP system Sperry Univac is also making available several new software products under OS 1100. The very popular IMS/90 transaction system has been implemented on the 1100 Series product line. Those VS/9 users who are making extensive use or plan to make extensive use of IMS/90 are assured that the functionality and end user interfaces of this system will continue to be available to them when they make the transition to the 1100 Series.

A new RPG II compiler for 1100 Series has been introduced. This compiler is the functional equivalent of the latest RPG II compiler available on SPERRY UNIVAC Series 90 Systems. It is a super set of the current VS/9 RPG II compiler, thus it provides upward compatibility to 1100 Series for those users of VS/9 RPG II.

The VS/9 user has become accustomed to a very comprehensive set of time sharing and online program development facilities. New products in the 1100 Series were designed to provide these same capabilities to the VS/9 user implementing applications on the Series 1100. IPF 1100 is a new interactive processing system which provides high volume, high performance time sharing services. Along with IPF 1100 there is a new editor, EDIT 1100, designed to provide a functional super set of VS/9, EDT. Also provided is a product called PADS 1100 which is an interactive debugging system designed to provide those capabilities found in VS/9.

Overall, this total set of products signify the commitment that Sperry Univac has made to satisfying the requirements of the VS/9 user base. These requirements were perceived to be new technology data processing products, both hardware and software and continuity of their current production applications to protect their investments in their software products.

# 8 MANUFACTURING

On a worldwide basis for general purpose computing, the manufacturing segment accounts for 26 percent of the total general purpose computer market. The past five years have seen tremendous changes in the marketplace caused by:

- Technology
- Increased competition
- The demand for increased quality and productivity
- Availability of manufacturing application software

More of the same can be expected throughout the decade of the 1980s. Consequently, this phenomenon must be recognized in our sales approach to the manufacturing company.

To remain competitive, manufacturers are shifting to:

- Specialized manufacturing units
- Modularly-built products
- Solution-oriented software for their manufacturing environments including the engineering department

Application software presents the opportunity to sell solutions, and through them computers, to the manufacturing industry. The environment of the 1980s will dictate application software products with:

- Online accessibility
- Search and query capabilities
- Minimum levels of communications overhead
- A data base architecture
- Highly visible and functional industry application products controlled by the end user.

## 8.1 STRATEGY

- Sell general-purpose and/or solution-oriented computers to manufacturing companies
- Generate revenue through application products
- Present a total business perspective to our customers/prospects by offering comprehensive software solutions for:
  — Manufacturing Control
  — CAD/CAM

## 8.2 TO WHOM DO WE SELL?

There are two basic types of manufacturing companies:

- Discrete – This involves the production of end items containing parts. These parts move from one area of a factory to another where various manufacturing operations are performed in batches. As the number of operations and component parts increases, efficient design, engineering, planning and production becomes increasingly difficult. THIS IS WHERE OUR APPLICATION PRODUCTS FIT BEST.

- Process – Where goods are manufactured in a smooth flow from raw material to final product. For example, electrial wire is manufactured from copper ingots that are rolled into wire, insulated, and coiled by the same machine. Chemicals, paints, oil refineries, bottling plants and certain food processing operations are examples of process manufacturers. When we are prospecting, this type of manufacturing entity should not be overlooked, since they have many of the same planning and production problems as the discrete manufacturer.

### SIC Codes

The following general SIC code categories will assist you in locating the prime manufacturing candidates:

### Major SIC Groupings

| Discrete | | Process | |
|---|---|---|---|
| 23 | Apparel | 20 | Food and Kindred Products |
| 24 | Lumber and Wood Products | 21 | Tobacco |
| 25 | Furniture and Fixtures | 22 | Textile Mill Products |
| 27 | Printing and Publishing | 26 | Paper and Allied Products |
| 30 | Rubber and Plastic Products | 28 | Chemicals and Allied Products |
| 31 | Leather and Leather Products | 32 | Stone, Clay and Glass Products |
| 34 | Fabricated Metal Products | 33 | Primary Metals |
| 35 | Machinery | | |
| 36 | Electrical Machinery | | |
| 37 | Transportation Equipment | | |
| 38 | Instruments | | |
| 39 | Misc. Manufacturing | | |

Revenue size is also a factor. The following is a breakdown of U.S. manaufacturing establishments by revenue size:

## All U.S. Manufacturing ($ Millions)

| Revenue Size | No. of Process | No. of Discrete | Total Firms |
|---|---|---|---|
| $   3- 19 | $7,003 | $6,567 | $13,570 |
| 20- 99 | 1,823 | 1,272 | 3,095 |
| 100-499 | 557 | 352 | 909 |
| 500-999 | 109 | 64 | 173 |
| Billion-Plus | 120 | 111 | 231 |
| TOTAL | $9,612 | $8,366 | $17,978 |

In any country our products fit best in the $50 million and above categories.


## 8.3 SALES APPROACH

Historically, we have been selling general-purpose computers to data processing people to be used in data center environments. We should continue to do so. Large manufacturing companies with a centralized data processing philosophy will probably accept this approach. But remember, companies both large and small are searching for answers to manufacturing problems. There is a need to address to this requirement.

The industry is characterized as responsive – responsive to user wants, hardware capabilities and price/performance curves. Right now, the important issue is to locate, purchase, and implement software solutions. In many cases, end user benefits are the most important criteria for selecting one computer vendor over another.

To sell computer-based manufacturing solutions, an end-user relationship should be developed. To do this, manufacturing management must be approached with the features and benefits our product(s) can bring to their organization. Forget the bits and bytes; the name of the game is return on assets and/or investment, how cash can be stretched and how working capital can be retained. The product or service is a manufacturing tool, not a computer. The chances are good that a manufacturing tool will sell a computer.

The selling of a computer for general business purposes has traditionally required convincing the data processing manager of the virtues of one computer over competitive systems. In contrast, selling a comprehensive manufacturing applications package, and through it the required hardware, dictates an approach geared to a different audience, the end user.

There is no such thing as a typical manufacturing organization, but a representative organization chart can be drawn. That is why it is important that you understand the organization. The size of the organization, variations in titles and names of departments, and the propensity to change all contribute to this.

Usually, it will look like this at the top:

```
                          ┌──────────────────┐
                          │     GENERAL      │
                          │     MANAGER      │
                          └──────────────────┘
                                   │
      ┌────────────┬───────────────┼───────────────┬──────────────┐
┌──────────┐ ┌──────────┐ ┌──────────────┐ ┌──────────┐ ┌──────────────┐
│          │ │   V.P.   │ │    V.P.      │ │   V.P.   │ │    V.P.      │
│CONTROLLER│ │MARKETING │ │MANUFACTURING │ │ QUALITY  │ │ ENGINEERING  │
│          │ │          │ │              │ │ASSURANCE │ │              │
└──────────┘ └──────────┘ └──────────────┘ └──────────┘ └──────────────┘
```
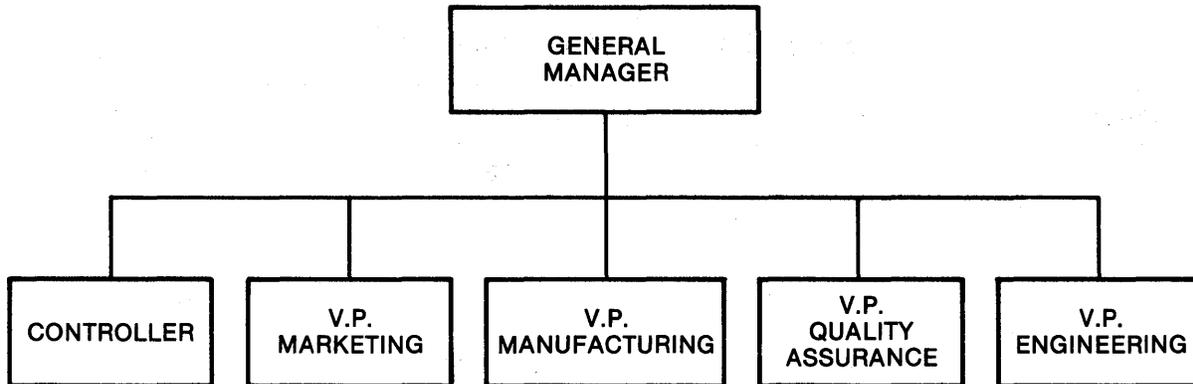
Because of the implementation cycle and support required to establish the system, management must justify in their own mind the expenses to be incurred. They must be convinced, by you, that it is the right thing to do.

