

1100 Series
Computer Systems

Sales Information
Manual

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

TABLE OF CONTENTS

	PAGE
PREFACE	
1 1100 SERIES OVERVIEW	
1.1 Family Concept and Commitment	1-1
1.2 History and Success	1-2
1.3 Software Architecture	1-7
1.4 Hardware Architecture	1-10
2 SYSTEM SOFTWARE – CAPABILITIES AND VALUES	
2.1 Information Management	2-1
2.2 Transaction Processing	2-4
2.3 Time Sharing	2-6
2.4 Batch Processing	2-9
2.5 System Resource Management	2-10
2.6 Security	2-16
2.7 Availability, Reliability, Maintainability	2-17
3 CENTRAL HARDWARE – CAPABILITIES AND VALUES	
3.1 Multiprocessing	3-1
3.2 Relative Performance	3-5
3.3 Input/Output Capabilities	3-7
3.4 Communications Capabilities	3-10
3.5 Model Features	3-10
4 PERIPHERAL HARDWARE – CAPABILITIES AND VALUES	
4.1 Mass Storage Disk Subsystems	4-2
4.2 SPERRY UNIVAC UNISERVO Magnetic Tape Subsystems	4-8
4.3 Sperry Univac Communications	4-11
4.4 Terminals	4-17
4.5 SPERRY UNIVAC Paper Peripherals	4-21
5 1100 SERIES MARKETS	
5.1 Introduction	5-1
5.2 Sperry Univac Upgrades	5-1
5.3 Competitive Replacement	5-2
5.4 New Applications	5-3
5.5 Consolidation	5-3
6 SPECIFIC INDUSTRY MARKETS	
6.1 Introduction	6-1
6.2 U.S. Federal Government	6-1
6.3 State and Local Government	6-9
6.4 Subsidiary Governments	6-13
6.5 Financial	6-16
6.6 Airline Market	6-46
6.7 Education	6-52
6.8 Energy Industries	6-58
6.9 EAAD Health Care Industry	6-70
6.10 Manufacturing	6-73

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

7 PROSPECT QUALIFICATION

7.1	Introduction	7-1
7.2	Common 1100 Prospect Characteristics	7-2
7.3	Determining the 1100 Series Systems to Propose	7-8
7.4	Summary	7-9

8 SELLING

8.1	Return on Investment (ROI)	8-1
8.2	Program Development	8-2
8.3	Applications Development	8-3
8.4	On-Line Database	8-4

9 COMPETITION

9.1	IBM Systems that Compete with 1100	9.1.1.1
9.2	Honeywell Systems that Compete with 1100	9.2.1.1
9.3	Burroughs Systems that Compete with 1100	9.3.1.1
9.4	DEC System that Compete with 1100	9.4.1.1
9.5	CDC Systems that Compete with 1100	9.5.1.1
9.6	Amdahl Systems that Compete with 1100	9.6.1.1
9.7	NCR Systems that Compete with 1100	9.7.1.1
9.8	ICL	
9.9	Siemens System that Compete with 1100	9.9.1.1
9.10	Fujitsu	
9.11	Hitachi	
9.12	Third Party Leasing Firms	9.12.1

10 CONVERSION

10.1	Conversion in AD	10-1
10.2	Conversion in EAAD	10-11
10.3	Conversion Support	10-18

11 SALES AIDS

11.1	Sales Aids for AD	11-1
11.2	Sales Aids for EAAD	11-15

1100 SERIES SIM GLOSSARY ITEMS	G-1
---	------------

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

PREFACE

This manual has been written for our sales representatives so they might have, in one document, all the information they need to learn about, to propose with, and to sell the SPERRY UNIVAC 1100 Series Family of computer systems.

It is our intent to update this manual when new systems are announced and when competitive systems have changed. While this update process will not be monthly, it should be often enough to make the manual useful.

The manual is divided into three different areas — a preface containing the new product announcement and highlights, a family series section containing hardware and software general information, and a sales section containing customer oriented marketing information.

The Preface section contains room for bulletins and announcements. This first edition has an announcement "highlights" notice for the 1100/80, the SPERRY UNIVAC 5046 Word Control System, and the SPERRY UNIVAC 8434 Disk Subsystem. There is, of course, the normal material already included in the body of the manual on these same products.

Future Products will contain a preface insert "highlighting" the product and a separate insert(s) for the body of the manual.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

PREFACE ANNOUNCEMENT HIGHLIGHTS SECTION

Concurrent with the release of this 1100 Series Sales Information Manual is the formal Sperry Univac announcement of the 1100/80 Series Computer System, the 5046 Word Control Unit, and the 8434 Disk Subsystem. These offerings will be highlighted in this section to allow the Sales Representative a quick review of the new products without having to read the total manual.

These products are already integrated into the manual in their respective sections, or, soon will be.

1100/80 HIGHLIGHTS

P.1.0 INTRODUCTION

The 1100/80 system is a continuation of the successful 1100 computer family. All user coded programs are fully compatible within this family. The common operating system — 1100 OS — continues with the 1100/80 hardware and offers enhancements based on this new family architecture. Recent technological advances have allowed Sperry Univac to continue to offer evolutionary changes to the 1100 system, while also continuing to maintain our customers' investment in applications and software.

The 1100/80 will make use of:

ECL

A new circuit technology — Emitter Coupled Logic (ECL) — is today's state of the art circuitry for stability coupled with high circuit speeds. Sperry Univac has chosen ECL logic for the 1100/80 because it is fast enough to satisfy our product need, can be run at that speed and stay well within its rated limits, and lends itself to packaging techniques that are advantageous to our customers.

MLP

Multilayer Packaging techniques enable Sperry Univac to manufacture cabinet components with vastly reduced labor involvement. Reduction in potential human error is always an attractive goal in the manufacturing process. The elimination of most of the back panel wiring also improves signal isolation and reliability.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

Buffer Memory

The growing user need for large real-memory configurations has been accommodated in the 1100/80 design. A very large, economical memory of relatively modest speed capabilities has been usefully configured into the computer system in combination with a high speed buffer interposed between the processing components and the memory.

The high speed buffer has been carefully designed and manufactured with more costly components to provide the system with the desired performance characteristics. In this way, Sperry Univac offers generous amounts of main storage at attractive prices, yet retains just the right balance of performance to make use of this memory.

ARM (Availability, Reliability, Maintainability)

The 1100/80 has continued the 1100 evolution in ARM through the use of ECL logic, MLP packaging techniques, and a complete mini-computer maintenance system. All of these functions have been chosen by Sperry Univac to ensure a stable product without compromise to raw performance. The entire 1100/80 system is designed to run well within its limits.

NEW I/O

There are both software and hardware changes in the I/O areas of the 1100/80 that will result in new system performance levels.

The 1100/80 will offer both word and byte I/O channels. A large data base that is accessed at a modest rate per second can make use of the Block Multiplexer that can daisy-chain several control units together. A large data base that must be accessed at a higher rate per second can use the word channel option to dedicate a channel to the full usage of each control unit, and therefore, greatly reduce potential queueing on the channel.

In addition to uniquely offering our customers the flexibility of industry standard byte-type multiplexers and dedicated word channels, a software change called the channelizer program will be provided for the entire 1100 product line that will significantly improve I/O processing performance. The 1100/80 will have unique capabilities within this channelizer program to further enhance its I/O performance.

P.2.0 MARKETING OBJECTIVES

The 1100/80 is designed to meet certain Sperry Univac marketing objectives in the 1976-1982 time frame. The major objectives are the following:

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

1. To continue to provide price competitive, state-of-the-art systems within the SPERRY UNIVAC 1100 computer family.
2. To provide certain aspects of 494 conversion capability to encourage 494 customer migration to the 1100 systems.
3. To continue to expand Sperry Univac's acceptance in the large scale general purpose marketplace.

These objectives are attained by the following system attributes:

1. Price Competitive 1100 Follow-On

The 1100/80 directly executes 1100 series code. The 1100/80 runs under the control of 1100 OS and executes all user code without changes.

The price/performance is competitive through the use of large amounts of memory configured inexpensively via a buffer memory/backing storage design. The backing storage offers inexpensive expansion and the buffer memory offers performance. Manufacturing techniques have lowered labor costs and reduced potential human errors, thus aiding in cost reduction.

2. 494 Conversion

Sperry Univac has produced several conversion aids for use in converting a 494 system into the 1100 computer line. These aids, in conjunction with close customer planning, are intended to facilitate the migration of this customer base.

3. High Performance Marketplace

The 1100/80 system includes up to a 2x2 system which provides up to 4 to 5 times an 1108 UP throughput. This system is very modular and very growth oriented and will make an attractive package to market to all Sperry Univac customers as well as all customers in need of a very large computer facility.

P.3.0 MARKET STRATEGY

P.3.1 New Sales

The 1100/80 will augment the 1100 family in new sales situations. The increased power and improved price effectiveness make this system competitive in any sales situation involving IBM's 370/168 series. Also, the presence of an 1100/80 as a follow-on to the 1100/40 should give assurance to existing and prospective 1100/40 customers that Sperry Univac will continue to support and provide growth opportunities for their needs.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

The 1100/80, with its high-speed buffer memory and large capacity backing store, will market well to any potential customer needing general purpose capability in the 2.0 to 4.5 MIP range.

Any EDP customer who is being offered an IBM 370/168-3 will be a prospect for the 1100/80.

P.3.2 1100 Replacements

The following comments are general in nature and should be modified for the customer's contractual position.

1108

The 1100/81 will provide up to approximately three times the system throughput of an 1108. This throughput advantage should be enough to make the existing 1108 base an attractive pool of potential customers. The 1108 system has been in the field for very close to the twelve year maximum expected for such a system's life cycle. The eight year average replacement timing will be occurring for most of the customer base during the next few years.

1106

The normal 1106 customer would be more attracted to the 1100/20, or to a MP enhancement, although this customer base will produce a group of customers who project fast enough growth to warrant the offering of our 1100/80. The 1100/20 offers less swap-out and more carry-over than the 1100/80, making the 1100/20 a potentially better offering for the customer.

1100/10 and 1100/20

These systems are newly introduced and represent systems that would not, in general, be attractive markets for the 1100/80. Increases in throughput needs will normally be met via add-on processors, more memory and upgrades in peripherals.

1110 and 1100/40

In general, the 1110 and 1100/40 customer base will have two basic choices. The first would be to add expansion equipment and stay within its own system growth potential. The 1110 and 1100/40 systems have large inherent growth potential and this expansion is usually the most cost effective.

The second choice would be to upgrade to an 1100/80 system. In this situation, a total system replacement will prove attractive to users requiring substantial growth and also to 1100/40 users who are not financially committed (via purchase, lease, or purchase credits) to their existing hardware.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

P.3.3 494 Replacements

The 494 customer base is ready to move to a follow-on. Sperry Univac is offering a migration path toward the 1100 systems which could be accomplished with any of the 1100 machines.

Approximately one-third of the forty-five world-wide customers have already begun their move. Sperry Univac has been successful in capturing a high percentage of these.

The standard 494 OMEGA/TCS user is offered the 1100 series hardware using 1100 OS with TIP 1100. These software packages are offered as replacements for his current system. The vast 1100 library of languages and sub-routines are substituted. The use of DMS 1100 and all of the interactive data processors are offered as new use capabilities and can be exploited for new applications.

The 494 user code must be replaced with newly written 1100 code or converted via conversion aids.

Conversion Aids

The conversion aids offered for use are standard basic conversion tools.

FORTRAN-to-FORTRAN will basically be accomplished by simple pre-processors.

COBOL-to-COBOL has several programs which are all available.

Data Convertors will be handled via own code.

ICCU — An Inter-Computer Unit (ICCU) is available to connect a 494 system to an 1100 system. This connection allows the 494 to pass data back and forth to the 1100 system. The ICCU would prove useful during conversion, or, the 494 could act as a front-end to the 1100.

Inverse Compiler — The inverse Compiler takes 494 Object Code as input and outputs in COBOL and has been checked via field tests. The decompiler has substantial uses with batch programs that are lacking in listings, with programs that the user wishes to rewrite, with users that are limited in human resources and would like to accomplish the conversion with more automated methods. This latter type of user may be willing to trade-off the human resource savings of the Inverse Compiler with a small increase in computer hardware needed.

PROMEGA — PROMEGA is a software program which allows 1100 OS to run the OMEGA executive on the 1100/80 hardware. The 1100/80 hardware has optionally available a 494 instruction set capability. This instruction set must be added to the 1100/80 system in order to use PROMEGA. This 494 "mode" will execute 494 user instructions directly.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

PROMEGA allows the running of 494 batch programs under the local control of OMEGA. When calls are made by the batch program to OMEGA, the calls are trapped by PROMEGA, converted to appropriate 1100 OS calls, and sent on to 1100 OS for execution.

The 494 batch program runs as fast under PROMEGA on the 1100/80 as it did under OMEGA on the 494.

P.4.0 HARDWARE OVERVIEW

P.4.1 Basic 1100/80

The basic 1100/80 configuration consists of those components needed to assure stable operation at a full performance level.