Stress the Sperry Univac strengths:

- Proven high level of support

- The dedicated manufacturing organization committed to the marketplace

- Proven stable application products (re: manufacturing success stories)

- Full line of reliable computing hardware

- Continued enhancements and product improvements

- Technical consulting and training

- Features and benefits of our application products

## 8.4  WHAT DO WE SELL?

Application sets to be offered to manufacturing prospects/customers fall into the following categories:

- Manufacturing Control Applications
  - UNIS 1100
  - OPTIMA 1100

- CAD/CAM
  - UNIS*CAD
  - 1100 ICES STRUDL

**Manufacturing Control**

Manufacturing planning is the specific area that our control products address, especially UNIS 1100. This area is concerned with developing procurement requirements and production schedules. The objective is to balance three conflicting goals:

- Maximum customer service

- Minimum inventory investment

- Maximum plant operating efficiency

8-4

Balancing these objectives is not any easy task. Several challenges must be faced:

- Higher interest rates
- Obsolete facilities
- Material shortages
- Low growth rates
- Inventory turnover and asset utilization
- Unplanned capital investments
- Strategic purchasing practices
- Severe productivity pressure

Four basic functions must be performed to meet the challenges and balance the objectives:

- Planning priorities
- Controlling priorities
- Planning capacity
- Controlling capacity

Material Requirements Planning is a technique used in manufacturing environments to plan and control priorities and capacity. Because of the volume of calculations involved, it requires a computer. MRP has been around for quite some time. Companies who do a good job have been able to cut their inventories by 25 percent to 35 percent. Think of the dollar savings and cost justification potential this represents to a manufacturer. Along with all of its other aspects, UNIS 1100 is RICH in MRP. It is one of the best! There are significant capital and carrying costs associated with the level of inventory that a manufacturer keeps on hand. Slight improvements can have large effects on profits.

When project control and long-range planning is important, consider OPTIMA. It can help to determine where peak workloads or idle resources might occur. It is an excellent vehicle for planning and launching new products and for undertaking maintenance projects.

*UNIS 1100*

UNIS 1100 is an interactive, database-oriented manufacturing control system. It emphasizes the planning and control aspects of a discrete manufacturing business. Certain aspects also apply to the process customer.

Three approaches can be taken in installing UNIS 1100:

- Implement the preprogrammed applications. Load your data and go
- Use the programs as a starting point, modify them and add programs tailored to your environment
- Use the UNIS 1100 functionality to create a customized system

Figure 8-1 is an overview of the UNIS 1100 system.
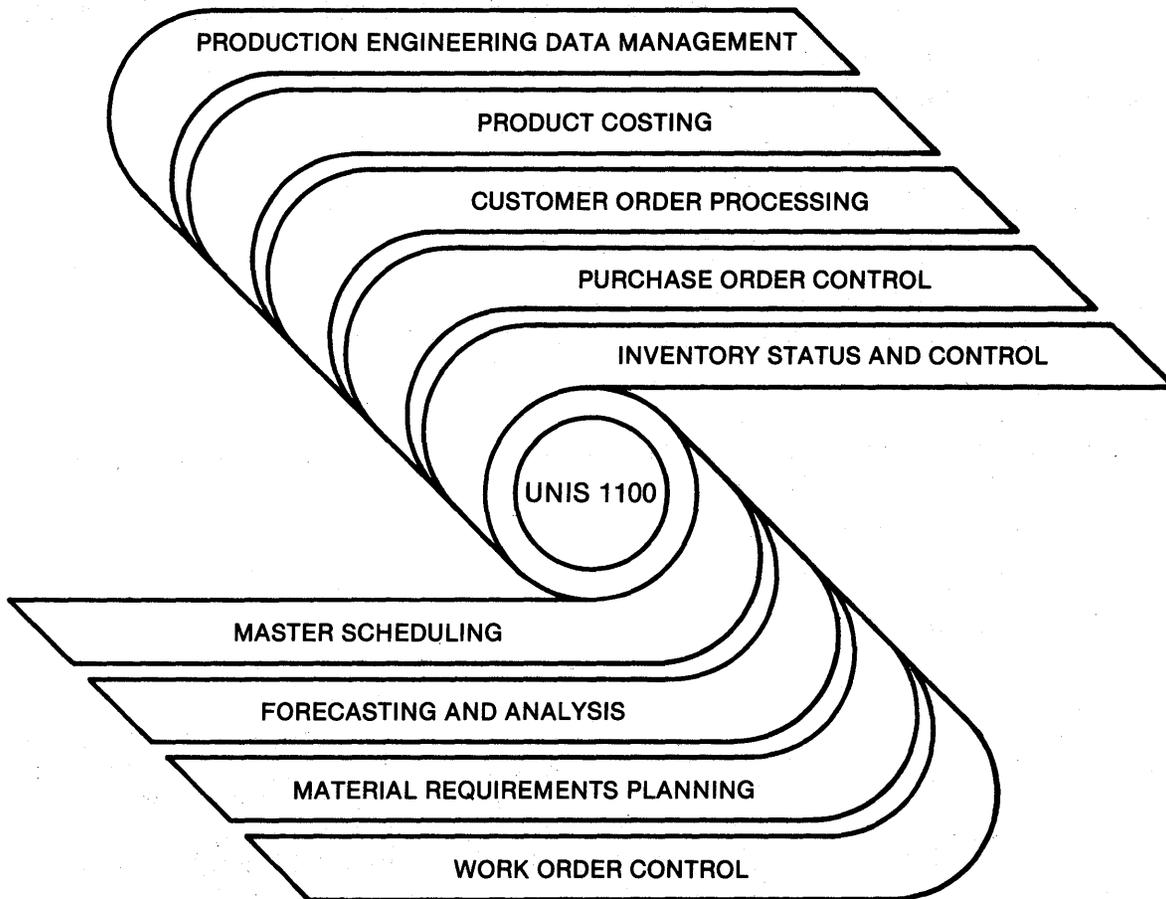
Figure 8-1. The UNIS 1100 Interactive System

The modules that may be progressively implemented by the user are:

- Master Data Processor – provides the data base on which the system operates. MDP loads, organizes and maintains the engineering records required to define the product.

- Inventory Management/Order Entry – establishes an integrated system of computerized material control, a major step in achieving a comprehensive manufacturing system.

- Planning and Scheduling/Work Order Management – this module is the key to controlling shop floor activity.

*OPTIMA 1100*

OPTIMA 1100 is an easy-to-use project management system that provides the ability to:

- Analyze plan versus actual
- Simulate schedules
- Control costs
- Measure performance
- Identify bottlenecks before they occur
- Forecast schedule dates and workloads

It is composed of five modules:

- Data entry processing enables you to enter and modify data. All entries are verified, a feature that protects against constructing an unworkable project.

- Time analysis gives you the answers to what is started, what is completed, what is in progress, and what is behind schedule. You know how you are doing compared to plan.

- Resource analysis helps you answer the questions of how much inventory is required, what skills are needed and what machine and work centers are available.

- Cost analysis permits you to establish expected project costs, determine cost variances based on progress to date and revise costs accordingly.

- Report processing provides a variety of reporting options. Included are bar charts, Gant charts and histograms.

OPTIMA 1100 is applicable wherever the requirement for long-range planning exists. It should be sold as a value-added package in a stand-alone mode or as an adjunct to UNIS 1100.

Industry segments that will have an interest in OPTIMA 1100 include aerospace, ship-building, switchgear and heavy electronics. It can also be used as the planning tool for launching new products or for undertaking maintenance projects.

## CAD/CAM

Computer Aided Design/Computer Aided Manufacturing (CAD/CAM) can be defined as the use of specialized computer applications and interactive graphics in the design and manufacture of a product. Presently, we are interested in the CAD market.

There are two types of CAD:

- Mechanical
- Electrical

Mechanical CAD will be the dominant application for the next few years. It is expected to grow 39 percent per year through 1986 when it will be a $3 billion market.

UNIS*CAD is our product offering.

*UNIS*CAD*

In a vanguard approach, UNIS*CAD offers the first integrated system for CAD/CAM. UNIS*CAD provides an orderly, business-like approach to the design and manufacture of a product. All aspects of design, engineering and manufacturing can operate from a common data base on a single mainframe.

The four major modules of UNIS*CAD include:

- Design – The definition of the geometry of parts and assemblies
- Engineering Analysis – The verification of the design through the use of Finite Element Analysis (FEM)
- Drafting – The documentation of a design by the preparation of an engineering drawing

- Numerical Control – The translation of the part geometry into the cutter path for manufacturing the part on an NC machine, tool

Benefits include:

- Management control of the design process
- Product quality
- Engineering resource utilization
- Improvement in product design
- Reduction of product and design costs
- Increased drafting productivity
- Customer and employee satisfaction
- Fewer revisions to parts and products
- High quality drawings

Key UNIS*CAD features include:

- 3D graphics terminals
- Separation of drafting and design
- A multi-schema relational data base
- Toleranced geometry
- Solids modeling

Target markets for UNIS*CAD are:

- Aerospace
- Automotive/industrial equipment
- Mechanical products
- Architecture/construction
- Civil engineering
- Petrochemicals

*ICES STRUDL*

ICES STRUDL is a set of integrated engineering tools that can assist with a variety of engineering design and analysis problems.

It is a value-added product and should be sold with other application solutions. It can be coupled with UNIS-CAD and sold as the engineering analysis solution.

Benefits to be derived include:

- Improvement in product quality
- Labor savings in the design and engineering departments
- Reduced prototype costs
- Reduced product and design cycle lead times

Key features include:
- Basic static and frames analysis
- Finite element modeling
- Dynamic analysis
- Heat analysis
- Graphics (topology)

The sales entry point for this product is the engineering department. Data processing may not know what the engineering requirements are. Besides, engineering managers usually have plenty of money in their budgets for special purchases that they can write off to Research and Development.