An instruction processor and an input/output processor both receive their instructions and data through the memories via the buffer. The basic 1100/80 uses an 8K word buffer and 524K words of main backing storage.

A transition unit is provided to electrically tie the system together. A maintenance system is provided to independently maintain the system. A console is used for the operations personnel to communicate to the system. Lastly, a special 400 Hertz motor alternator is used to help isolate the 1100/80's central components from minor power fluctuations.

The basic 1100/80 configuration has a number of expansion features, so that the customer can configure the system to meet a wide variety of performance levels.

The 1100/80 has memory expansion features which exceed the rest of the industry's offerings. Main memory is divided into a backing storage and a buffer storage. The backing storage can be expanded by 262K word modules — two modules per cabinet — up to a maximum of four million words. That is approximately sixteen megabytes. Virtual memory systems currently on the market consider sixteen million bytes as the theoretical addressing limit of virtual range. This is offered on the 1100/80 as real memory.

The buffer storage can be expanded by 4K word modules up to a maximum of 16K words. That is approximately 64 kilobytes (or twice the size of the maximum buffer for the Amdahl 470 and its competitors).

The 1100/80 basic system can continue to expand in the processor area with the addition of another CPU and another IOU.

Sperry Univac has chosen to use both CPU's and both IOU's with the single buffer, rather than provide another buffer and separate the second processor from the basic system. Because of the use of multiple paths to memory, this special buffered memory will handle the request rate of a multiprocessor configuration.

The 1100/82 with two IOU's is a true multiprocessor in every sense of the term.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

P.4.2 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, a software/hardware batch emulation capability that we offer to our 494 customers.

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

P.4.3 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 — two are provided with the unit and the remaining two are optionally chosen. The basic two channel modules are a byte mux channel and a block mux channel. The two optional channel modules 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.

The 1100/80 can be configured with one or two of these IOU processors.

P.4.3.1 Byte I/O

The byte I/O channel module is a new feature on 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.

We provide the capability for up to eight control units to be attached to each byte mux channel. 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.

We provide the capability for up to eight control units to be attached to each block mux channel. The transfer rate of the block mux is up to 1.5 mega byte/per 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.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

Sperry Univac recommends the use of block mux channel modules whenever there is a large data base which is accessed at somewhat moderate access rates per second — a very good choice for most users.

P.4.3.2 Word I/O

SPERRY UNIVAC's 1100 word I/O has been extremely successful and is being 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 higher 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 our customers may wish to carry over to the 1100/80.

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

Sperry Univac has chosen to bring all of 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.

P.4.4 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, eight words at a time are fetched from the backing store into the buffer, where the buffer then allows the CPU to execute eight times as fast.

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. We have designed the buffer-backing storage linkage with 1100 OS in mind and will run our software unchanged with regard to the buffer design.

As the buffer is enlarged from the basic 8K words to the maximum of 16K words, increase in hit rate will result because there are more buffer "slots" for instructions to reside in — waiting (or aging) for the next request from a CPU or an IOU.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

As more CPU's and IOU's are added, more buffer is needed to offset the obvious increase in requestors. We have sized the 8K word buffer as optimum for the single CPU and IOU system, and a 16K word buffer as optimum for a two CPU and IOU system. The backing store fetches eight words in 1250 nanoseconds, and the buffer cycles in 125 nanoseconds.

Backing store can be added up to four million words maximum. This amount of memory, while admittedly large, is a trend setting capability that will allow the 1100/80 to grow with each user's requirements.

P.4.5 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.

The CRT and hard copy printer for the operator are the same devices as for all 1100's. The optional use of up to five additional printers is also allowed.

P.4.6 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.

P.4.6.1 Transition Unit

The transition unit is the electronic heart of the system. All central components are inter-connected 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 with a chosen boot being loaded through a chosen I/O path. Back up paths are available should the first choice fail.

P.4.6.2 Maintenance System

A separate mini-computer 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,

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

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 maintenance system has an integrated card tester to test, repair, and re-test cards on site.

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

P.4.6.3 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.

P.5.0 SOFTWARE OVERVIEW

The 1100 Series Hardware operates for the user through the 1100 Operating System. This Operating System had its beginning as EXEC 8 and has been evolving ever since. 1100 OS has had enhancements to use the new hardware developed, new industry standard data management techniques, and in parallel with all of these changes, 1100 OS has managed to gain efficiency and improve its throughput.

The Operating System is now one of the simplest to operate and interface with in the industry.

The 1100/80 will continue the 1100 family tradition and will operate under the control of 1100 Operating System. Furthermore, user changes are not required to change from any other 1100 equipment to the 1100/80.

P.5.1 CHANNELIZER

In addition, the 1100 Operating System contains a few notable enhancements — some are in response to 1100/80 hardware enhancements and some are in response to user needs.

Sperry Univac has taken advantage of the change in 1100/80 I/O processing, and has re-written the entire I/O software.

This rewrite is done in two general areas: one is to take advantage of the 1100/80's more intelligent I/O unit and make use of the channel program concept; and two is to do a rewrite of all I/O handlers with the intent to reduce path lengths, make common I/O code more abundant so buffer hit rates are maximal, and in general, enhance the I/O software for all 1100 Systems.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

P.5.2 SYS-GEN

We have taken time to make enhancements to the system generation process with the intent to reduce human errors and allow faster SYS-GEN compilation. This will permit users to bring up new software levels quickly with a useful reduction in manpower needed to perform the software upgrade.

P.5.3 ENHANCED TIP 1100

The enhancements that are being done in the I/O area will greatly benefit those users of TIP 1100, our real time transaction package. We are further enhancing TIP in memory management, real time switching, and COMPOOL Block handling areas, to further provide additional processing speed.

P.6.0 8434 STORAGE UNIT

The SPERRY UNIVAC 8434 disk subsystem incorporates the latest advances in disk technology.

- Increases in Reliability are achieved through:
 - An electromagnetic positioner rapidly moves 20 heads to precise cylinder positions.
 - Programmed Servo Offset allows the disk drive to move the accessor in small increments from its original position to recover marginal data.
 - A number of safety circuits are built into the device to protect data in the event of unsafe power, speed, head selection, track selection or write conditions.
 - Defect Skipping within a track is handled by the subsystem to automatically skip over small defect areas. Previously, the entire track had to be downed.
- Operation Features are improved through:
 - Module Select Plug — defines the logical address of the device from 0 thru hex F. When diagnostics are used, a special plug is inserted to enable thorough device testing.
 - Read only switch — can be used to disable write circuits for file protection.
 - Dual access selection switch — this switch controls the dual access optional feature by selective enabling either or both control units to access the device.

DOCUMENT NO	TITLE	PAGE REV.	PAGE
-------------	-------	-----------	------

P.7.0 5046 CONTROL UNIT

- The 5046 Control Unit is a high performance, microprogrammed control unit that can control up to thirty-two (32) disk storage devices. It has modular construction consisting of memory, the processor, channel interface and device interface which provides extreme flexibility of configuration.
- The 5046 provides a word channel interface to 1100 processors and does not require an MSA for system connection. The functional characteristics of the 5046 SCU are determined by the microprogram and the interfaces installed for a particular feature. The microprogram is contained on an inexpensive floppy diskette that is loaded when the control is powered on.
- The data contained on the diskette includes the functional microprogram, "in-line" routines for diagnosing device failures and "off-line" routines for diagnosing failures.
- The channel and device interfaces contain registers used for control and status information for the microprogram.
- The 5046 emphasized host off-loading and streamlined software on the 1100 systems. Command chaining as used in previous older subsystems is not used. The channel to control command set is "macro" in nature in that single commands provide a level of functionality equivalent to a chain of multiple commands at reduced software overhead.
- Device orientation information is supplied with each read or write command, although optional prepositioning commands are also provided. A continuous read or write data capability allows the processing of multiple physical records per command.
- Device relative word addressability is provided to off-load physical address conversion from the host. It also provides the advantage of contiguous address space across the device. Data transfers which begin or end off physical boundaries are accepted and processed by the 5046.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

- A record buffer within the control insures data integrity for the user. Each physical record can be loaded into an area of the microprogram memory to facilitate transparent error recovery. As each record is read, it is checked for the correct Error Correction Code. Wherever feasible, the microprogram performs automatic error recovery in a manner that is transparent to the host system. Error and usage counters are maintained for each drive and are made available to the host system upon host request or upon counter overflow so potential reliability problems can be detected. Error conditions which are covered by transparent error recovery are as follows:

- Data errors
- Seek errors
- Overruns
- Defective/alternate tracks
- Defect skipping
- Equipment checks

A 1024 word buffer is also provided in the control unit to absorb irregularities in the rate of data transfer between the channel and the control unit.

1 SERIES OVERVIEW

1.1 FAMILY CONCEPT AND COMMITMENT

The SPERRY UNIVAC 1100 Series provides an unequalled family of computer systems to present and prospective users. This family offers a growth potential from the smallest 1100/11, not itself a small system, to the largest 1100/82 — a potential tenfold performance increase.

The advantage of this enormous 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 1100/80 customers. One of the major benefits is knowledgeable support. Sperry Univac Systems Analysts and Customer Engineers have been working with the 1100 type architecture 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 12 years to add new design features to the time-proven 1100 design and thus have been able to continually evolve the 1100 system. This umbrella of expert support, this continuing refinement of design and repair techniques insures each 1100 user of the best practical application of today's technology.

Changes in the 1100 Product Line 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.

Evolutionary changes have taken place in the CPU/memory area as well. Perhaps the best example of the family orientation of the 1100 Series is the recent doubling of 1106 and 1108 main storage capability from 262K words to 524K words. Another example is the product line upgrade to the new MOS memories. These actions are evidence of our intention to help 1100 users grow in the directions that fit their requirements and stay in the forefront of technological change.

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 EXEC has provided a bridge of compatibility between all of the system members. It allows upgrade from one model to another without program conversion. This is undoubtedly the most workable

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

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 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 boil down to 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 subsystems 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 1100 Series 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 1100 Series makes a value package which would be hard for any competitor to equal.

1.2 HISTORY AND SUCCESS

The success of the 1100 Series 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.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

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 1100 Series! In FY'76, Sperry Univac exceeded \$400 million in 1100 Series revenue, with close to \$500 million expected in FY'77. This is a product position that we obviously are dedicated to sustaining with new models, added software capability, and solid field support. The 1100 Series product line is a significant portion of Sperry Rand Corporation's business base.

Over the last four fiscal years, an annual average of 129 1100 Series Systems have been booked. Shipments are now exceeding a half billion dollars per year.

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 1100 Series.

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 (for example, a predominantly batch operation can justify an 1100 Series System). Most users, though, are constantly investigating and installing new applications that require new modes of processing. When the time comes to move into remote batch or time-sharing, or real-time, or a combination of them all, the program and application development can be done on the existing system, and each new mode can be added to the Operating System simply by generating a new systems tape. No previous capability disappears or changes; the new things simply are added. The Operating System provides the tools to run all the processing modes. It provides features as good as any in the industry, but it combines them far better than most any competitive system.

Any 1100 System with 1100 OS can be a real-time system, a time-sharing system, a local/remote batch system, or a cost effective melding of all of these!

The following information covers some of the industry segments in which 1100 penetration is the strongest, and discusses applications and processing modes as further indications of 1100 Systems strengths.

1.2.1 The 1100 Series Sales History and Distribution

It may be useful for you to know how many 1100 Series systems are being employed by our customers and in what businesses. You will see that 1100 Series 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 1100 Series and the services provided by Sperry Univac. Not only are all major industrial categories and nations represented, but all processing modes, batch, time-share, and real-time, are all widely used. There is virtually no area of the computing business where 1100 Series 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 1108's and 1106's 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 1000 CPU's or CAU's (1106's, 1108's, 1110's, 1100/10's, 1100/20's, and 1100/40's) installed and operating in customer locations throughout the world.

The current 1000+ units are distributed approximately equally between Americas Division customers and the rest of 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:	51%
Scientific:	25%
Special:	12%
Scientific and Business (equally):	<u>12%</u>
	100%

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

Processing Mode

Predominantly Batch:	41%
Predominantly Real Time:	21%
Predominantly Demand:	8%
Equally Batch and Demand:	15%
Equally Batch and Real Time:	10%
Equally All Three Modes:	5%
	<u>100%</u>

Figure 1-1 shows the 1100 Base organized according to the U.S. Department of Commerce's Standard Industrial codes. Most of the 15 categories shown contain major subcategories. You may be interested in what they are:

1. Financial: Banking; Securities; Insurance
2. Education: Colleges and Universities; Other
3. Medical: Hospitals; Other
4. Service Bureaus and Networks
5. Communications (includes operations and administration)
6. General Building and Heavy Construction
7. Manufacturing: Food & Kindred Products; Apparel & Textile Products; Paper & Allied Products; Publishing; Chemicals & Allied Products; Stone, Clay & Glass Products; Primary Metals; Fabricated Metal Products; Machinery (except electrical); Electrical Equipment & Supplies; Transportation Equipment; Other Mfg.
8. Energy: Sources (Petroleum, Coal, Atomic); Electric Utilities; Gas Utilities.
9. Transportation: Railroads, Trucking & Warehousing; Airlines.
10. Trade: Wholesale; Retail
11. U.S. Federal (Military): Army, Navy, Air Force; Security Agencies.
12. U.S. Federal (Aerospace)
13. U.S. Federal (Civil)
14. Non-U.S. National Governments
15. State and Local Governments

The data in the bar chart (Figure 1-1) represents a snapshot of the base in 1975. The proportions will change with time, but because of the large size of the base, can be expected to change slowly.