The following SIC codes should generate the most interest:
- 34 Fabricated Metals
- 35 Machinery
- 36 Electrical Machinery
- 37 Transportation Equipment
- 39 Miscellaneous Manufacturing

Several other market segments should also be interested:
- 91 Federal Government
- 49 Utilities
- 77 Service Bureaus
- 82 Education (Universities)

# 9 GOVERNMENT

## 9.1 UNITED STATES FEDERAL GOVERNMENT (AD)

### Charter

Sperry Univac Federal Systems Operations has the charter within the Americas Division to price, propose, and contract for the following business:

- Standard, commercial Sperry Univac product line hardware (non Mil Spec) to the United States Federal Government and its contractors.

- Special purpose (RPQ) hardware that is attached to standard, commercial Sperry Univac product line hardware to the United States Federal Government and its contractors.

- The hardware described above to organizations that exist for the primary purpose of servicing Federal Government employees and are located within Federal Government facilities.

- The hardware described above can be marketed to agencies and corporations where the funding for the purchase of lease of the hardware is totally provided by the U. S. Federal Government regardless of which organization has title to the hardware. The agency or corporation must employ the hardware to perform the functions of their prime contract(s) with the U. S. Federal Government. Federal Systems is excluded from business with U. S. Federal Government prime contractors where the EDP hardware is used to manage their business (i.e., MIS, accounting, factory process control, etc.)

- Support services associated with the hardware contracts described above.

Sperry Univac Federal Systems negotiates and enters into an annual contract with the General Services Administration setting the price and the terms/conditions to the U. S. Federal Government for all standard, commercial (non Mil Spec), Sperry Univac products and services. In addition, special contracts are negotiated for many large awards where special considerations are required.

### Federal Government

The total annual expenditures (equipment, personnel, facilities, outside services) within the Federal Government for general purpose ADP operations now approaches $6.5 billion. If special, militarized and federally-funded contractors are added, the total is over $13 billion. This is 2 percent of the total federal budget. As a result of the costs and widespread use and dependence on computer operations, the attention of more congressional committees and key representatives and senators is focused on ADP activities. This means:

- Waste, duplication of effort, meaningless production and poor procurement practices will be scrutinized carefully, criticized publicly, and reduced or eliminated in some cases.

- The General Accounting Office (GAO), an investigative agency for Congress, will place pressure on government ADP users to employ maximum practicable competition to save money. However, much greater emphasis is being placed upon total life cycle costs with factors other than hardware playing a major role. For example, conversion costs are becoming a very important consideration because of the cost, time and risk involved in the conversion process. As a result, it is more difficult to replace encumbent suppliers.

- Budgets for ADPE will be carefully reviewed, particularly in Civil Agencies. DOD will have less scrutiny.

- The present administration is pushing hard for less Federal Regulation of business and elimination of some reports now required by business. This may lead to an investigation of some reports prepared by ADPE and the real necessity for each.

- The DOD Computer Security Evaluation Center under the auspices of NSA was established 1Q FY81. This organization initially staffed with 100 people will grow to approximately 300 in three years and is chartered with the evaluation of EDP Security Products, Research and Development and Support to the Federal Government in this area of increasing importance to the EDP user community.

- A major concern throughout the Federal Government is the lack of productivity resulting partly from the use of antiquated ADPE (60 percent of the installed systems are no longer in manufacturing). The GAO issued a report in late 1980 urging agencies to update old systems to new ones based on:

  1. A fully compatible upgrade.
  2. Maintaining the same approximate capacity.
  3. Economic benefits including costs of people, space, energy and maintenance as well as equipment.
  4. Increased reliability and productivity.
  5. Securing the equipment on a 3–5 year basis pending a full systems study in order to fully complete the upgrade for the longer term (7–15 years depending on the scope and complexity of the system).

During 1981, procurement activity has accelerated as a result of this study and the recommendations made. This should continue, particularly in the defense sector during the next few years.

Serious attempts are being made by the government to better control and utilize their current ADPE inventories and to reduce the cost and accelerate the procurement time cycle by:

- Establishment of FEDSIM (Federal Computer Performance, Evaluation and Simulation Center) – was created to assist agencies in RFP development and evaluation, simulation and benchmark advice and assistance in improving the throughput and utilization of systems installed.

- General Services Administration (GSA), the agency responsible for carrying out government-wide ADPE policies on acquisition and contracts, is delegating nearly all procurements back to the user agencies to execute. Any

competitive procurement over $500K must secure GSA review and approval prior to delegation and the subsequent request for proposals. This is reducing the procurement time in many cases.

- The establishment of the Conversion Center by GSA in 1980 to assist and advise user agencies concerning the problems and costs regarding ADP conversions.

- Implementing an aggressive standards program aimed at all hardware and software products brought into the government inventory. After promulgating IBM-like I/O interface standards, the government is now preparing to publish communications and network standards to cover all layers described in the International Standards Organization's (ISO) Open System Interconnection model. A subset of the CCITT X.25 (1980) is currently planned to be effective later in 1982.

  Additional language and one or more DBMS standards are also planned.

Other recent activities by the Federal Government regarding government-wide ADPE acquisition and management are:

- A trend toward contracting out a larger share of the total ADP budget for services including:
  - Time share services
  - Programming services
  - Conversion efforts
  - CE services
  - Facilities management

- A decline in the share of the total ADP budget for hardware.

- Increased activity by the government partially funding large complex procurements where major development and/or systems changes are required.

- Consolidation and simplifying acquisition regulations for all products including ADPE.

- Less GSA, OMB and congressional involvement and approval in defense-related ADPE procurements. This, it is hoped, will accelerate DOD procurements and provide for greater user agency decision-making. This means more selling at the user level and greater advantage to the incumbent suppliers.

The Federal Government will remain the world's largest single customer for computer equipment ($7.5 billion inventory) into the 1980s. New procurement will continue to be dominated during the 1980s by the Department of Defense. Civilian Agencies will continue to grow and modernize systems. The major justification for new buys within DOD will continue to be upgrading, modernization and consolidation of existing installations and applications, with a few new applications added. The past years of comparative underdevelopment of new applications by the civilian agencies, caused primarily by budget restrictions, is now beginning to change and there is more opportunity for aggressive, new system marketing.

## Department of Defense

*General*

The DOD market segment of the Federal Government includes the following areas:
- Army
- Navy
- Air Force
- Other Defense-wide Agencies (Mapping, Communications, Logistics, Intelligence)

Sperry Univac FSO has had good success in securing awards in all areas of DOD. Goals have been met in the DOD nearly every year for the past ten years. 58 percent of all ADPE in the Federal Government is within DOD.

The Sperry Univac Federal Systems Operation expects to maintain a dominant position within the DOD marketplace. One of the major policy/plans of the Department of Defense that is being implemented presently and that will continue in many application areas during at least the next five years, is the policy to consolidate, standardize, and upgrade – all within a single plan action wherever and whenever possible.

There is great pressure from the Federal Government to provide system capabilities consistent with the new technology, at prices governed by a very competitive ADP industry. Very large central computing complexes are being linked by communications networks. Workloads as well as data and job streams are passed between complexes and shared. Huge data bases with computer-controlled security from unauthorized access are being requested.

In the continuing review of DOD's overall ADP budget plans, it is expected that the total DOD budget for hardware (rental, purchase, and maintenance) will accelerate during 1982–84. Communications equipment, terminals, and minis are taking, and will continue to take, a significant and increasing share of this budget.

The Department of Defense has maintained a ratio of 80 percent owned and 20 percent rented of their installed inventory. With budget pressure to delay outlays of funds being the primary cause, this ratio will continue to show a reduction of about 2 percent per year in owned equipment and a corresponding increase in rental equipment.

Currently HIS is rated as Sperry Univac FSO's primary competition followed by IBM, CDC, Burroughs and DEC.

## Civilian Agencies

The Civilian Agencies of the Federal Government are made up of some 90 to 100 departments, bureaus, commissions, services, agencies and administrations. Some date from 1790; others were formed very recently. The administration is currently considering major reorganizations and reductions of funding in this sector of the Federal Government. Hardest hit will be health and human services, education, and energy regulatory areas.

Twelve of the 13 cabinet members fall within the civilian agencies – the sole exception is the Secretary of Defense. The civilian agencies region is made up of four bran-

ches generally organized to market and service on a functional basis. They are:

1. Human and Natural Resources
2. Finance and Commerce
3. NASA
4. Security and Intelligence

Policy and decision-making for ADPE planning, products and services is generally vested at the headquarters of each agency. Exceptions are DOE (Department of Energy) with extensive contractor-operated field operations, and to a lesser degree at NASA (National Aeronautics and Space Administration). These agencies' ADPE needs are often developed, justified, evaluated and given initial approval at the point of use. Final approval must come from national headquarters.

Each agency must be sold independently. For a score or more of major ADPE users within the civil sector this means more marketing manpower, particularly in the pre-sale effort, both in the field and at headquarters.