The proportions do change, however. A few years ago, for example, the education market segment would have been a larger percentage of the whole than it currently is. While the size of the education segment has continued to grow, some other segments have grown even faster.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

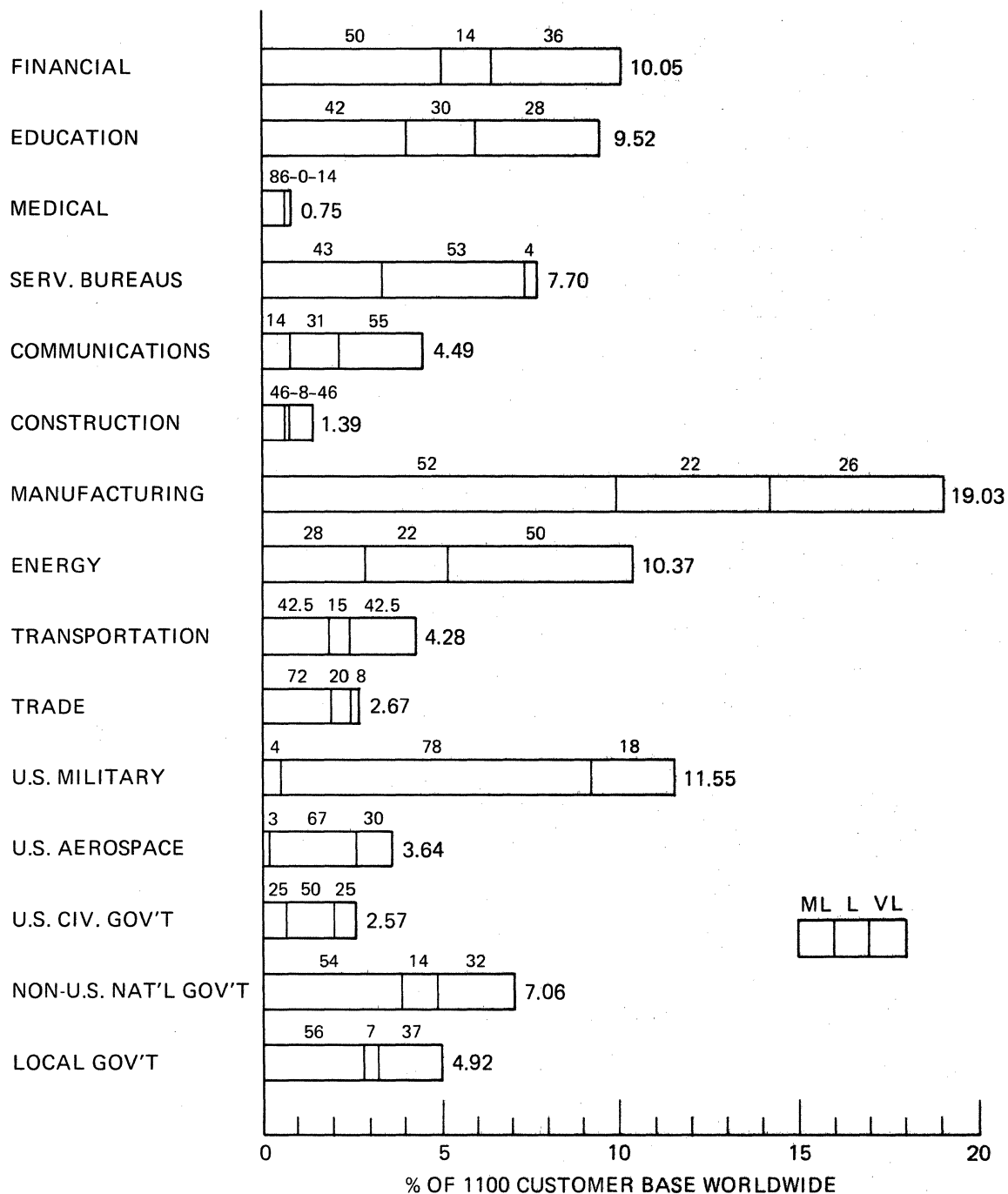


Figure 1-1. How the 1100 Customer Base is Divided

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

It must be remembered that many large firms are in a number of businesses, and that the main business is the one used to categorize them.

Each bar is divided vertically into three parts, corresponding to medium large, large, and very large 1100 systems, according to the classifications used by Auerbach and others, and as defined below:

Very Large — 1100/40, 1110

Large — 1100/22, 1106-II, 1108

Medium Large — 1106-I, 1100/21, 1100/10's.

The percentage of very large, large, and medium large systems is indicated for each segment. For example, Manufacturing constitutes about 19 percent of the total customer base, and is composed of 26 percent very large, 22 percent large, and 52 percent medium large.

All segments in which large and very large systems compose half or more the base must be considered good areas for the 1100/80.

Those segments where there is a high percentage of large systems which are mostly 1108's, might be considered for upgrade to an 1100/80. These are service bureaus, U.S. Military, and U.S. Aerospace. Other segments also have many 1108's and should contain good prospects for upgrade.

Among the other segments that tend toward heavy use of the more powerful systems such as the 1100/80 are education, communications (including telephone companies), energy, transportation, financial, and non-U.S. national governments. While less than 50 percent of the manufacturing segment has large and very large systems, the segment is so large that it contains a high absolute number of these larger 1100 systems.

1.3 SOFTWARE ARCHITECTURE

The 1100 Operating System includes all Software furnished with an 1100 Series System. It is a single source Software System with the capability of supporting any 1100 System. The Operating System is made up of several groups of Software components. From these components, an 1100 user chooses the facilities which he wishes to use and 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.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

The Executive area forms the central core of the entire software system. It provides the detailed linkage between each of the distinct hardware architectures, the users' needs and all of the rest of the software available. The EXEC provides services for the other components through ER's (Executive Requests), and automatically schedules and executes 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 provided for those users who need data communications support. The Communications Management System (CMS) 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 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, 1100 OS 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 highly complex systems.

Language Processors, which are compilers with many helpful functions added, form an important part of 1100 series 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, 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 from the human side.

The 1100 Operating System includes a Data Management System (DMS 1100) which provides a fully developed set of tools for setting up, maintaining and accessing even the most elaborate data base. This capability has become one of the most important features for large scale systems as businesses move closer and closer to the ideal of fully integrated information management systems.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

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; a medical management system, 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 1100 OS provides SIP (Software Instrumentation Package) which collects internal statistics and facilitates their analysis. Using this package, as well as an error log analyzer, it is possible to achieve both short-term and long-term improvements in 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 1100 OS which reduce both the time consumed, and the risk involved whenever change is made.

Section 2 of this manual will provide specific information on the usefulness of the more than sixty software components that make up the 1100 Operating System.

The evolutionary policy of the 1100 Series 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") without charge, 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.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

The architecture of the 1100 OS 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 (1100/10 and 1100/20, 1100/40, 1100/80) resides in small areas of the EXEC. It is this code that provides the final touch of compatibility. With few exceptions, all of the other software components are not hardware sensitive and depend upon the EXEC to provide any hardware-unique support that may be required.

In this way, the 1100 Operating System has become, and will remain, a mature, growing operating system, benefiting from more than twelve 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.

1.4 HARDWARE ARCHITECTURE

The four system types which comprise the current 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. Each difference is based upon cost or performance considerations, or a combination of both. Thus, each of the four system types represents a very effective combination of these design decisions packed into an attractively priced, user-oriented package.

The differences in design are compared in the following sections and summarized in Table 1-1. Each system is more fully explained in Section 3 of this manual.

1.4.1 1100/10 – 1100/20

These systems have virtually identical architecture. They feature CPU's with fully integrated Input/Output logic. This produces an effective yet low-cost system. Both systems contain large sets of internal, very high-speed registers which are organized into separate sets for user and EXEC functions so that no time is lost due to register swapping whenever the EXEC takes control or relinquishes it. Both systems feature memory overlap – the capability to access the next instruction and the operand for the current instruction simultaneously, as long as they are in separate memory modules. This provides good performance without requiring very expensive, extra high-speed technology.

Both the 1100/10 and 1100/20 can be configured as multiprocessors, and the 1100/10 can be field converted to an 1100/20 with very minimal down time.

Input/Output channels on these models are word channels with channel parity. Byte oriented peripheral subsystems are connected via MSA's (Multi-Subsystem Adapters), which perform the necessary word to byte conversion in either direction.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

Memory is organized around a single level concept, that is, all memory is the same speed. Each system may have up to 524K words and up to four memory modules maximum.

Maintenance is done primarily in the traditional manner, with oscilloscope etc, although connection to the TRACE system in Roseville for remote maintenance operation is provided through the console.

1.4.2 1100/40

This system offers two distinct differences in CPU design. First there is a division between command/arithmetic and input/output functions. While the Command Arithmetic Unit (CAU) has prime control in the system, a separately packaged Input/Output Access Unit (IOAU) takes over much of the I/O overhead work, and with its separate, direct access to memory, leaves the CAU free for other work. This adds compute power to the system, increase configuration flexibility, and reduces the possibility of being I/O bound within the system.

The second difference is in the instruction execution area. The 1100/40 has a "four-deep" instruction stack. That is, it is accessing and executing parts of four instructions simultaneously. This allows the processor to execute instructions at a higher rate than would be possible using traditional design for this type of circuitry, again gaining compute power.

In addition the 1100/40 offers a two level memory concept, recognizing that many users with multiprocessors need more than the 524K of main storage that can be configured. Extended Storage — which may be added to expand memory to as much as 1572K words — at 800 nanoseconds is not slow storage, but its larger module size coupled with the slower speed makes it much lower priced. When used effectively, it extends available on-line memory without a significant decrease in instruction execution times.

Maintenance of the more complex 1100/40 is assisted by a Maintenance Controller which automates some of the more commonly used remedial maintenance procedures. This provides for faster fault isolation and repair. The Maintenance Controller also provides additional on-line printed circuit card testing.

1.4.3 1100/80

This system carries the concept of the separation of compute capability from the Input/Output capability introduced in the 1100/40 even further. 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.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

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 using the new 5046 Word Control Unit. Byte channels, both Byte Multiplexer and Block Multiplexer have been added. These provide the most efficient hook-up for paper peripherals, such as printers and card readers, and a potentially less expensive hook-up 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 8K—16K words in front of a very large inexpensive main storage. This large main storage, or backing store, is designed to transfer 8-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 125 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. Therefore, the 1100/80 uses the same concept as the 1100/10 and 1100/20.

Automatic maintenance capability has been further extended by providing a Maintenance Processor. This free-standing 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.

Table 1-1. Systems

<u>COMPONENT</u>	<u>1100/10</u>	<u>1100/20</u>	<u>1100/40</u>	<u>1100/80</u>
Central Processor	Integrated Input/Output	Integrated Input/Output	Separate Access Input/Output	Free-Standing Input/Output
Registers	128 Registers	128 Registers	112 Registers	128 Registers
Cycle Time	125 Nanosecond Cycle	125 Nanosecond Cycle	90 Nanosecond Cycle	50 Nanosecond Cycle
Features	Instruction/Operand Overlap	Instruction/Operand Overlap	4 Deep Instruction Stach	Access Overlap
MP	Multi-Processor 2x0	Multi-Processor 2x0	Multi-Processor 4x4	Multi-Processor 2x2
	<u>MAIN</u>	<u>MAIN</u>	<u>PRIMARY</u>	<u>BUFFER</u> (Storage Interface Unit)
Memory – First Level	Cycle – 1125 Nanoseconds	Cycle – 875 Nanoseconds	Cycle – 250 Read/380 Write	Cycle – 125 Nanoseconds
Maximum	524K Maximum	524K Maximum	196K – 524K	8K – 16K
Features	Error Correction	Error Correction		
			<u>EXTENDED</u>	<u>BACKING STORE</u> (Main Storage Unit)
Memory – Second Level	(None)	(None)	Cycle – 800 Nanoseconds	Cycle – 1250 Nanoseconds/8 words
Minimum/Maximum			0 – 1,048K	524K – 4 Million
Features			Error Correction	Error Correction
Input/Output	Integrated in CPU	Integrated in CPU	Separate IOAU Input/Output	Separate IOU Input/Output Unit
Memory Access	Access to Memory thru CPU	Access to Memory thru CPU	Direct Memory Access	Direct Memory Access/Controls
No. of Channels	4-16 Channels/CPU	4-16 Channels/CPU	8-24 Channels/IOAU = 96 Total	Channel Modules 2-8/IOU
No. of Control Units	1 Control Unit/Channel	1 Control Unit/Channel	1 Control Unit/Channel	1-8 Control Units/Channel Module
Types of Channels	Word Channels/MSA's	Word Channels/MSA's	Word Channels/MSA's	Byte & Word Channels
	ISI/ESI	ISI/ESI	ISI/ESI	Byte/Block Multiplexer/ISI/ESI
Channel Speed	44K Words/Second	572K Words/Second	500-600K Words/Second	200-1,670K Bytes/500K Words/Sec.
Total Transfer Rate	888K Words/Second	1,143K Words/Second	4,000K Words/Second per IOAU	2,000K Words/Second per IOU
Maintenance Aids	Local Maintenance-Panel	Local Maintenance-Panel	Maintenance Controller	Maintenance Processor
	TRACE Connection	TRACE Connection	TRACE/Scan Set	TRACE/Scan Set

2 SYSTEM SOFTWARE — CAPABILITIES AND VALUES

The 1100 Series system software has many, many features of power, productivity, flexibility, and usability, but the central fact is that is *a system*. All of the components; even those which are systems themselves, the Executive and DMS 1100 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 1100 Series, from the smallest 1100/10 to the largest 1100/80. Furthermore, the system applies across time; it has not been and it will not be necessary to go to different system software in order to grow.

As stated above, components of the 1100 system software can in themselves often be considered systems, and even systems of systems. For example, there is a *system* of information management software, the system being composed of several systems which emphasize various kinds of information management needs, but which can be synergistically combined to meet as many needs as a user might have. A customer merely chooses the information management systems that fit his requirements, and he can be sure that they will function together correctly and supportively.

One of the design features of the 1100 OS that will be a definite user benefit is the interface between the operations personnel and the system. Sperry Univac is acutely aware of the difficulty in training operators to handle and manage the user workload.

This operations interface has grown from the early computing days when the operator had to be an integral part of the programmers run until the advent of a total Software Operating System where the operator must monitor the system console for action-by-exception only.

SPERRY UNIVAC's 1100 OS is acknowledged as the best in the industry for its operations interface.

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 should be kept in mind when you read any portion of this section on system software. This characteristic of SPERRY UNIVAC 1100 Series software is unique in the industry, and is of very great value to a customer.

2.1 INFORMATION MANAGEMENT

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

- DMS 1100 — A comprehensive, CODASYL-based, data management system allowing state of the art data storage structures and access methods.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

- QLP 1100 — A high level interface used to query a DMS 1100 data-base via a remote terminal or a batch program.
- RPS 1100 — A high level, end-user oriented, interactive file handling system, which includes an on-line tutorial processor for the creation of entire applications by non-programmers.

Here are some of the key capabilities implemented in the 1100 series information management systems.

- There is an integrated system of information management systems — not merely a collection of alternatives, some old, some new, some competing.
- A logical consolidation can be made of all or some corporate data.
- Data can be made more accessible to current and potential users and business can benefit accordingly.
- Data can be accessed by several associated paths.
- Data can be accessed by several access modes.
- Non-programmers as well as programmers can easily access data.
- Except where desired for reliability or operational purposes, there need be no redundant data — only one copy of each data record being kept.
- Where there are no redundant files, each user has the most current, complete, and accurate data.
- Controls over data access can readily be maintained.
- Since programmers do not have to define and build their own data files, and since DMS provides accessing services for user programs, programmer productivity can be increased significantly.
- Logical consolidation of data lends itself equally well to both centralized and distributed processing — and there are still economy of scale benefits to be realized from judicious centralization.

2.1.1 Data Management System (DMS 1100)

Data Management System 1100 (DMS 1100) is an information management system based upon the specifications of the CODASYL Data Base Task Group. It features the separation of data definition (by the data administrator) from data manipulation (which is carried out by applications programmers). This independence of definition and access allows the data administrator to use a variety of access techniques and to perform optimization without impacting existing applications programs. DMS-1100 uses standard languages, and is machine-independent from a user standpoint.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

DMS 1100 is now being employed successfully, and enthusiastically, by hundreds of 1100 users. A leading data processing analysis and publication firm says of DMS 1100: "Most users seem pleased with the system, with reactions varying from "extremely satisfied" to "quite happy". Considering the problems that normally dog systems of the size and power of DMS 1100, it seems to be remarkably successful, being flexible easy to use, and powerful, without sacrificing too much efficiency or reliability".*

2.1.2 Query Language Processor (QLP)

QLP is a language processor which permits the user to interact, in either a demand mode or batch mode, with a DMS 1100 database. The command repertoire and language syntax are designed to allow the user to communicate with the QLP processor with english-like statements. This reduces the time required to become proficient in its use.

Provisions to select, retrieve, update, create, sort, edit, remove, or print data in a DMS 1100 database are available.

QLP is designed for conversational use, and is an interpretive processor. The user enters a command: QLP carries it out and responds to the user. The user enters his next command: QLP performs it, etc. It also functions efficiently in batch processing.

There is also a Query Report Writer (QRW). It provides a flexible but comprehensive report writing capabilities. The end user can define the contents and format of the report he wants.

2.1.3 Remote Processing System (RPS 1100)

The Remote Processing System 1100 (RPS 1100) is general-purpose file-processing system oriented toward the end user who wishes to access a file via a UNISCOPE remote terminal. The basic premise behind the existence of this general-purpose file processing system is that the "end-user" may choose the system functions which he desires, have them operate on a file, and gain the "answers" without ever having to involve himself with the normal programming techniques.

The primary factor in making such a system a success is its ease of use. This ease of use is designed into the interaction between the remote user and the computer. The interaction developed for RPS 1100 accommodates the "new" user. The new user may be guided through system functions in a "tutorial" manner, with the system providing a reinforcing response to each entry and a clearly defined "menu" of options available at each step.

RPS 1100 has sufficient capability to satisfy a vast majority of applications and can cover the gamut of industry sectors.

*From a 1976 Infotech Information Limited book entitled, "Data Base Systems – Infotech State of the Art Report".

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

2.2 TRANSACTION PROCESSING

All transaction-type or real-time application programs have many functions in common, such as pre-processing 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 1100 Series provides the transaction processing user with both economic value and processing efficiency with its Transaction Interface Package (TIP 1100) and its Communications Management System (CMS 1100). TIP and CMS are partners in providing transaction processing capabilities, relieving users of the necessity to do real time system design.

2.2.1 Transaction Interface Package (TIP 1100)

TIP provides the 1100 Series user with an on-line, communications oriented capability which is an identifiable section of the Executive 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 1100 Series 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 real-time or transaction user access to the data base or the use of DMS's data management routines for identified real time files. TIP also acts as the "Host" for RPS 1100 described earlier.

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

- Maximum of computer use through a mixture of transaction processing with demand and batch operations.
- Minimization of installation time and costs by means of a generalized transaction interface package 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.
- On-line 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 1100 Series Systems.

2.2.2 Communications Management System (CMS)

CMS's purpose is to get input messages from users, wherever they may be, and hand the messages over to TIP 1100. Likewise, CMS accepts output messages from TIP 1100 and gets them to their destinations.

Through CMS, applications programs can operate without any concern for remote hardware locations, polling, or communications control procedures. These considerations are fully under control of the communications management system.

CMS has the following capabilities:

- Cognizance of all transaction terminals with the SPERRY UNIVAC 1100 series computer networks. It does all polling, parity checking (message and character), data blocking, message envelope formatting, data packing and unpacking, character code translation and other message-type procedures.
- Depending on whether it receives good or bad data, CMS will send the acknowledgement or negative acknowledgement to the terminal.
- CMS determines what the current activity should be on each circuit in terms of such factors as facilities available, priorities established by the user, the type of circuit or device used, and the activity response level from the terminal. It considers circuit specifics, but also responds to overall system facilities to prevent loading beyond the capability of the system.

- CMS places input messages, after checking them for errors and removing transmission headers, trailers, error checking bits, etc., in a communications buffer which is part of TIP 1100. TIP 1100 will then process the message in accordance with its own functioning. Similarly, CMS takes output messages from TIP 1100, and routes them to their destinations.
- Operates selected terminals in Test Mode, Training Mode, or Test and Training Mode. These modes will permit terminal operators to be trained and new transaction programs (controlled by TIP) to be tested without impacting the normal operation of all the other terminals.

2.3 TIME SHARING

The 1100 Series provides two major time sharing systems: the TEXT EDITOR (ED) and the Conversational Time Sharing System (CTS 1100).

The TEXT EDITOR was the first of these to be developed. It is widely used by nearly all 1100 customers. It is powerful, versatile, fully debugged, and easy to use.

CTS provides all the powers of ED, adds many of its own, and is even simpler to use. It allows the novice user to begin doing useful work almost immediately while at the same time satisfying the most experienced programmer by giving him access to all the resources and powers of the 1100 system.

The time sharing user can, from his terminal if it is properly equipped, initiate the entry of batch runs, and initiate the execution of batch runs which have been previously stored.

2.3.1 TEXT EDITOR (ED)

The 1100 TEXT EDITOR, or ED processor as it is often called, provides the user with the capability to conversationally create and edit a symbolic (source code) file or element of a file. ED facilitates the insertion, deletion, changing, and replacement of text. Both ASCII and Fielddata character sets may be used.

When calling ED, the user may specify an input file, which is used as input text by ED or he may input data from his terminal keyboard. ED operates in one of two modes: input or edit. In input mode, all lines are inserted directly into the text. In edit mode, the user specifies a command which may be used to edit the existing text. The user can switch from one mode to the other merely by pressing the Return key on his terminal.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

Some of the capabilities of the Text Editor are:

- Text may be listed in a variety of manners. Output may be sent to any terminal of the network, onsite printers, or onsite card punches; line numbers may be listed or omitted as desired. Text may be printed in Quick mode (i.e. all nonsignificant blanks omitted).
- Existing lines may be altered in a number of ways or deleted; new lines may be inserted.
- Tabs may be set to automatically indent or format text in accordance with the requirements of the programming language used or as otherwise desired.
- Specified character strings in the text may be located by ED.
- Lines may be copied or moved from one section of text to another.
- Sections of text from other files may be added to the existing text, and sections of existing text may be split off to form new files.
- An internal cursor keeps track of line numbers.
- The user can specify a line number and the internal cursor will position the text accordingly.
- ASCII, Fielddata, or mixed ASCII-Fielddata input text may be read in; ASCII or Fielddata text may be written out.
- After editing has been completed, the updated text may be written out into an output file specified by the user on the ED control Statement.

2.3.2 Conversational Time Sharing (CTS 1100)

CTS is a timesharing system designed for both the novice and for the sophisticated programmer. It helps the beginner to do productive programming work while he grows in ability. It opens doors for the experienced user to everything an 1100 system is capable of doing.

CTS assists the user in creating and editing programs written in a variety of programming languages. It is especially effective with ASCII FORTRAN, Fielddata FORTRAN, COBOL, BASIC, and APL.

While providing the user with many services which make his work both easier and more accurate, CTS also applies a discipline to each user for judicious use of the system with respect to storage and CPU utilization.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

CTS command statements are simple and easy to learn, but a powerful repertoire of commands is provided. These commands can be used to create, edit, and manipulate any kind of textual material, including, specifically, programs. CTS is, in fact, optimized for the development and execution of programs written in various languages. At the same time, the CTS statements themselves can be used to construct powerful routines without the use of other languages.

When a user specifies the programming language he will use, CTS "connects" a prescanner for that language to the user. As each program statement is entered, the prescanner analyzes it for syntactical correctness and informs the user of any errors. An error can then be corrected before the next statement is entered.

Similarly, CTS will, if the user wishes, provide a global scan of the entire program before it is compiled or saved, flagging inter-statement errors. CTS thus helps assure syntactically correct programs, saving both programmer and system time.

The Broad Capabilities of CTS 1100 are listed below. SPERRY UNIVAC CTS 1100 provides remote users with a powerful, efficient and easy-to-use means of calling on the total system for:

- Performing high precision desk calculator computations.
- Saving programs, data, and procedures.
- Retrieving saved programs, data, and CTS subroutines.
- Creating files.
- Formatting output of data and other information.
- Merging of programs and/or data.
- Editing source programs and/or data.
- Executing programs.
- Scanning print files.
- Accessing the file management system.
- Writing interactive procedures in CTS control language.
- Providing a query facility, useful for gaming or tutorials.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

2.4 BATCH PROCESSING

2.4.1 Local Batch

In spite of the increasing use of transaction and time sharing processing, batch processing still uses the greater 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 time sharing and doing batch less efficiently, or concentrating on batch performance and de-emphasizing real-time. The 1100 Series systems incorporate fundamental design principles which instantaneously tailor the system for each run as it is dispatched for execution regardless of the type of processing the run employs. As a result, 1100 Series systems perform batch processing with outstanding efficiency.

Listed below are some of the 1100 Series 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
- Error Retry

2.4.2 Remote Batch

In some system architectures, remote batch must be programmed differently from local batch. With 1100 Series systems, a program may be run locally or remotely without change. All the benefits and efficiencies of local processing are available to the remote batch user.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

1100 Series systems are very strong in remote batch processing. One of our customers who has several 1100 systems at his site is currently operating 75 remote batch terminals and is in the process of increasing the number. The workload ranges from small jobs to very large scientific number crunching operations.