In general, government policy and decision-makers are:

- Well-educated and generally well-informed on ADP matters
- Reasonably objective and open-minded
- Loyal, stable, and well-paid
- Honest and generally not subject to political pressures in ADPE selections
- Generally open to innovative ideas and new concepts, if risks are limited and present operations not disrupted

*Nature of Market Segment:*

Currently 42 percent of Federal Government ADPE is in the civilian agencies. Major users are:

- NASA (National Aeronautics and Space Administration)
- DOE (Department of Energy)
- Department of Health and Human Services
- Treasury Department
- Department of Transportation
- Department of Commerce
- Veterans Administration
- U. S. Department of Agriculture
- Postal Service

Most of the above are expected to have steady, but limited ADPE growth during the 1982–84 period.

The Sperry Univac Civilian Agency Region has been successful in capturing a substantial percentage of the ADPE business in the following major accounts:

- NASA – about 40 percent of the total
- Department of Commerce – 50 percent of the total
- Environmental Protection Agency – 50 percent of the total

- Housing and Urban Development – 70 percent of the total
- Treasury – 60 percent of the total

Most of the civilian agencies do not have large central staffs, as does DOD, to monitor ADPE acquisitions and usage. Experience is generally limited. The trend toward more ADPE management expertise is growing with expanding ADPE acquisitions.

### Field Marketing and Communications

A third-line marketing directorate was established to market two major areas of the Federal Government:

1. The federal marketplace outside the Washington, DC, metropolitan area
2. The communications marketplace in both DOD and civilian agencies

To fulfill the special needs and requirements of the above marketplaces, salesmen, systems analysts and CE personnel with proper backgrounds were selected to cover these important and growing areas of computer usage.

Currently, Sperry Univac dominates the Federal Government Communications market with particularly strong penetration in defense communications (Army, Navy, Air Force). Increased activities in the civil market offer us good opportunities.

Federal Systems was previously awarded a contract for the Internal Revenue Service Communications Switching Network and, in 1981, received a major competitive award to replace the mainframe systems at all eleven IRS Service Centers.

Federal Systems also has its own 0777 Laser Printer demonstration facility in its new McLean, Virginia, complex.

### Federal Projects Marketing

The directorate was established in order to respond to large and unusual requests for solutions to problems involving the use of ADP. Frequently these projects involve lengthy and complex solutions with development and conversion efforts required. In some cases advance funding is provided by the Federal Government.

Currently, this directorate is deeply involved in competing with Burroughs for the updating of the 160 Air Force Base Level Systems to do supply, accounting and personnel work.

### 9.2 STATE AND LOCAL GOVERNMENTS

### Public Sector Marketing

This market is characterized by a continued and dramatic growth averaging 15–20 percent per year. The public sector market development program in the Americas Division has dealt primarily with dedication toward state and local government business, with increasing additional emphasis on the total public sector market, including education. This market is characterized by a formalized procurement process, a multifaceted decision cycle, and benchmark efforts.

The marketplace is particularly sensitive to considerations of security and confidentiality of data. OS 1100, DMS 1100 and TIP 1100 provide these critical capabilities. The

presence of these proven products and capabilities provides marketing leverage to states, cities, counties, school and special districts, not for profit institutions, etc.

The movement within the marketplace to end user tools like MAPPER, online systems and larger data bases has created a concern among users over redundancy and reliability within their systems. The Series 1100 provides those users with the solutions to their concerns. It also provides each user upward growth capability with minimal transitional efforts. This specifically applies to those state agencies that get started on a large central system and eventually are spun-off to their own systems. Their investment is protected and, as a result, the impact to their state is minimal.

*Standard Industry Classification*

> 82XX Educational
> 92XX State Government
> 93XX Local Government

Sperry Univac has achieved particularly good penetration with the Series 1100 in the public sector, especially in state government and education. We are the second largest supplier to state government with approximately 25 percent of the total industry installed base. Major installations by state agency functional area include:

- Finance and Administration: AL, AZ, FL, IL, MA, NY, PA, KA
- Public Safety: AL, CA, CO, GA, LA, NY, NC, OH, PA, VA, WA, SC
- Social Services: GA, NY, PA, TX, VA, WA
- Employment Security: AR, CT, MA, NC, OH, IN
- Natural Resources and Transportation: CT, NH, LA, TX, WI, MD

  (AL, AZ, FK, etc. used above are abbreviations for state names;
  e.g., AL = Alabama, AZ = Arizona)

Sperry Univac has significant market potential with the 1100 Series in major cities and counties, public utilities, and multi-jurisdictional data centers. The current Sperry Univac installed base in local governments is approximately 8 percent of the total market share. This clearly indicates that there is a large replacement market that should be targeted.

Examples of some local government Series 1100 sites are:

- The New York City Fire Department
- The City of Savannah/Chatham County
- Washoe County, NV
- Houston Police Department
- Houston MTA
- Lansing Water Board
- Denver Water Board
- Westchester County, NY
- Erie County, NY

The 1100 in the New York City Fire Department will be used for several personnel and job accounting functions as well as statistical reporting. The 1100 in Savannah/Chatham County, a joint municipal data center, will be used for general government functions as well as police reporting and dispatching using the SPERRY UNIVAC V77 minicomputer as a remote front-end processor.

*Target Markets*

The Series 1100 gives Sperry Univac an excellent marketing posture within the public sector and provides the ability to:

1. Significantly extend the marketing horizon to include medium-sized cities and counties and their administrative departments (Health and Welfare, Justice, Education, Engineering, etc.) as well as moderate-sized colleges/universities such as state regional junior colleges, teacher colleges and vocational and other specialty schools, and larger local community colleges.

2. Greatly augment the capability to penetrate larger states, counties, and cities on a departmental basis in such a way that Sperry Univac's credibility in data processing centralization/consolidation is established.

Successful penetration of federal markets in the defense/intelligence sectors has resulted in substantial enhancements to OS 1100, DMS 1100, and TIP 1100. The presence of these features provides additional marketing strength to a product line already well-suited to the demands of the public sector prospect by virtue of its uniquely flexible operating system, efficient language processors, well-developed communications/database software, and considerable library of proven, transferrable applications systems.

*State Government Targets*

Consider functional areas that have a large data base and require the uninterrupted operation at almost any cost. Prime candidates would include:

- Law Enforcement
- Welfare (Social Services)
- Administration
- Motor Vehicle Registration
- Drivers License Registration
- Labor/Unemployment Administration
- Transportation
- Revenue Administration
- Licensing
- Court Administration

*City and County Government Targets*

The Series 1100 offers high potential in the larger local and regional governments who already have existing equipment filled to capacity. Over 50 percent of these users with a population in excess of 500,000 have more than one large scale system. By focusing on new applications development areas, the cost of conversion can be overcome and a viable growth plan anticipated. The price range of the Series 1100 makes it possible to penetrate the multiprocessor shop at the low end and offer the user a growth potential without conversion that is unparalleled in the industry.

*Market Trends*

- *Distributed Processing* – The trend towards distributed data processing continues as governments attempt to develop end user capability and economies of scale in an area that has experienced uncontrolled growth with minimal technical expertise.

- *Privacy and Security* – Another area of major impact on government data processing is the passage of federal, state, and local legislation related to control of data . . . OS 1100 and DMS 1100 provide these important capabilities.

- *Integrated Data Base* – With the increasing concern associated with financial stability and information availability, the state and local government market has become highly receptive to the need for data base concepts in developing their information systems. This provides us with a unique opportunity to capitalize on the proven capabilities of DMS 1100 and TIP 1100.

## Industry Marketing Sales Aids

| | | |
|---|---|---|
| BLOOMSBURG STATE COLLEGE – AN INTEGRATED APPROACH TO INFORMATION MANAGEMENT | U6981 | DESCRIBES USE OF DMS, TIP, QLP, CTS AT COLLEGE |
| LOCAL CRIMINAL JUSTICE APPLICATIONS | U6984 | SUMMARY OF UNIVAC'S LAW ENFORCEMENT APPLICATIONS |
| SPERRY UNIVAC TEAMS | U6656 | DESCRIBES A HUMAN RESOURCES INFORMATION SYSTEM |
| MEETING THE CHALLENGE | GS9125 | APPROACHES TO HUMAN RESOURCE MANAGEMENT |
| LOCAL GOVT SUCCESS STORY READING, PA. POLICE BUREAU | U6460R1 | CITY OF READING'S MUNICIPAL INFORMATION SYSTEM |
| LOCAL LAW ENFORCEMENT INFORMATION SYSTEMS | U6965 | POLICE APPLICATIONS FOR THE SYSTEM 80 COMPUTER |
| MUNICIPAL INFORMATION SYSTEM OVERVIEW | U6536 | LOCAL GOVT CONCERNS AND SPERRY UNIVAC'S SOLUTIONS |
| LOGAS-FS | U6983 | LOCAL GOVT ADMINISTRATIVE & FINANCIAL SYSTEM BRIEF |
| TOTAL ACCOUNTING FOR GOVT (TAG) | U6934 | INTERACTIVE FINANCIAL ACCOUNTING SYSTEM |
| LOCAL GOVT SUCCESS STORY WOOD COUNTY, WISCONSIN | U6378 | A COMPUTERIZED ALIMONY & SUPPORT ENFORCEMENT SYSTEM |
| LOCAL GOVT SUCCESS STORY CITY OF INGLEWOOD, CALIFORNIA | U6359 | A TOTAL MANAGEMENT INFO SYSTEM FOR ALL CITY DEPTS |
| LOCAL GOVT SUCCESS STORY CITY OF MARIETTA, GEORGIA | U6377 | AN APPLICATION PROFILE OF THE UTILITY BILLING SYSTEM |
| LOCAL GOVT SUCCESS STORY HENRICO COUNTY, VIRGINIA | U6458 | A FINANCIAL MANAGEMENT AND PERSONNEL & PAYROLL SYSTEM |
| LOCAL GOVT SUCCESS STORY CITY OF PUEBLO, COLORADO | U6537 | AN AUTOMATED LIBRARY SYSTEM FOR LIBRARY MANAGEMENT |
| LOCAL GOVT SUCCESS STORY YAKIMA COUNTY, WASHINGTON | U6405 | A BATCH AND REAL-TIME COUNTY ASSESSMENT SYSTEM |
| LOCAL GOVT SUCCESS STORY CORTLAND COUNTY, NEW YORK | U6397 | DESCRIBES THE COUNTY'S REAL PROPERTY INFORMATION SYSTEM |
| LOCAL GOVT SUCCESS STORY HINDS COUNTY, MISSISSIPPI | U6413 | JURY SELECTION AND VOTER REGISTRATION SYSTEM |

| | | |
|---|---|---|
| BC/7 BUSINESS COMPUTERS<br>UTILITY BILLING SYSTEM | U6375 | BILLING APPLICATION SYSTEM<br>FOR WATER & SEWER UTILITIES |
| BC/7 BUSINESS COMPUTERS<br>BUDGETARY ACCOUNTING SYSTEM | U6376 | AN AUTOMATED BUDGETARY<br>ACCOUNTING SYSTEM FOR GOVT |
| SPERRY UNIVAC IN SERVICE<br>TO PENNSYLVANIA | U6129 | SPERRY UNIVAC IN PA. INCLUDING<br>ITS PRODUCTS AND SERVICES |
| SPERRY UNIVAC IN SERVICE<br>TO ARIZONA | U6165 | SPERRY UNIVAC'S INVOLVEMENT<br>IN INDUSTRY AND STATE GOVT |
| SPERRY UNIVAC IN SERVICE<br>TO THE MID-ATLANTIC STATES | U6814 | SPERRY UNIVAC'S PRODUCTS,<br>SERVICES & EMPLOYMENT<br>IN MID-AMERICA |
| SPERRY UNIVAC IN SERVICE<br>TO FLORIDA | U6737 | SPERRY UNIVAC'S PRODUCTS &<br>SERVICE SUPPORT STATE IN<br>MANY AREAS |
| SPERRY UNIVAC IN SERVICE<br>TO CALIFORNIA | U6181 | DESCRIBES SPERRY UNIVAC AS<br>THE MAJOR STATE DP SUPPLIER |
| MAPPER: SERVING THE PUBLIC SECTOR | U7076 | DESCRIBES MAPPER 1100, WITH A<br>PUBLIC SECTOR EMPHASIS |
| KANSAS CITY POWER AND LIGHT CO.<br>A SPERRY UNIVAC MAPPER 1100<br>SUCCESS STORY | U7079 | DESCRIBES HOW MAPPER IS<br>USED, WITH COMMENTS BY<br>COMPUTER SERVICES DIRECTOR |
| MAPPER: SPERRY UNIVAC SYSTEM FOR<br>MAINTAINING, PREPARING AND PROCESSING<br>EXECUTIVE REPORTS | U7122 | KIT (FOLDER & INSERTS),<br>CONTAINING U7076 & U7079<br>(ABOVE) PLUS MORE BROCHURES<br>AND REPRINTS ABOUT MAPPER |
| PUBLIC SAFETY | U6985 | AN OVERVIEW ON THE TYPES OF<br>APPLICATIONS IN POLICE, FIRE,<br>COURTS, AND CORRECTIONS |

## State and Local Government Contacts

*Blue Bell:*

Bruce Burgoyne, Director, Public Sector Marketing
(M.S. B334M: Phone X3862)

Cappy Capocasale, Legislative/Statutory/Transportation
(M.S. B334M: Phone X5717)

Bo Reese, State Government Marketing
(M.S. B334M: Phone X4273)        (

Mike Shearer, Human Services Marketing
(M.S. B334M: Phone X6975)

Joe Henshaw, Technical Pre-Sales Support
(M.S. B334M: Phone X3662)

Ken Schmidt, Technical Pre-Sales Support
(M.S. B334M: Phone X4670)

Al DeMagnus, Employment Security Program
(M.S. B334M: Phone X4312)

Joe Riggione, Public Safety Marketing
(M.S. B334M: Phone X5439)

Ed Lias, Education Marketing
(M.S. B334M: Phone X4312)

*Local:*

Operations Public Sector Marketing Managers:

| | | |
|---|---|---|
| Jim Berry | – | Mideast Operations |
| Kent Durso | – | Southern Operations |
| Bob Farmer | – | Western Operations |
| Joe Pranica | – | Central Operations |
| Bob Taylor | – | Northeast Operations |

**Presentations:**

All personnel from both Headquarters Public Sector Industry Marketing Group and the Operations Public Sector Marketing Managers are available to make state and/or local government presentations to prospects or customers.

# 10 ENERGY AND UTILITIES INDUSTRIES

## 10.1 INTRODUCTION TO AD MARKETS

The Energy industry consists of the following major segments within the petroleum industry:

- Oil and gas exploration, production, refining, distribution, marketing
- Standard major industrial classifications are 13, 29, 46

The requirement for data processing in all phases of the industry is increasing, particularly in this era of critical need for energy reserves and new sources.

The economic size of the industry is tremendous. As an example, of the 16 largest U.S. industrial corporations in 1981, 9 are in the petrochemical segment alone.

Characterizations of the industry are difficult, but the following generally hold true:

- A typical energy-industry company tends to have a great number of diverse computing needs. (Scientific, commercial, etc.)
- Multiple computer vendor installations are common in order to best serve each need
- A *large number* of computing sources (multiple in-house computers, service bureaus) are used to satisfy the computing needs
- Constant demands for growth cause frequent evaluations and changes of computer systems
- The computer systems users are sophisticated

### Energy Market Areas

Specific areas especially suited for marketing by SPERRY UNIVAC Series 1100 systems are:

*Petrochemical*

- *Exploration* – Geophysical or Seismic Data Processing
- *Production* – Oil & gas accounting (lease evaluation, royalty payments, etc.), reservoir modeling/simulation
- *Refining* – Refinery operation & scheduling, direct process control
- *Distribution* – Control/monitoring/simulation of pipelines, transportation network optimization
- *Marketing* – Retail credit, point-of-sale applications, information management systems

*Engineering Activities for Petrochemical Segments*

- Project control/monitoring
- Structural design of process plants, marine structures
- Piping and vessel design
- Process unit design

## Worldwide Energy Industry Center

WWEIC is based at Sperry Univac corporate headquarters in Blue Bell, Pennsylvania. The group is responsible for (a) identifying and acquiring or developing products of special interest to the energy industry, (b) providing guidance to Sperry Univac top management in long range planning relative to that industry, and (c) supporting the field marketing organization. Having formerly worked in the energy industry, the WWEIC staff brings a unique understanding of industry needs and wants to Sperry Univac's marketing effort.

## AD Energy Operation

The National Energy Operation, located in Houston, Texas, was organized for the purpose of specific marketing to the petrochemical industry. The Operation offers specialized knowledge and support in products, applications and marketing for the petrochemical industry. Particular expertise in seismic data processing, petrochemical retail credit marketing, oil refinery operations, etc., in all Sperry Univac product lines is provided. Expertise is not limited to petrochemical applications, however. Knowledge of engineering design and electrical power generation/transmission is coordinated from sources throughout the world, and an extensive reference library for the energy industry is maintained in Houston.

## Specialized Software

- Seismic
    - Sperry Univac Array Processor Software including VAST, in automatic FORTRAN translation facility for the Array Processing System
- Process Optimization
- Transportation Network Optimization – FMPS
- Investment Planning
- Engineering – ICES, APL, Nuclear codes, Piping and Vessel Design, UNIS-1100
- Project Control – PERT/CPM, OPTIMA

The following is a short list of selected petrochemical applications software available for use on the SPERRY UNIVAC Series 1100. For more detailed descriptions of these and many other energy industry related software packages, refer to the Energy Applications Software Handbook (U6955). If further information is required, contact either the vendor or the Sperry Univac Energy Operation.