2.5 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 1100 OS, 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.

1100 OS 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 1100 OS elements benefit the user is given below.

2.5.1 Executive Features

The Operating System of the 1100 Series is universally acknowledged to be the most advanced and powerful tool at the user's disposition for handling programs in Real-Time, 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.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

2.5.1.1 Control Language

All Operating Systems must be very complex pieces of software 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 1100 OS. 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.

2.5.1.2 Symbionts

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. A set of system routines called symbionts provides these capabilities.

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

This mode of operation insures a very efficient usage of peripherals because, as long as input or output exist, 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 1100 OS contains symbionts for both onsite and remote devices and is designed to allow inclusion of symbionts for non-standard peripherals.

2.5.1.3 Run Scheduling

In 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 1100 OS scheduling is based on run type, priority, time of submission, time to be executed and facility requirements. For instance, Demand Runs (Time-Sharing) are 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.

2.5.1.4 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 term 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.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

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 pre-partitioning has never been necessary and the user need not be concerned at all about storage allocation for his program.

2.5.1.5 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.

All the programs for each mode of execution, i.e. Executive, Real-Time, Demand, Batch, are queued in a switch list for each priority.

Executive 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.

2.5.1.6 File Management

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

- All users which are interested in other than simple calculations will need files for saving information such as data or program and this user would like to have his file handling problems resolved by the computer without using a complicated interface.

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

- 1100 OS 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 1100 OS will provide a simple interface for handling all the I/O functions for the user program.
- When the run is closed, the 1100 OS will return all the facilities used during the run to the facilities inventory of the Executive.

2.5.2 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 reusable 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.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

- 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.

2.5.3 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 for billing purpose of all the 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 useage of all system resources.

2.5.4 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.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

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

- SSG Symbolic Stream Generator is a batch processor for the easy and automatically tailored compilation of 1100 OS.
- FLIT Fault Location by Interpretative Technique is a 1100 Series simulator for the testing of the newly generated Operation System on another system installation.
- CS1100 1100 Communications Simulator is a simulator of the communication environment.
- SIP Software Instrumentation Package is for helping the system analyst in tuning the performance of the entire system.

2.5.5 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 difficult job of testing 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.

- ED TERR

Customer Engineers have at their disposition a program called "ED TERR" 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 C.E. 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.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

- 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 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 analysis those parts of production programs with high frequency of usage for which the user would like to improve the coding for better execution time.

2.6 SECURITY

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

2.6.1 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 Time Sharing (CTS) mode.

2.6.2 Files

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

1100 OS 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.

2.6.3 Programs

The design of 1100 OS 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.

2.6.4 Terminals

Every user terminal in the system is identified by a six character site-ID.

Hard-wired or dedicated-line type terminal 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.

2.7 AVAILABILITY, RELIABILITY, MAINTAINABILITY

Throughout the 1100 Operating System, careful consideration has been given to retention of the value of the entire system to the customer. Typically, this concept is known by its principal constituents, Availability, Reliability and Maintainability.

Because of their inherent interrelationships, with each other and with the system hardware, these elements are treated together in the following discussion.

The aspect of 1100 OS which contributes the greatest amount to system reliability is the stability resulting from the evolutionary nature of the Operating System. Because there is a single common operating system, the addition of enhancements, supporting new hardware or providing new software features occurs in a localized, controlled manner.

Logic supporting Availability, Reliability and Maintainability permeates the Operating System and provides the following capabilities:

- On line check continually verifies the exact system status.
- Detection of some types of data errors produces an attempt to regain the data.
- Erroring components, both user software and hardware, can be dynamically deleted from the system, minimizing the impact of an error on the entire system.
- If a fatal error should occur, system recovery can be initiated automatically.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

- Where sufficient hardware is available, alternate load paths can be selected either manually or automatically.
- Information relating to errors is retained to assist the fault isolation process, an especially useful feature if the error is transient.
- After repair, system components can dynamically be reinserted into the system.
- Operator requested system stops are allowed only after reconfirmation.
- Provision for efficient checkpointing or critical information permits recovery of transactions as well as batch programs, in the event of system error.

1100 OS utilizes hardware error detection features to verify correct operation, and supports the use of on line diagnostic routines for system component repair.

And if errors should warrant further aid, TRACE, Total Remote Assistance Center located in Roseville, can offer immediate expert assistance to isolate complex errors, and verify system operation in the most expeditious manner.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

3 CENTRAL HARDWARE — CAPABILITIES AND VALUES

3.1 MULTIPROCESSING

Sperry Univac introduced multiprocessing in 1965 in the 1100 Series 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 main storage, and able in general to communicate with all peripheral subsystems. Notice particularly that the two or more processors are accessing common storage and notice that each processor during a single storage cycle, is attempting to access an instruction word and a data word. Thus, in a 2x multiprocessor system there are four requests from the two processors for each storage cycle.

In order for all four of those requests to be honored there must, of course, be at least four storage modules. If there are not four modules, or if, for some other reason, two of the requests are to the same module, then a storage conflict has occurred. This conflict is resolved by the Multiple-Module Access (MMA) section and the higher priority request is honored. The other request will not be honored until the next storage cycle. Ideally, the second processor should approximately double the system performance of a single processor. Obviously, if there are too many storage conflicts, this doubling will not occur.

One factor which determines the number of storage conflicts, is the modularity of the storage or, more precisely, the number of independently accessible modules that are available in the system. There are four requesters in a 2x multiprocessing system, and N servers or storage modules honoring those requests. The larger N is, on a purely statistical basis, the smaller is the probability of storage conflicts. Note particularly that if N is less than 2 times the number of processors, or in our example, four, then there will be conflicts constantly. Thus from a performance viewpoint, it is not reasonable to have a 2x multiprocessing system with less than four modules. If the user is willing to pay for the second processor in order to get redundancy and is not concerned about performance, only two modules might be a reasonable configuration.

The modularity for each model in the 1100 Series is given in Table 3-2.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

3.1.1 Interleaving

All processors in a multiprocessing environment, in Sperry Univac architecture are always working on independent tasks. As long as these tasks are placed in separate modules of storage, there will be no storage conflicts. The operating system, however, is a special consideration. While the two processors may be executing independent tasks, each of those tasks might make a request for a particular service of the operating system. They could conceivably make the same request at an identical moment in time. This and other circumstances could result in some instructions of the operating system being executed on two (or more) processors simultaneously.

We do not want to pay the overhead of having multiple copies of the operating system in storage. Therefore, if two tasks request identical service, they want identical code to be executed. This, by definition, means that the instructions are in the same module. Thus in the worst case two processors might go to the same location in storage to execute code. They would experience constant instruction fetch conflicts. How does Univac alleviate this problem?

The storage architecture is such that for multiprocessing systems, odd locations are placed in one logical module and even locations are placed in a different logical module. This is known as interleaving storage.

Interleaving greatly reduces the conflict where two processors attempt to execute instructions in the same module. If it were not for interleaving, one of these processors might have to wait which would greatly deflate the overall performance of the multiprocessing system.

3.1.2 Shared Processor

Sperry Univac introduced the 1108 Shared Processor architecture in 1969. This organization used two 1108 processors, but with the I/O function contained only in one processor, rather than both, as with true multiprocessing architectures. The purpose of the 1108 SP was to meet a specific product requirement of a junior grade multiprocessor with 1.5 times the cost and 1.67 times the performance of the existing 1108 UP. The architecture is no longer considered necessary in the family of models making up the 1100 Series, although one competitor has seen fit to introduce an associated processor with essentially the same architecture as our older 1108 Shared Processor.

3.1.3 Shared Subsystem

The 1100 Series Systems share auxiliary storage and peripheral subsystems by independent input/output processors of the central complex through the use of shared peripheral interface devices(SPI). The SPI is similar in operation to the multi-module access device used for main storage. At all times, the multiple access paths from the processors to the other units in the central complex are managed and controlled by the operating software.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

Software aspects that provide for multiprocessing are essentially the same as those required for multiprogramming, since multiprocessors actually force more than one program to operate at the same time. The provision for assigning and controlling unique portions of the total facilities to different work segments protected from each other is one of the most important aspects of the 1100 Operating System as applied to a multiprocessor system. To this end, the system resources are centrally controlled and priorities for the activities are provided. Additionally, so that resources can be applied optimally, the hardware provides a family of interrupts to the software so that compute operations can be effectively overlapped with more time consuming I/O operations.

Multiprocessing goes beyond the software requirements of multiprogramming in that independent processing units extend the scope of resources to be maintained. The operating system is modular in design to allow all processors to execute various functions within the operating system at the same time. Furthermore, each processor is capable of multiprogramming and treated as an independent processing entity. The 1100 OS for all systems in the 1100 family has evolved over the years with multiprogramming and multiprocessing as a central requirement.

3.1.4 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 oriented when real-time or demand program loads are lower.

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 back-up 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.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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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.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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3.2 RELATIVE PERFORMANCE

Choosing which of the 1100 systems to propose to a customer is primarily dependent on performance and price. This section will give relative performance data within the 1100 family.

3.2.1 Primary Performance Factors

The current 1100 Series family includes the 1100/10, the 1100/20, the 1100/40, and the 1100/80 systems. This family of systems ranges in performance over a ten-fold increase in processing power. Each member of the family is, itself, a system complete with multiple components. Some of these components can produce an increase in performance, such as the 1100/40 having approximately a four-fold increase in performance within its own system.

In any computer system, the performance capability will depend on the type of job the customer wants to do, the types of hardware that comprise the computer system, and the types of software that are used on the computer. In this relative performance section, the ranking is based on hardware considerations only.

It must be remembered that all systems are bounded in performance. This boundary may be caused by "not enough I/O capability", or "not enough processor power"; or, perhaps, "not enough memory". Normal standards in the computer industry use the processor power to give the primary and most meaningful value to a system's upper bounds on performance.

Therefore, the maximum performance that a system can produce is primarily determined by the speed with which the CPU executes its instructions. The 1100 Series is ranked in Table 3-1 by the relative processor power of each system.

3.2.2 Relative Performance Ranking

The following table lists the 1100 Series family in a relative performance ranking using the 1100/11 as the base with its performance equal to 1.0.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Table 3-1. 1100 Series Relative Performance

SYSTEM	RELATIVE PERFORMANCE	
1100/11	1.0 – 1.4	Depending on Memory Overlap
1100/12	2.2 – 2.8	
1100/21	1.2 – 1.8	Depending on Memory Overlap
1100/22	2.8 – 3.4	
1100/41	2.3 – 2.7	} Depending on Extended Storage Configured
1100/42	3.9 – 5.4	
1100/43	5.1 – 7.9	
1100/44	5.9 – 9.8	
1100/81	4.1 – 5.4	
1100/82	7.3 – 9.9	

3.2.3 Secondary Performance Factors

There is, of course, many secondary performance effects. A system that has only 262K words of main memory is probably memory bound for many applications. This may be true even for a very powerful processor.

The 1100 Series have in common the memory capacity of at least 524K words or roughly equivalent to two megabytes. The 1100/40 Series can use 1.5M words or six megabytes. The 1100/80 Series has a capacity of 4M words or 16 megabytes. The more powerful systems need more memory to hold more programs concurrently. This allows the faster processor to have something to do while each program waits for its I/O request before resuming its instruction execution.

In addition to the maximum size of memory allowed on each system, the speed of the memory, its modularity, and its overlapping design all help to establish system performance.

The entire family of 1100 Systems use the same peripherals and therefore have about the same I/O performance capability. There are some differences in I/O channels allowed, and their respective transfer speeds; and some systems have separate I/O units to control the I/O functions with less interfacing from the CPU; but, essentially the I/O being done for any single job can be done at about the same capability.

Even though the primary measurement of system performance is the CPU, these secondary performance factors may swing borderline proposals from one system to another. The 1100 sizing guide, the 1100 configuration guide and in more difficult cases, the use of a simulation model may be needed to be more exact in your proposal efforts.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

3.3 INPUT/OUTPUT CAPABILITIES

Functional compatability is retained throughout the 1100 Series Input/Output processors although architectural approaches in the I/O area take three different forms. The 1100/10 and 1100/20 systems have the I/O hardware integrated with the central processing unit while the 1100/40 system uses an independent Input/Output Access Unit (IOAU). The foregoing systems all use word type channels and may be configured into either ESI or ISI modes.

The 1100/80 also has an independent I/O processor designated an Input/Output Unit (IOU). The channel organization for the 1100/80 departs significantly from the other systems in the 1100 Series in that byte multiplexer and block (burst) multiplexer data transfer modes are provided in addition to the standard ISI/ESI word channels. Each IOU has both byte multiplexer (mux) and block mux channel capability in addition to word channel capability.

Performance capabilities are discussed in the following paragraphs for each of the 1100 Series systems. Channel configuration and characteristic details and differences for each of the system are discussed in Section 3.5.