*Series 1100 Petrochemical Applications Programs Summary List*

| Refinery Simulation/Design | Vendor |
|---|---|
| • B-DISTIL | Sperry Univac |
| • Proslator-S | Sperry Univac |
| • Chemical Engineering Series | Sperry Univac |
| • RPMS | Bonner & Moore |
| • REFINE | Chemshare |
| • DESIGN/2000 | Chemshare |

| Reservoir Simulation | Vendor |
|---|---|
| • BETA II | Intercomp |
| • BOSS | Scientific Software |
| • N-COMP | Scientific Software |
| • FIRST | Scientific Software |

| Petrochemical Engineering | Vendor |
|---|---|
| • TRI*FLEX (Piping System Design & Analysis) | AAA Technology |
| • TRI*VESSEL (Pressure Vessel Design & Analysis) | AAA Technology |
| • WERCO (Vessel Shell Local Stress Analysis) | AAA Technology |

| Miscellaneous | Vendor |
|---|---|
| • Well Logging System | Intercomp |
| • LOGCALC (Well Log Information System) | Scientific Software |

| Seismic Processing/Exploration | Vendor |
|---|---|
| • Digitech Seismic Processing System (DSPS) | Digitech |

*Vendor Address*

| Address | Telephone No. |
|---|---|
| • AAA Technology & Specialties Co., Inc.<br>6116 Skyline Drive, Suite 200<br>Houston, Texas 77057 | (713) 789-6200 |
| • Bonner & Moore Associates, Inc.<br>2727 Allen Parkway<br>Houston, Texas 77019<br>Also offices in: New York/Brussels/London/Wiesbaden | (713) 228-0871 |
| • Chemshare Corporation<br>1900 Lummins Tower<br>Houston, Texas 77027<br>Also offices in: London | (713) 627-8945 |

- Digitech, Ltd.
  441 5th Avenue, Southwest
  Calgary, Alberta, Canada T2P2V1

- Groupe European de Recherche Gassienne
  Dr. Kirschke
  c/o Ruhrgaz A.G.
  43 Essen 1
  Postfach 28, Germany

- Scientific Software Corporation            (713) 236-1414
  1100 Milam Building, Suite 580
  Houston, Texas 77002
  Also offices in: Denver, Colorado/Calgary, Canada

## Specialized Hardware and Hardware Support

*Seismic/Vector Processing*

- Sperry Univac Array Processor (extremely high speed calculations for matrices)
- Floating Point Systems, Inc. AP-190L Array Processor (1100 Series)
- Sperry Univac Array Processing System – APS for 1100/80 systems

*Graphics*

- AGT, Tecktronix
- Remote 9300/plotter systems

## Reference Materials/Information Sources

*Sperry Univac Publications*

| Name | Sperry Univac Number or Source | Pages |
|---|---|---|
| The SPERRY UNIVAC Array Processor Design Description | | 200 |
| Array Processor Information Bulletin (Series) | AD Energy Operation | |
| Commitment to Energy | U6184.1 | 35 slides |
| Energy Applications Software Handbook | U6955 | 200 |
| Geoprocessor | AD Energy Operation | |

*Periodicals*

| Name | Publisher | Type |
|------|-----------|------|
| • Oil & Gas Journal | Petroleum Publishing Co., Tulsa | Weekly |
| • World Oil | Gulf Publishing Co., Houston | Monthly |
| • Geophysics | Society of Exploration Geophysicists, Tulsa | Monthly |
| • Electric Light & Power | Cahners Publishing Co., Boston | Monthly |
| • Petroleum Engineer | Petroleum Engineer Publishing Co., Houston | Monthly |

*Miscellaneous*

- NTIS – National Technical Information Service
  (U.S. Government Energy Reports)
  5285 Port Royal Road, Springfield, VA. 22161

- Argonne Code Center – Argonne National Laboratory
  (Center Info. Agency for Nuclear Codes)
  9700 South Cass Avenue
  Argonne, Illinois 60439

- DOE – Department of Energy
  Technical Information Center

- NASA/Cosmic – (Public Domain Computer Applications)
  Superintendent of Documents/Computer
  Program Abstracts
  U.S. Government Printing Office
  Washington, D.C. 20402

*Societies/Trade Shows/Conferences*

- SEG – Society of Exploration Geophysicists
  (Sperry Univac Institutional Member)
  Annual Conference (Sperry Univac exhibit)

- NPRA – National Petroleum Refiners Association Computer
  Applications Committee
  Annual Computer Conference (Sperry Univac Users Attend)

- AGA – American Gas Association

- AIChE – American Institute of Chemical Engineers

- SPE – Society of Petroleum Engineers (AIME)

- IEEE – Institute of Electrical and Electronics Engineers

## 10.2 INTERNATIONAL DIVISION ENERGY

**Introduction**

Energy covers both 'Primary Energy Production' e.g. exploration and production of oil, gas and coal, as well as energy treatment and distribution or 'Secondary Energy distribution.' It therefore includes:

- Major international oil companies such as Shell, BP, Esso, at headquarters, region or country level
- National oil and gas companies, e.g. CEPSA (National Oil Company of Spain)
- Independent Producers, refiners and marketing/distribution companies, e.g. Nafta Distributor, Belgium
   Enpetrol Refineries, Spain
- Petrochemical Manufacturing Companies, e.g. A.T.O. France.

   Manufacture of hydrocarbon based petrochemicals such as acetylene, ethylene, propylene, olefins, benzene, napthalene, naptha and other gas derivatives give rise to computer applications virtually identical to those in oil refineries. Such intermediate chemicals are widely used in plastics, fibres, detergents, paints, fertilizers etc.
- Coal mining, producing and distribution companies

EDP in Energy concentrates on cost saving and improved technical solutions. Here are some of the important applications. For specific software please contact Chris Gridley, Energy Marketing Manager I.D., Brentfields, who will advise on both Sperry Univac and 3rd Party software appropriate to your needs.

**Petroleum Industry**

There are six main areas of activity for oil and gas companies – Exploration, Production, Transportation, Refining, Petrochemical Manufacture and Marketing.

*Exploration* – oil and gas

This activity includes such prospecting methods as gravity, magnetics and seismic surveys; drilling for reservoirs and evaluation of any discoveries. Seismic is the major computer opportunity, and may involve array processors.

Key applications include:
- Seismic processing
- Well Data Systems
- Geological and Lithological Information Systems
- Reservoir engineering and simulation

*Production* – oil and gas

Covering such areas as production planning, scheduling, and recovery maximization from oil and gas fields. Applications include:
- Production Scheduling
- Production information systems (oil, gas, water)
- Reservoir engineering and modelling
- Plant design and construction

Reservoir Engineering is the most important.

In addition, for offshore production there is a major series of technical application in the design, construction and operation of production platforms.

*Transportation* – oil and gas

The transportation of crude oil or gas from local reservoirs, via pipelines to oil ports and thence by tanker to major consumption areas is generally known as Transportation. A major computer application involves the supply function, whereby a company allocates crudes from various oil fields (all have different properties) to different markets in appropriate oil tankers. This is a major linear programming application.

Other applications include pipeline design and monitoring of operations.

*Refining and Petrochemicals*

At this stage of operations crude oil is distilled and processed into at least eight fractions for future treatment to produce not only the familiar products such as petrol and fuel oil, but also such intermediate hydrocarbon chemicals as ethylene and propylene which are further processed in petrochemical plants. Major applications for refineries and petrochemical plants include:
- Production Planning (monthly)
- Manufactured stock recording and dispatch systems
- Refinery stores and spare parts system
- Maintenance scheduling and costing
- Equipment performance technical calculations
- Plant design, construction and debottlenecking

*Marketing* – all products except gas (utility)

Covering the distribution, sale, and delivery in bulk and packaged form via depots and filling stations to wholesalers & retailers in a wide range of industries. The principal applications are:
- Sales Accounting and billing
- Sales Analysis (reports and forecasts)
- Costs and Budgets suites
- Accounts Receivable and Debtors
- Dealer Site Information System
- Credit Card Processing

*Headquarters*

Centralized or headquarter functions of major oil companies give rise to major computer applications which include such areas as:

- Personnel systems
- Intra Company and Group Accounts
- Supply and Distribution Planning
- Basic Petroleum Research
- Aviation and Marine bunkering sales systems

The key areas of concern to use in discussions with prospects include – pressure on costs; cash flow; current margins.

*References*

- *Exploration and Production*

  Gasunie, Holland – 1100/60
  Shell KSEPL, Holland – 1100/80 and Array Processor
  Industrije Nafte/INA/, Yugoslavia – 1100/60

- *Refining and Petrochemical Plants*

  Industria Siciliana Asfalti Bitume/ISAB/, Sicily – 1106
  Compania Espanola De Petroleos, S.A./CEPSA/, Spain – 1100/61 and 2 x 90/30
  Dutch State Mines,/CCN/Holland – 1100/42

- *Marketing and Distribution*

  Shell Francaise, Paris – 1100/80
  BP Oil Ltd, UK – 1100/80

- *Centralized Functions*

  BP Trading Ltd, UK – 1100/80
  Shell UK Ltd – 1100/80
  Norsk Hydro, Norway – 1100/60

A worldwide list of Sperry Univac oil, gas and petrochemical company users is maintained by Chris Gridley, Energy Industry Marketing Manager, I.D., Brentfields. Contact him for information on applications, user references, market shares (which we are well above average). Also see glossy brochure and installation guide for Energy.