Input/Output data transfer capability for the 1100/11 unit processor system is as follows:

- 444,444 words per second for one or more channels (same OBR*)
- 888,889 wps for two or more channels (both OBR's)

Multiprocessor (1100/12) I/O compared to unit processor rates are 40% greater when 2 modules of storage are used, 60% greater with 3 modules and 70% greater with four modules.

1100/20 — Input/Output data transfer rates for the 1100/21 unit processor system are as follows:

- 571,429 wps for one or more channels (same OBR)
- 1,142,857 wps for two or more channels (both OBR's)

Multiprocessor (1100/22) I/O rates are derived as with the 1100/10 — dependent on the number of storage modules employed.

*OBR is Output Buffer Register within I/O logic of 1100/10 and 1100/20 central processors.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

1100/40 – Input/Output data transfer rates for the 1100/40 IOAU is as follows for single channel rates:

- ISI Output – 500,000 wps
- ISI Input – 600,000 wps
- ESI Output – 333,000 wps
- ESI Input – 400,000 wps

The aggregate I/O channel transfer rate for the 1100/40 IOAU is 4,000,000 wps maximum. No guideline is available for multiple IOAU configuration transfer rates. However, total rates can be expected to be less than the rate for each IOAU times the number of IOAU's.

1100/80 – The 1100/80 Input/Output Unit (IOU) provides the capability to handle byte interfaces directly as well as word interfaces. In addition, the IOU includes additional buffering, extended chaining and branching, and interrupt tabling.

Channels in the IOU are contained within channel modules which may be of three types: byte multiplexed, block multiplexed (burst mode for byte transfers) and 36-bit word channel modules. Word channel modules accept channels configured as either ISI or ESI mode.

The maximum data transfer rates for the different types are as follows:

- byte mux – 200,000 bytes per second (bps)
- block mux – 1,500,000 (bps)
- word – 500,000 words per second (wps)

The total maximum aggregate data transfer rate for one IOU is 2M wps and 3.1M wps for two IOU's. These rates assume no CPU "misses" in the buffer. At a 97% hit rate from the processor, these rates become 1.5M wps and 2.4M wps respectively. Aggregate I/O rate is a function the hit rate percentage.

1100/80 Peripheral Differences

The current user of an 1100 Series system may utilize a major percentage of his current peripheral subsystems when moving up to the 1100/80 system.

The faster access times of the FH 432/1782 drums will be required on some 1100/80 Systems. For this reason the drum systems continue to be a viable product on the 1100/80 system. 1100 Systems being upgraded to the 1100/80 that currently have 432/1782 drum subsystems can therefore move them directly to the 1100/80 word channels without modification. This is also true for any existing 8460 disk subsystems.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

As for other disk subsystems being moved to 1100/80 Systems, all connect to the Block multiplexer channels of IOU. The built-in MSA's in the Control units for 8405/8430/8433 and 8440 disk subsystems will be disabled (and may be physically removed if desired) when such systems are connected to the 1100/80 block mux channels.

Magnetic tape subsystems such as the UNISERVO 12, 14, 16, 20 and 30 Group all will interface directly the block mux channel of the 1100/80 resulting in a saving of the MSA in each case. The built-in MSA in the UNISERVO 20 Tape control unit would be disabled but not physically removed. The MSA in the UNISERVO 30 Group control unit would be disabled and physically removed if desired. The UNISERVO 12, 14 and 16 tape control units connect directly to the 1100/80 I/O without intervening MSA's.

The UNISERVO 6C tape unit subsystem cannot be used on the 1100/80. This tape system cannot be brought forward when upgrading to an 1100/80 System.

Currently installed paper peripheral subsystems utilizing MSA's would connect to the byte multiplexor channel of the 1100/80 without using the MSA's. Significant saving results since the MSA is not required with paper peripherals on the 1100/80.

Communications equipment including C/SP's, CTMC's, and GCS's on current 1100 Series systems may be moved directly the 1100/80 without change. C/SP's would be connected to ISI word channels and CTMC's and GCS's would be connected to ESI word channels of the 1100/80.

Some existing subsystems currently in use on 1100 Series systems do not include channel parity capability. The following listing identifies the subsystems which can have channel parity added and the feature number required to make the change.

- F1493-00, 0955 Channel Adapter—required to operate an SPI type 0955-04 or 0955-05.
- F1494-00, 5012 Channel Adapter—required to operate a 5012-00 FH432/1782 Control Unit.
- F1496-00, 5009 Channel Adapter—required to operate the 5009-00,—04 FASTRAND II Control Unit. Two features are needed for dual control.
- F1496-02, 5009 Channel Adapter—required to operate FASTRAND II/III Control Type 5009-24, -73, -77, -81, -85, or -89. One adapter is required for all controls except 5009-77 and 5009-85 which requires two.
- F1095-12, F1095 Channel Adapter—required to operate an ICCU F1095-10.
- F1095-98, F1095 Channel Adapter—required to operate an ICCU F1095-02.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

Investment protection for current 1100 Series users is thus assured through the use of the optional word channels on the 1100/80 and the additional savings resulting from the removal of existing MSA's. Virtually all existing subsystems, with very few exceptions, may be used with little or no modification when upgrading to the 1100/80 System.

3.4 COMMUNICATIONS CAPABILITIES

Input/Output data word transfers in the 1100 Series are normally specified internally by the program controlling the transfer. This mode of transfer, called Internally Specified Index (ISI), requires the program to monitor and control data flow. The make-up of communications data differs from normal subsystem data flows in that several data envelopes may be multiplexed on a single I/O Channel. To allow the several remote communications devices to communicate directly with main storage on a self-controlled basis, the data flows are controlled externally (from the program).

Input/Output channels of the 1100 Series may easily be converted to allow communicating devices to interface to any channel desired. This mode of data control, called Externally Specified Index (ESI), uses data control words unique to each device which are assigned to dedicated areas of main storage. As the device transfers data, the control of the data transfer is initiated by the device via its assigned, unique access control word. The task of monitoring the data flow for ESI data transfers is off-loaded from the executive system in this way.

Further matching of the I/O channel to communications devices occurs through the use of quarter word (9 bit) or half-word (18 bit) data transfers to make more efficient use of main storage for communication type data buffers. The data increments associated with communications devices are generally 9 or less data bits long, and four data elements can be packed into a single 36 bit 1100 Series word to conserve storage.

Through the use of ESI I/O channels and partial word capability the 1100 Series effectively handles the special requirements of data transfers to and from communication devices.

3.5 MODEL FEATURES

The distinctions between the various models of the 1100 Series provide both a wide range in systems performance and functional differences that can be readily matched with numerous medium to large-scale application environments. As great as the functional differences are in some instances, full compatibility from a user processing standpoint is maintained through the use of 1100 OS, the operating system used by every model in the 1100 Series. It is difficult to overemphasize this point of compatibility.

Model Characteristics — The following table compares the features and characteristics of the 1100/10, 1100/20, 1100/40, and 1100/80 systems. The discussion centers about the central complex for each of the models, since the auxiliary storage, communications, and peripheral subsystems generally apply to all models.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

Table 3-2. Comparison of 1100 Series Model Features

	1100/10	1100/20	1100/40	1100/80
<u>CENTRAL PROCESSOR</u>				
DESIGNATION	CPU	CPU	CAU	CPU
TYPE	T3011	T3011	T3023	T3032
NO. OF CP's	1 OR 2	1 OR 2	1,2,3 OR 4	1 OR 2
INSTRUCTION REPERTOIRE	1100 SERIES	1100 SERIES	1100 SERIES	1100 SERIES 494 SERIES
<u>INPUT OUTPUT</u>				
DESIGNATION	(WITH CPU)	(WITH CPU)	IOAU	IOU
TYPE			T3025	T3033
NO. OF I/O CHANNELS	4-32	4-32	8-96	*
NO. OF I/O PROCESSORS	(WITH CPU)	(WITH CPU)	1,2,3 OR 4	1 OR 2
<u>MAIN STORAGE</u>				
DESIGNATION	MAIN	MAIN	MAIN	MAIN (BACKING)
TYPE	T7036	T7033	T7030	T7034
MIN./MAX. STORAGE (KWDS)	131-524	131-524	196-524	524-4,096
TECHNOLOGY	MOS	MOS	MOS	MOS
EXPANSION SIZE (KWDS)	65 OR 131	65K	65K	262K
CYCLE TIME (NSEC)	1,125	875	300	1,250**
MODULARITY (NO. MODULES)	1-4	1-4	12-32	1-16
<u>SPECIAL MAIN STORAGE</u>				
DESIGNATION	—	—	EXTENDED	SIU (BUFFER)
TYPE	—	—	T7033	T7022
MIN./MAX. STORAGE (KWDS)	—	—	262-1,048	8-16
TECHNOLOGY	—	—	MOS	BIPOLAR
EXPANSION SIZE (KWDS)	—	—	65 OR 131	4
CYCLE TIME (NSEC)	—	—	800	125
MODULARITY (NO. MODULES)	—	—	2-8	2-4
<u>PARTITIONING UNIT</u>				
DESIGNATION	ACU	ACU	SPU	STU
TYPE	T2506	T2506	T2516	T1925

*2-14 Byte Mux Channels or,
 2-14 Block Mux or high speed block MUX Channels or,
 0-48 Word Channels
 Combinations of channels are delineated in section 1.4.3.

**Time specified is read or write transfer time for 8 word block between main storage and the buffer.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

Common elements between all models are the 1100 OS mentioned earlier, the 1100 Series instruction repertoire (expanded for unique 1100/40 and 1100/80 functions), and a common system display console (type 4013) used on all models. Remote diagnostic maintenance capability is also common to all models.

Initial model selection to meet specific user requirements require in-depth analysis of the requirements and sizing the selected system accordingly. System sizing is an acknowledged complex task requiring experienced Sperry Univac analyst teams. There are however, some broad guidelines that may be applied to aid in initial model selection from the 1100 Series.

Cost/Performances — Cost and performance are, without question, two of the most important criteria affecting computer selection. There are other criteria which sometimes are merely different aspects of the basic two, but, are important considerations none the less.

Redundancy — There can be overlap in price between the smaller 1100/40 or 1100/80 models and the larger multiprocessor configurations of 1100/10 or 1100/20. But when system redundancy is a requirement, the choice could be directed towards large configurations of the smaller models where multiprocessing provides greater performance but primarily a stand-by, back-up redundancy requirement.

Byte and Character Processing — If processing requirements include byte or character processing, the 1100/40 or 1100/80 would be indicated since the 1100/10 and 1100/20 models do not have these instructions in the hardware.

Large Data Base I/O — In a case where large numbers of I/O devices are required with modest processing requirements, the 1100/80 might be the best choice because one processor and two I/O units can be configured to provide up to 16 byte or block mux channels connecting to a maximum of 64 control units with a single processor unit. By contrast only 16 channels or control units on an 1100/10 or 1100/20 or 24 channels and 24 control units on an 1100/40 can be configured with a single processor.

1100/10 and Scientific Processing — A preponderance of scientific (extended instruction) processing can favor the 1100/10 versus the 1100/20. Performance differences relate entirely to main storage differences because the processors have the same cycle rate. The result is that the extended instruction times are more nearly the same between the models. The lower cost of the 1100/10 then weights the decision towards the 1100/10, based on cost/performance considerations in this particular case.

These are just a few considerations that might weight a decision towards a particular model. In general, however, the real environment and detailed requirements of the user will dictate a particular system configuration and comprehensive sizing will be needed to assure that the proper system is selected and configured.

4 PERIPHERAL HARDWARE — CAPABILITIES AND VALUES

Peripheral Subsystems are attached to members of the 1100 Series Family systems through general purpose input/output channels or on the 1100/80 byte or word channels. The governing factor for peripheral attachment is the transfer rate of the device to be attached. As the channels are numbered in order of priority, subsystems with very high transfer rates should be attached to the lower numbered channels which have the higher priority. With this adaptable input/output arrangement, SPERRY UNIVAC 1100 Systems can be used to receive information from many types of real-time devices and other information processing systems.

The SPERRY UNIVAC 1100 Series Peripheral Subsystems are:

4.1 Mass Storage

Disk Subsystems

- SPERRY UNIVAC 8405 Disk Subsystem
- SPERRY UNIVAC 8430 Disk Subsystem
- SPERRY UNIVAC 8433 Disk Subsystem
- SPERRY UNIVAC 8425 Disk Subsystem
- SPERRY UNIVAC 8434 Disk Subsystem

High Performance Drums

- FH-432
- FH-1782

4.2 Magnetic Tape Subsystems

- UNISERVO 12 Magnetic Tape Subsystem
- UNISERVO 16 Magnetic Tape Subsystem
- UNISERVO 20 Magnetic Tape Subsystem
- UNISERVO 14 Magnetic Tape Subsystem
- UNISERVO 30 Magnetic Tape Subsystem
- UNISERVO 32 Magnetic Tape Subsystem
- UNISERVO 34 Magnetic Tape Subsystem
- UNISERVO 36 Magnetic Tape Subsystem

4.3 Communications Equipment/Onsite

- SPERRY UNIVAC General Communications Subsystem (GCS)
- SPERRY UNIVAC Communications/Symbiont Processor
- SPERRY UNIVAC TELCON Distributed Processing System

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

4.4 Communications Equipment/Remote

SPERRY UNIVAC Data Communications Terminal (DCT) 1000

SPERRY UNIVAC Data Communications Terminal (DCT) 500

UNISCOPE 100 Display Terminal

UNISCOPE 200 Display Terminal

Universal Terminal System 700

Universal Terminal System 400

SPERRY UNIVAC TELCON Distributed Communications
Processor (Remote)

4.5 Paper Peripheral Subsystems

SPERRY UNIVAC 0770 Printer

SPERRY UNIVAC 0776 Printer

SPERRY UNIVAC 0716 Card Reader

SPERRY UNIVAC 0604 Card Punch

SPERRY UNIVAC 0920 Paper Tape

4.1 MASS STORAGE DISK SUBSYSTEMS

Sperry Univac offers a variety of disk subsystems for use on the 1100 Series Systems. These disk subsystems give the customer a choice of efficient ways to substantially increase throughput on any of the 1100 Series. In addition, provisions for incremental growth allow the customer to expand his potential for on-line processing and capabilities for real-time operation and multiprogramming.

4.1.1 Improved Systems Performance

Rotational Position Sensing

The 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 from the 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 removable disk pack.

High Capacity

The subsystem provides a removable disk device which is equivalent to the largest provided in the industry. In addition there is multiple device attachment of smaller removable disk and fixed head disk devices to provide better modularity and granularity.

DOCUMENT NO.	TITLE				PAGE REV.	PAGE
--------------	-------	--	--	--	-----------	------

**Table 4-1. General Characteristics of
SPERRY UNIVAC 8405, 8425, 8433 and 8434 Disk Subsystems**

CHARACTERISTIC	8405-00/01	8405-04/05	8425	8430	8433	8434
DRIVES PER SUBSYSTEM	1-8 (NON-REMOVABLE)	1-8 (NON-REMOVABLE)	2-8	2-16	2-16	2-16
DISK PACKS PER DRIVE	1	1	1	1	1	1
R/W HEAD-ACCESSOR MECHANISMS	FIXED HEAD	FIXED HEAD	1	1	1	1
R/W HEADS PER DISK PACK	768 (PLUS 96 SPARES)	384 (PLUS 48 SPARES)	20 (ONE PER SURFACE)	19 (ONE PER SURFACE)	19 (ONE PER SURFACE)	19 (ONE PER SURFACE)
TRACKS PER DISK SURFACE	72	72	406	411	815	887
RECORDING SURFACES PER DISK PACK	12	6	20	19	19	19
ADDRESSABLE TRACKS PER SURFACE	64 (PLUS 8 SPARES)	32 (PLUS 4 SPARES)	400 (PLUS 6 SPARES)	404 (PLUS 7 SPARES)	808 (PLUS 7 SPARES)	878 (PLUS 7 SPARES)
ADDRESSABLE TRACKS PER DISK PACK	768 (PLUS 96 SPARES)	384 (PLUS 48 SPARES)	8,000 (PLUS 120 SPARES)	7,676 (PLUS 133 SPARES)	15,352 (PLUS 133 SPARES)	16,682 (PLUS 133 SPARES)
WORDS PER RECORD (36-BIT)	112	112	112	112	112	112
RECORDS PER TRACK	16	16	12	20	20	29
CAPACITY PER DISK PACK (36-BIT WORDS)*	1,376,256	688,128	10,752,000	17,194,240	34,388,480	54,183,136
MINIMUM ACCESS TIME (MILLISECONDS)	N/A	N/A	7.5	7	7	7
AVERAGE ACCESS TIME (MILLISECONDS)	8.34	8.34	29	27	30	30
MAXIMUM ACCESS TIME (MILLISECONDS)	16.67	16.67	55	50	55	55
DISK PACK SPEED (RPM)	3,600	3,600	2,400	3,600	3,600	3,600
DATA TRANSFER RATE (PER SECOND)	622,000 BYTES 138,222 WORDS	622,000 BYTES 138,222 WORDS	312,000 BYTES 69,333 WORDS	806,000 BYTES 179,111 WORDS	806,000 BYTES 179,111 WORDS	1,260,000 BYTES 280,000 WORDS
DUAL ACCESS FEATURE	AVAILABLE	AVAILABLE	AVAILABLE	AVAILABLE	AVAILABLE	AVAILABLE

*SIMULATED FASTRAND DRUM MODE. IN ADDITION, THE FREE-FORMAT MODE WILL ALLOW THE USER TO EMPLOY VARIABLE-LENGTH RECORDS. THIS OPTION IS AVAILABLE THROUGH USE OF THE ARBITRARY DEVICE HANDLER (ADH). (NOT AVAILABLE WITH 5046 CONTROL.)

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

Fast Access

All the devices attached to the 5039 or 5046 Control Units are high speed, fast accessing devices. The removable disk drives employ the latest design in voice coil actuators which provide for 27 ms average head positioning time for the 8430 and 30 ms average head positioning time for the 8433. The 8405 is a head per track disk with an average access time of 8.33 ms (average rotational latency).

4.1.2 Improved Flexibility

Configuring a disk subsystem is remarkably easy with these devices. The 5039 and 5046 Control Units attach numerous combinations of up to thirty-two 8433, 8434, 8430 and 8405 drives with the appropriate features. This capability provides previously unavailable configuration flexibility and provides substantial savings to those who currently must order separate controls for disks and FH drums.

4.1.3 High 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 (1100 Series)

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.

4.1.4 Availability

Dual Access Subsystems

All Sperry Univac disk units may be configured as Dual Access Subsystems.

By adding a second control unit and the appropriate dual channel 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.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

4.1.5 Investment Protection

Intermixing

Through special features on the control unit, a user may wish to mix 8405 disk units with either the 8430, 8433 or 8434 disk units. He may also mix, in any combination, 8430's, 8433's and 8434's.

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

4.1.6 SPERRY UNIVAC 5039 Control Unit

The 5039 Control Unit is a high performance microprogrammed unit which will control an intermix of 8433 and 8430 Disk Storage Drives and 8405 FHD Drives. The basic control will attach eight 8433/8430 drives or sixteen 8433/8430 drives via feature F2047-00. To attach the 8405 FHD a feature F2076-00 is required. This feature will allow the connection of up to eight of the fixed head disks. The maximum configuration of devices on the 5039 Control Unit can be 16 8433 and 8430 drives in any intermix combination or a total of 8 8433 and 8430 drives and 8 8405 FHD for a maximum of 16 drives. F2047 and F2076 are mutually exclusive. The control unit capabilities include Rotational Position Sensing (RPS), Error Correction Code (ECC) and command retry.

The 5039 Control Unit contains all the necessary logic and storage facilities for data and control transfer between the Sperry Univac systems channels and the disk units. Data is transferred between the processor and the subsystem at a rate of up to 806,000 bytes per second for the 8433 and 8430 and 622,000 bytes per second for the 8405.

A 5039 control unit, can in turn allow an attachment of an auxiliary control unit, 5039/93-92. The use of an auxiliary control unit provides a number of configuration alternatives. For example an additional 16 drives can be configured with the auxiliary unit in addition to the 16 drives available on the main control.

Control Unit Buffer

The 1100 Series Systems typically consist of one or more main frame elements operating with one or more main storage units. Since the systems are multi-programmed and multiprocessed many or all I/O channels can be concurrently active with storage unit conflicts dependent on request distribution. Although a software I/O Load Monitor provides a software means of regulating the data transfer load on storage modules when very fast transfer rate peripherals are used, it frequently does so at the price of system throughput. Two versions are available:

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

- The 5039-99/98 Buffered Control provides a 1024 word buffer. The buffered control unit will eliminate sensitivity to data overrun and allow the software I/O Load Monitor to optimize I/O initiations with data transfer rates. The Buffered Control Unit is required on the 1106-I, 1106-II, 1108, 1110 and is also available for the 1100/10, 1100/20 and 1100/40 systems.
- The 5039-93/92 Control is unbuffered and can be used with the 1100/20 and 1100/40 systems only. In addition, the unbuffered 5039-93/92 subsystem should be assigned lower numbered channels which have higher priority.

A feature, F0974-XX, provides for field conversion of a 5039-93/92 to a 5039-99/98. The conversion involves replacement of a portion of the control including cabinetry. Upon conversion, the 5039-93/92 assumes the same characteristics as the 5039-99/98.

The 5039-XX/YY is unbuffered and can be used with the 1100/80 only. It will attach to the 1100/80 via the BLK MUX Channel. (Note: This control can only accommodate up to six 8405's).

4.1.7 SPERRY UNIVAC 5046 Storage Control Unit (SCU)

The 5046 Storage Control Unit (SCU) is a high performance microprogrammed unit which will control an intermix of 8430, 8433, 8434 and 8405 FHD drives.

ON ONE BASIC STORAGE CONTROL UNIT: if configured with appropriate features.

- up to eight 8405 Disk Drives
- up to eight 8405's AND up to sixteen 8430's and/or 8433's
- up to eight 8405's and up to sixteen 8434's
- up to sixteen (16) 8430's, or 8433's, or 8434's. There may also be an intermix of up to sixteen 8430/8433/8434's.
- up to thirty two (32) 8430's, or (32) 8433's, or (32) 8434's or an intermix of thirty two (32) 8430's, 8433's, or 8434's devices can be attached. (no provision for 8405 intermix).

The 5046 SCU contains all the necessary logic and storage facilities for data and control transfer between the Sperry Univac systems channels and the disk units. Data is transferred between the processor and the subsystem at rates up to:

- 622,000 bytes/second for the 8405
- 806,000 bytes/second for the 8430/8433
- 1,260,000 bytes/second for the 8434

By the addition of a second control unit, the subsystem can be configured as Dual Access, which will open a second path to the data — this feature is especially useful for those systems with multiprocessors.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Storage Control Unit Buffer

A channel buffer is provided in the channel interface section of the 5046 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.

4.1.8 Drum Subsystems

Two flying-head drum subsystems are available on 1100 Series systems — the high speed FH432 magnetic drum (with an average access time of 4.3 milliseconds) and the fast, large capacity FH1782. Both systems have an individual read/write head for each track. While the FH432 gives you fast access time, the FH1782 gives you high capacity and high speed — particularly useful where large data files must be accessed frequently. A valuable characteristic of these Sperry Univac flying-head drum systems is that they can be mixed, up to a combination of eight. Thus you can make an efficient blend to mix speed, capacity and economy, greatly enhancing the storage configuration of the 1100 Series System.

Table 4-2. General Characteristics of the
UNIVAC FH-432 and FH-1782 Flying-Head Drums

CHARACTERISTIC	FH-432	FH-1782
STORAGE CAPACITY	262,144 36-BIT WORDS PLUS PARITY BITS: 1,572,864 CHARACTERS PER DRUM	2,097,152 36-BIT WORDS, PLUS PARITY BITS: 12,582,912 CHARACTERS PER DRUM
AVERAGE ACCESS TIME (MILLISECONDS)	4.3	17
DRUM SPEED (RPM)	7,200	1,800
READ/WRITE HEADS FOR DATA	384—ONE PER TRACK	1,782 (33 BLOCKS WITH 54 HEADS PER BLOCK)
CHARACTER TRANSFER RATES*	1,440,000; 720,000; 360,000; 180,000; 90,000	1,440,000; 720,000; 360,000; 180,000; 90,000
WORD TRANSFER RATES*	240,000; 120,000; 60,000; 30,000; 15,000	240,000; 120,000; 60,000; 30,000; 15,000
I/O CHANNELS REQUIRED	1 OR 2 PER SUBSYSTEM	1 OR 2 PER SUBSYSTEM
DRUMS PER SYSTEM	1 TO 8 (12,582,912 CHARACTERS MAXIMUM)	1 TO 8 (100,663,296 CHARACTERS MAXIMUM)

*DEPENDENT ON INTERLACE USED; 1:1, 2:1, 4:1, 8:1, or 16:1.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

4.2 SPERRY UNIVAC UNISERVO MAGNETIC TAPE SUBSYSTEMS

SPERRY UNIVAC Magnetic Tape Subsystems offer a wide range of performance — from the UNISERVO 12 with a data transfer rate of 68,320 frames per second to the UNISERVO 36 with a data transfer rate of 1,250,000 bytes per second. In addition to the feature of intermixing selective tape units, simultaneous dual access, cartridge capability, PE — NRZI — GCR modes of recording, and a wide variety of densities offer the customer features which will satisfy any possible configuration and application for tape storage. Eight Magnetic Tape Subsystems are available with the 1100 Series Systems. These subsystems may include:

- UNISERVO 12 Magnetic Tape Units
- UNISERVO 14 Magnetic Tape Units
- UNISERVO 16 Magnetic Tape Units
- UNISERVO 20 Magnetic Tape Units
- UNISERVO 30 Magnetic Tape Units
- UNISERVO 32 Magnetic Tape Units
- UNISERVO 34 Magnetic Tape Units
- UNISERVO 36 Magnetic Tape Units

Each of the above Tape Units have characteristics which tend to dictate which 1100 System and application will its performance and price best meet.