**Coal Industry**

Since the 1973 Energy crisis coal has become a more significant alternative source of primary energy. Important applications include:

- Geological and Reserve Information Systems
- Mine production planning systems
- Production simulation
- Spare parts inventory
- Maintenance scheduling
- Payroll and personnel

*References*

- *Coal Companies*

  Rheinbraunkohle, Germany – 1110
  South African Oil, Coal and Gas Corp/SASOL/ – 1100/60

## 10.3 PUBLIC UTILITIES IN INTERNATIONAL DIVISION

### Introduction

I.D. Public Utilities consist of electricity, gas, and water services (but not communications). Univac has a double figure market share and some excellent references in this conservative sector. Utility undertakings are organized in widely different ways in each country from government monopoly (e.g. British Gas, Electricite de France) through independent but state regulated companies e.g. E.N.H.E.R. Spain to municipality-owned multiple utility organizations such as Salzberg Stadtwerke.

With increase in costs of manpower, basic energy sources and capital, as well as environmental pressures and legislative requirements, utilities are finding it increasingly difficult to maintain a full customer service at competitive costs. Computer applications can assist the drive for efficiency, cost reduction and productivity by contributing in the following areas:

### Gas Trunkline Companies

For major trunkline companies the principal applications cover the Planning, Simulation and Control of the gas pipeline and network, i.e.

- Steady state analysis
- Transient flow analysis
- Compressor and regulator requirements planning, operation, simulation
- Online supervisory control systems

NB: Trunkline companies use their pipe networks as pressure storage vessels.

### Gas Utilities

Local distribution companies, whilst also concerned with low pressure transient flow applications, are predominantly involved in providing Customer Information Systems, often online using data base techniques and covering such applications as:

- Meter Reading
- Customer Records and Enquiries – online
- Customer Billing and Receipts
- Marketing Statistics
- Stores and Spare Parts Control (conversion to natural gas?)
- Accounts payable
- Operating Expenses
- Corporate and Financial Models
- Construction and Project Control
- Pipeline routing information

In Europe gas is expected to double its share of the energy cake in the next decade. As a major growth sector it is therefore an excellent area for new customers.

*References*

- *Gas Companies*
  British Gas Corp. – Production and Supply/Trunkline/,UK – 1106
  British Gas Corp. – East Midland Gas Region/Local Distribution/UK – 1100/42
  Gas, Electricity and Water Co. of Koln/GEW/Germany – 1100/12

**Electricity Producing & Distribution Companies**

Like gas, the key application is a comprehensive Customer Information System. Increasingly these are going online using data base and providing immediate information on customers' consumption, payments, changes, meter information etc. Both utilities have similar applications in this area, (see gas) and involve intensive computer and terminal usage.

Technical applications are numerous and include:
- Generator Scheduling and Planning
- Load Forecasting and Dispatching
- System Security Analysis
- Transient Stability Calculations
- Distribution and Transmission Planning
- Supervisory Control Systems
- Power Pool Information and Coordination
- Nuclear Power applications including safety
- Hydro management applications
- Tariff Modelling
- Plant Construction and Project Scheduling

*References*

- *Electric Companies*
  Statens Vattenfallsverk, Sweden – 1100/42
  Compania Portuguesa De Electricidade/CPE/, Portugal – 1106
  Berlin Kraft Und Licht AG/BEWAG/, Germany – 1108
  Electroslavonija, Yugoslavia – 1100/11
  Enher, Spain – 1100/11

**Water Companies**

Increasing water scarcity is resulting in more careful planning and utilization. Applications include:

- Geological and Catchment Information
- Financial Information System
- Water usage/supply systems
- Billing and accounting routines
- Spares and stores accounting
- Plant design and construction

*References*

- *Institute of Hydrology, UK # 1108*
  Secrejana d'Etat a L'Hydraulique, Algiers – 1106
  Gas, Electricity and Water, Kdn/GEW – 1100/12
  Denver Board of Water, U.S.A. – 1106
  Texas Water Development Board, U.S.A. – 1100/40

For information and application assistance on Utilities contact Chris Gridley, Industry Marketing Manager, Energy & Utilities International Division HQ, Brentfields, London.

Also see following I.D. Publications

- "Public Utility User Systems & Applications" Publication No. SU/ID/7809 Rev. I, includes U.S., Japan & I.D.
- "Univac in Public Utilities" – glossy Publication No. SU/ED 7512
- Applications Software Directory

# 11 EDUCATION

## 11.1 INTRODUCTION TO THE WORLDWIDE MARKET

### General Characteristics

The Education Market is one of the larger Series 1100 user markets and is divided into the following specific functional areas:

*Major SIC Groupings*

    8211 – Elementary/Secondary Schools
    8221 – Colleges/Universities and Professional Schools
    8222 – Junior & Community Colleges/Technical Institutes
    8231 – Libraries and Information Centers
    8241 – Correspondence Schools
    8243 – Data Processing Schools
    8244 – Business & Secretarial Schools
    8249 – Vocational Schools, except Vocational High Schools
    8273 – Research and Development Laboratories
    8299 – Schools & Educational Services not elsewhere classified

In addition, the related Public Sector areas of Federal, State and Local Governments, provide up to 10 percent of their computer use in education related applications. Computer based instruction (CAI) as a training vehicle is gaining recognition throughout industry and is available as the Author System for Education and Training (ASET).

The Education Market (SIC 82) as an entity spends in excess of $100 billion annually in the United States alone. It is currently being influenced by public demand for performance and accountability as evidenced by new legislation being introduced at the federal and state levels. New or higher taxes are being questioned or voted down with a result oriented underlying force in education spending.

### Major Trends

The Education 1100 Market divides computer needs into two general service areas:

- Administration
- Academic/Instructional

Timesharing continues as a major trend for academic/instructional computing, particularly in the post-secondary education market.

The trend towards integrated data base administrative systems is very apparent in the U.S., and beginning to be recognized internationally.

The advent of personal computing has significantly impacted educational data processing, with microcomputers being heavily utilized in the elementary/secondary school market for instructional purpose.

## Market Potential

The SPERRY UNIVAC Series 1100 is well known and widely accepted throughout the education community. Over 130 Series 1100 computers are installed worldwide, servicing the education market, with 49 of these in the Americas Division and 82 in the international Division. Reference selling this broad base of 1100 users in education, and their many administrative and academic/instructional software programs provides an excellent testimonial to Sperry Univac's credibility and capability to service this market.

## College and University Market

The post-secondary education market is currently the largest user of computers in Education. There are 3,190 publicly and privately controlled colleges and universities in the United States, consisting of 1,975 4-year colleges and universities, and 1,215 2-year junior, community and technical colleges. Other countries have similar strong commitments to post-secondary education. In Australia, for example, there are 19 universities, 73 Colleges for Advanced Education, and 287 Technical and Further Education institutions. Total computers installed worldwide in Education are valued at approximately ten billion dollars.

In administrative applications, some application software has been exchanged from site to site, but most programs are written to meet the needs of the particular institution. CAUSE, which is the professional association for development, use and management of information systems in higher education, estimates that less than 10 percent of the inquiries which it receives actually result in software exchange. A significant amount of concept exchange does take place through review of application abstracts. This may change with the increased flexibility of data base technology and the availability of sophisticated interactive data base systems like the Bloomsburg State College Student Administrative System, and the North Orange County Community College District Administrative Systems.

Common application areas fall into two broad areas, plus Alumni/Development and Library.

## Student Administrative System

Undergraduate Admissions
Graduate Admissions
Financial Aid Packaging
Course Catalog
Class Schedule
Student Registration
Algorithmic Student Scheduling
Drop/Add
Grade Reporting

Word Processing
Degree Audit
Student Housing
Tuition & Fee Assessment
Final Exam Scheduling
Planning
Institutional Research
Facilities Inventory (Space)
Student Records

**Financial Administrative System**

| | |
|---|---|
| Payroll | Budget Preparation |
| Personnel | Purchasing |
| Salary Projection | Accounts Payable |
| Grants & Contracts | Stores Inventory |
| Research Accounting | Physical Plant |
| Financial Aid Accounting | Property Inventory |
| Food Service | Student Accounts Receivable |
| General Ledger | |

In academic/instructional computing, a tremendous amount of software is available on the Series 1100, from both Sperry Univac and education users. In addition to a wide variety of compilers, application packages are readily available. They include BMD, BMDP, SPSS, SCSS, IMSL, FMPS, GAMMA, IGDS, MINITAB, ASET, Courseware, SUFICS, GIFTS, UNIDAS, UNADS, APT, UNIS, OPTIMA, MAPPER and ICES. In these areas, the prospective institution looks primarily for three things:

- Sophisticated student oriented timesharing

- Language versatility and debugging aids to support a computer science curriculum.

- Package-type statistical and other mathematical type software, to support student use and faculty research activity. The latter activity often generates institutional revenue by way of government and industry research grants.

**Elementary and Secondary School Market**

There are 15,834 elementary/secondary public school districts within the United States, servicing 89,577 schools, and approximately 43 million students. Of these, 717 school districts have over 10,000 students and can be considered Series 1100 prospects. In addition, there are 272,664 private and parochial elementary/secondary schools with an enrollment of approximately 5 million students.

Since 1960, the number of school districts in the United States has decreased by over 50 percent. This consolidation has created many more prospects, because districts are now larger, with increased budgets and with corresponding larger problems to solve. The need to automate is nowhere more mandatory than in the nation's public school system.

In administration, unlike the college market, the applications are well identified and sufficiently "standard" to warrant a package application approach. They fall into two broad areas:

| *Financial* | *Pupil* |
|---|---|
| General Ledger | Student Records |
| Budget | Scheduling |
| Purchasing | Attendance Accounting |
| Accounts Payable | Grade Reporting |
| Personnel/Payroll | Test Scoring |
| Stores Inventory | Career Guidance |
| Fixed Asset Inventory | |

The need for computer-based drill and practice programs is solved by ASET. This CAI system enables school teachers at all grade levels to develop instructional modules which are tailored to local student requirements.

**Other Series 1100 Markets**

Libraries are a small but growing market. Mankato State University has developed an online card catalog and biographical system for the Minnesota State Universities on the Series 1100. Mankato has indicated an interest in making their system available to other libraries and information service organizations.

Regional Consortiums/Networks exist in many parts of the United States. They provide a basis for sharing computing services for educational institutions. Examples include the Maryland State Colleges Information Center, on behalf of eight Maryland State Colleges; Mankato State University, academic/instructional computing on behalf of seven Minnesota college/universities; St. Cloud State University, Administrative computing on behalf of seven Minnesota college/universities; and Bloomsburg State College, administrative and instructional computing for seventeen small school districts.

**Sales Benefits**

Sperry Univac offers the Education Market:

- Sophisticated timesharing within the Series 1100 Operating System, which eliminates the need for a separate timesharing operating system.
- Mature Series 1100 Operating System.
- Efficient Multifunction Performance:
  BATCH/RJE/INTERACTIVE/TRANSACTION
- Extensive Sperry Univac and users library of academic software.
- State-of-the-art administrative software in DMS 1100/TIP 1100/QLP 1100.
- Special tools for computer-aided instruction and scientific research

**Sales Aids**

The following sales aids are available:

*Brochures:*

- U6669   North Orange County Community College District (12/79)
- U6715   The 1100 on Campus (5/81)
- U6958   SUNY/Albany—Facilities Description (1/81)
- U6981   Bloomsburg State College—An Integrated Approach to Information Management (6/81)

*Newsletters:*

- Sperry Univac Worldwide Education/Research Newsletter:
- U6041R   Summer 1978
- U6324   Summer 1979
- U6919   Summer 1981

These newsletters describe Sperry Univac activities with its customers in Education and research. U6919 also contains portions of the SUNY/Albany, NOCCCD and Bloomsburg brochures.

*Slide Presentations:*

- U9386.0   Sperry Univac in Education script (1982)

   U9386.1   Sperry Univac in Education slides (1982)

*Education Industry Center Bulletin:*

| 801 | May 1980 | Sperry Univac Membership in CAUSE |
|-----|----------|-----------------------------------|
| 811 | February 1981 | ASET Courseware |
| 812 | March 1981 | SUNY/Albany |
| 813 | May 1981 | SCSS |
| 814 | June 1981 | The 1100 on Campus |
| 815 | July 1981 | Bloomsburg State College |
| 816 | August 1981 | Minitab |

# 12 DISTRIBUTION

## 12.1 INTRODUCTION TO WORLDWIDE MARKET

### General Market Characteristics

The distribution industry market place currently affords Sperry Univac a market penetration growth potential second only to manufacturing. The significant target areas for this potential can be itemized by major SIC code groupings commonly used in differentiating between distribution environments.

The Distribution Industry includes all SIC codes 50 through 59 – the industry is further segmented to include the following market segment classification:

| Market Segment Classification | Major SIC Groupings | |
|---|---|---|
| Wholesale – Durable Goods | 501 | Motor Vehicle and Automotive Parts and Supplies |
| | 502 | Furniture and Home Furnishings |
| | 503 | Lumber and Other Construction Materials |
| | 504 | Sporting Recreational, Photographic and Hobby Goods, Toys and Supplies |
| | 505 | Metals and Minerals, Except Petroleum |
| | 506 | Electrical Goods |
| | 507 | Hardware and Plumbing and Heating Equipment and Supplies |
| | 509 | Miscellaneous Durable Goods |
| Wholesale – Nondurable Goods | 511 | Paper and Paper Products |
| | 512 | Drugs, Drug Proprietaries and Druggist Sundries |
| | 513 | Apparel, Piece Goods and Notions |
| | 514 | Groceries and Related Products |
| | 515 | Farm Product Raw Materials |
| | 516 | Chemicals and Allied Products |
| | 517 | Petroleum and Petroleum Products |
| | 518 | Beer, Wine and Distilled Alcoholic Beverages |
| | 519 | Miscellaneous Nondurable Goods |

| Market Segment Classification | Major SIC Groupings | |
|---|---|---|
| Retail – Food | 541 | Grocery Stores |
| | 542 | Seafood Markets, Including Freezer Provisions |
| | 543 | Fruit Stores and Vegetable Markets |
| | 544 | Candy, Nut, and Confectionery Stores |
| | 545 | Dairy Products Stores |
| | 545 | Retail Bakeries |
| | 546 | Miscellaneous Food Stores |
| Retail – All Others | 521 | Building Materials, Hardware, Garden Supply |
| | 523 | and Mobile Home Dealers |
| | 525 | |
| | 526 | |
| | 527 | |
| | 531 | General Merchandise Stores |
| | 533 | |
| | 539 | |
| | 551 | Automotive Dealers and Gasoline Service Stations |
| | 552 | |
| | 553 | |
| | 554 | |
| | 555 | |
| | 556 | |
| | 557 | |
| | 559 | |
| | 561 | Apparel and Accessory Stores |
| | 562 | |
| | 563 | |
| | 564 | |
| | 565 | |
| | 566 | |
| | 568 | |
| | 569 | |
| | 571 | Furniture, Home Furnishings and Equipment Stores |
| | 572 | |
| | 573 | |
| | 581 | Eating and Drinking Places |
| | 591 | Miscellaneous Retail |
| | 592 | |
| | 593 | |
| | 594 | |
| | 596 | |
| | 598 | |
| | 599 | |

| Market Segment Classification | Major SIC Groupings | |
|---|---|---|
| Transportation – Railroad | 401 | Railroads |
| | 404 | Railway Express Service |
| | | |
| Transportation – Motor | 421 | Trucking, Local and Long Distance |
| Freight and Warehousing | 422 | Public Warehousing |
| | 423 | Terminal and Maintenance Facilities |
| | | |
| Transportation – Water | 441 | Deep Sea Foreign Transportation |
| | 442 | Deep Sea Domestic Transportation |
| | 443 | Great Lakes/St. Lawrence Seaway Transportation |
| | 444 | Transportation on Rivers and Canals |
| | 445 | Local Water Transportation |
| | 446 | Service Incidental to Water Transportation |
| | | |
| Transportation – Services | 471 | Freight Forwarding |
| | 472 | Arrangement of Passenger Transportation |

The diversification of distribution environments are numerous; however, all have the commonality of certain requirements, disbursement of physical goods and minimizing inventory levels thus investment. In many cases this commonality can be shared by the manufacturer as well as by the distributor leading to even higher market potential.

## Market Trends

Distribution involves many different operations and activities – order entry, customer services, warehousing, merchandising and purchasing, traffic shipping, finished goods inventory, and private fleet operations. Sound distribution management requires effective coordination of all those functions that form the principal connecting link between manufacturer and customer. Distribution operations make up a system that involves a flow of information from the customer to the manufacturer – as well as a product flow from the manufacturer to the customer.

As a result of management pressures, and operation opportunities, companies will focus increased attention on distribution and its integration into the total management decision-making process. Although distribution is one of the lesser understood areas of many companies' operations, it frequently is an area of great potential management interest.

This interest is based on management recognition of continued growth of physical volumes to be distributed, resulting increases in distribution costs, changes in technology and distribution methods requiring continuing evaluation and attention for effective use, and increased demands for customer service to support marketing strategies in the face of continuing cost advances.

- Large distributors will add new applications by integrating files into large data bases which will require super-sized computers coupled with vast memories and sophisticated software management systems.

- Small distributors will take advantage of computer power for the first time either through intelligent terminals, minicomputers or purchased services.

- Major purchases of data collection devices with wanding or fixed head readers will be utilized by distributors to record UPC coding as well as internal coding. This data in turn will be used for more effective inventory management.
- The industry as a whole will become more and more "package" or application oriented requiring vendors to provide industry oriented application software as well as demonstrable industry expertise.
- Distributors will look towards vendors for problem solutions based on actual "hands on" experience as less and less emphasis is placed on hardware solutions to business problems.
- Software application will center around online order entry/invoicing

## Data Processing Applications

Data processing applications fall into the following major groupings:
- Order Entry/Invoicing
- Warehouse Receipt and Location
- Stock Control and Status
- Merchandising and Purchasing
- Accounts Receivable/Payable
- Return on Investment/Cash Flow Forecasting
- Management Reporting
- Merchandising Movement/Census and In Store Services
- Message Switching
- Vehicle Maintenance/Equipment Control
- Freight/Way Billing Preparation and Audit