Two basic methods of operation are available. These are:

- Nonsimultaneous (single channel operation) — In this method of operation, one or more tape units are connected to a single I/O channel through the appropriate control unit. Only one function, on any one of the tape units, may be active at any single instant.
- Simultaneous 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. The dual channel is a desirable feature for multiprocessor systems which require an alternate path ensuring the availability of information to either host processor.

Users today are asking for solutions, short term as well as long term, to the present problems of tape handling and processing. They hope to see these improvements brought about by techniques and devices that will not bring about a complete revolutionary change from the way they are now operating. By providing a wide variety of UNISERVO Tape Units from which to select for his specific application, the customer is assured that Sperry Univac can always meet his needs — immediate or in the future. Magnetic tape still holds its unique place in data storage. It has remained the traditional mass storage medium despite many new developments. It will continue to be a very significant mass storage medium because the cost, capacity and interchangeability of tape is difficult to beat.

Two of the major considerations in tape subsystems are the type of access required and file size. Disk has a faster peak transfer rate, offers random ability for an on-line file and provides data handling advantages. When extremely large files are needed and sequential processing makes up the bulk of the required

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

work, one of the SPERRY UNIVAC Tape Units will surely fill the bill. When a choice has to be made between tape or disk, the file size, especially for sorting, must be accurately determined, and the access requirements assessed.

A Tape/Disk configuration is particularly suited for accounts with both large files and random access requirements. An example would be a Bill Of Materials application where the bills would be stored on tape and the master inventory record on the disk file. This configuration is also well suited for the account with extensive sorting requirements. The high speed sorting capability of the disk subsystem could be utilized to sort transaction data prior to being processed against a large sequential file on tape.

Table 4-3. UNISERVO 12/14/16/20
Magnetic Tape Subsystems Characteristics

SUBSYSTEM	UNISERVO 12	UNISERVO 14	UNISERVO 16	UNISERVO 20
TAPE UNITS PER SUBSYSTEM	1 TO 16	2 TO 8	1 TO 16	1 TO 16
DATA TRANSFER RATE (MAX.)	68,320 FRAMES/ SECOND	96,000 FRAMES/ SECOND	192,000 FRAMES/ SECOND	320,000 FRAMES/ SECOND
TAPE SPEED	42.7 INCHES/ SECOND	60 INCHES/ SECOND	120 INCHES/ SECOND	200 INCHES/ SECOND
TAPE DIRECTION:				
READING	FORWARD OR REVERSE	FORWARD OR REVERSE	FORWARD OR REVERSE	FORWARD OR REVERSE
WRITING	FORWARD	FORWARD	FORWARD	FORWARD
TAPE LENGTH (MAX.)	2400 FEET	2400 FEET	2400 FEET	2400 FEET
TAPE THICKNESS	1.5 MILS	1.5 MILS	1.5 MILS	1.5 MILS
BLOCK LENGTH	VARIABLE	VARIABLE	VARIABLE	VARIABLE
INTERBLOCK GAP:				
9-TRACK	0.6 INCH	0.6 INCH	0.6 INCH	0.6 INCH
7-TRACK	0.75 INCH	0.75 INCH	0.75 INCH	—
INTERBLOCK GAP TIME (9-TRACK):				
NONSTOP	14.1 MS	10 MS	5.0 MS	3.0 MS
START-STOP	20.1 MS	6 MS	8.0 MS	5.0 MS
INTERBLOCK GAP TIME (7-TRACK):				
NONSTOP	17.6 MS	12.5 MS	6.25 MS	NOT
START-STOP	23.6 MS	6 MS	9.25 MS	AVAILABLE
REVERSAL TIME	25 MS	13.3 MS	10 MS	16 MS
REWIND TIME	3 MINUTES	2.8 MINUTES	2 MINUTES	1 MINUTE
SIMULTANEOUS OPERATION	OPTIONAL	—	OPTIONAL	OPTIONAL
RECORDING MODE	PHASE ENCODING NRZI	PHASE ENCODING NRZI	PHASE ENCODING NRZI	PHASE ENCODING

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

The advantages provided by these magnetic tape subsystems include:

- wide range of performance
- intermix of UNISERVO 12/16/20 Magnetic Tape Units
- simultaneous dual access
- cartridge capability
- data translator features
- PE, NRZI – 7 and 9 track – variety of densities

Table 4-4. UNISERVO 30/32/34/36
Magnetic Tape Subsystems Characteristics

SUBSYSTEM	UNISERVO 30	UNISERVO 32	UNISERVO 34	UNISERVO 36
TAPE UNITS PER SUBSYSTEM	1 – 16	1 – 16	1 – 16	1 – 16
RECORDING DENSITY (PE) (NRZI) (GCR)	1600 BPI 200,566 AND 800 BPI	1600 BPI 6250 BPI	1600 BPI 6250 BPI	1600 BPI 6250 BPI
TRANSFER RATE (PE) (NRZI) (GCR)	320,000 FPS 40,000; 111,200; 160,000 FPS	120,000 FPS 468,750 FPS	200,000 FPS 781,250 FPS	320,000 FPS 1,250,000 FPS
TAPE SPEED	200 INCHES PER SECOND	75 IN PER SEC	125 IN PER SEC	200 IN PER SEC
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 TR) 0.6 INCH (9 TR)	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)	3.0 MS (NONSTOP) 10.4 MS (START/STOP)	4.8 MS (NONSTOP) 6.3 MS (START/STOP)	3.0 MS (NONSTOP) 4.6 MS (START/STOP)
REWIND TIME (2400 FT)	45 SECONDS	60 SECONDS	60 SECONDS	45 SECONDS

The UNISERVO 30 Tape Subsystem provides the advantage of completely automatic tape loading which helps assure ease of operation and maximum operator efficiency. Utilizing the industry standard dustproof wraparound cartridge, loading is faster, with no manual threading required, and the tape ends are never touched by the operator. In addition, standard tape reels without cartridges may be used quickly and conveniently with the same automatic loading and threading capability.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

The performance range of the UNISERVO 30 Tape Subsystem is varied and wide. Group Coded Recording (GCR), Phase Encoded (PE) and both 9-track and 7-track Non-Return to Zero (NRZI) recording techniques at 6250 bpi, 1600 bpi, 800 bpi, 556 bpi and 200 bpi are all employed.

4.3 SPERRY UNIVAC COMMUNICATIONS

The early use of general purpose computers to perform batch, scientific, or real-time data processing was accomplished on a computer which was highly specialized. Originally, the only applications were scientific and commercial. Because effective data transmission was unavailable, the early commercial computers were used only for batch processing. With the advent of computer controlled data communication lines, applications were separated into batch, real time, and demand. Advances in computer technology have made it possible to produce general purpose computers which meet the requirements of two of the three types of data processing, but seldom all three. The SPERRY UNIVAC 1100 Series Systems offers its users all three types of data processing capabilities.

Most companies of any size are making use of data communications either in front-end processing or through the direct use of terminals in applications such as:

- Accounting Operations
- Personnel Applications
- Production Control
- Inventory Control
- Engineering Applications
- Marketing Operations
- Business Information System
- Management Information System

Benefits to the user from the use of data communications are:

- Improved Planning and Forecasting
- Increased Services to Customers
- Expansion in Markets (Growth)
- Improvement in Personnel Efficiency
- Internal Organization Flexibility
- Improvement in Gathering and Control of Information
- Facilitates Management Decision Making

4.3.1 Front-End Processors

Front-end processors provide the connection between communications interface equipment (such as modems and line adapters) and the 1100 Series I/O channel. The benefits from a stored-program communications front-end include:

- Reduction in CPU memory requirements for communications
- Longer useful life for the system by transferring the communications to the front-end

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

- Flexibility in the handling of codes, formats, and line disciplines
- Maintenance of major data communications during CPU downtime
Easier system recovery through complete message buffering
- Increased cost-effectiveness by performing routine, communications-related processing functions in a lower cost processor
- More flexible control of communication functions through system's improvements and more rapid recovery in case of a malfunction

Principal Applications of Front-end Processors

- Message Switching
- Network Control/Management
- Terminal Control/Support
- Peripheral Control/Support
- Traffic Monitor/Load Control
- Site Verification (Security)
- On-line Testing (Diagnostics)
- System Recovery
- Communication Housekeeping Activities

4.3.2 SPERRY UNIVAC General Communications Subsystem (GCS)

The SPERRY UNIVAC General Communications Subsystem (GCS), plug compatible with the SPERRY UNIVAC CTMC, operates under central processor control to fulfill the Input/Output communications transfer requirements of SPERRY UNIVAC 1100 Systems.

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 concurrently with almost any mix of telegraph, low speed, medium speed and high speed data lines at rates up to 50,000 bits per second.

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

Design of the GCS reflects the optimization of high performance and low cost. Data transfers between terminal equipment and the central processor are handled in an effective, reliable, and efficient manner.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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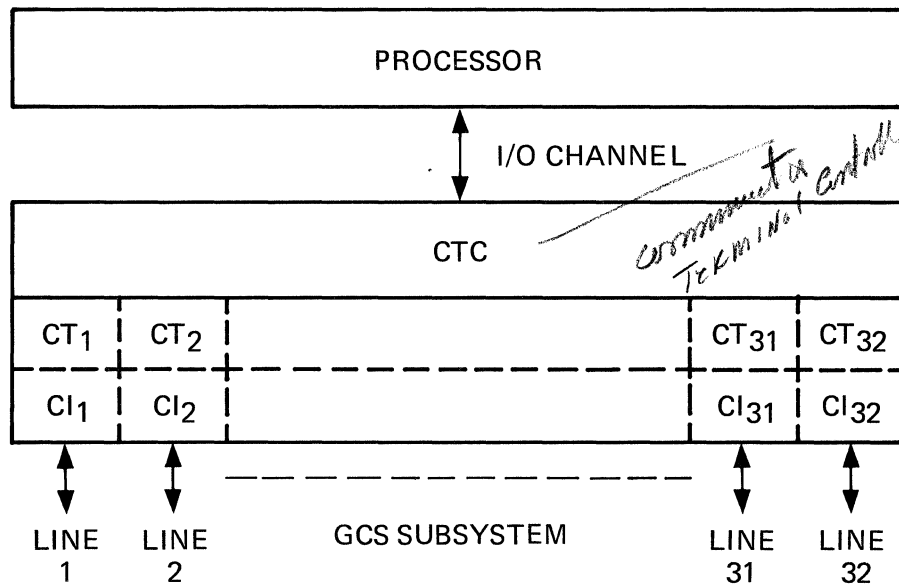
Hardware Description

The GCS is a communication subsystem that interfaces to the SPERRY UNIVAC 1100 series processors through an I/O channel in Externally Specified Index (ESI) mode. It can also operate via a free standing SPI, or a Transfer Switch Unit (TSU).

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 GCS is logically located between the processor and Terminal devices. The interface between the processor and the GCS is the normal I/O channel of the 1100 series processor which operate in ESI mode.

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

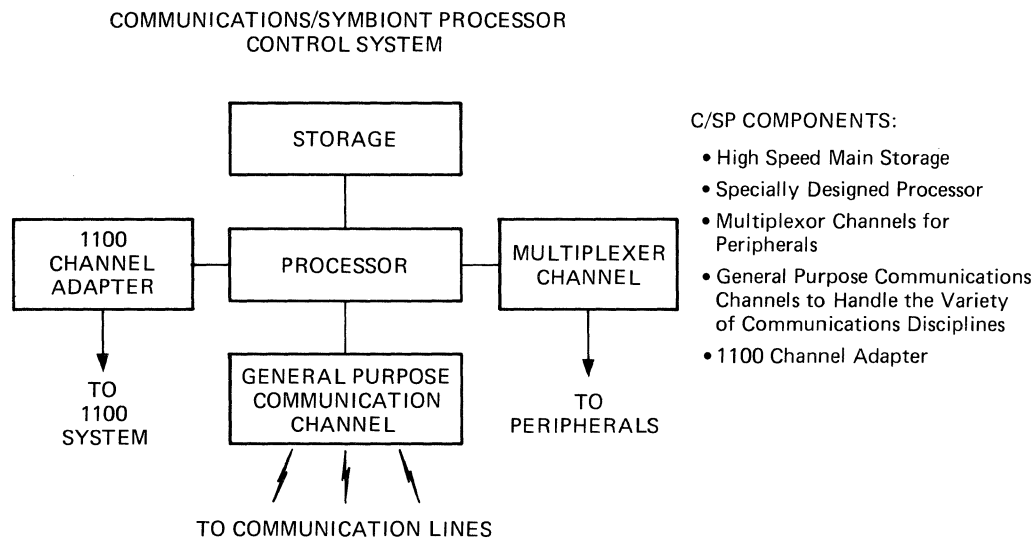


4.3.3 SPERRY UNIVAC Communications/Symbiont Processor (C/SP)

The C/SP is a high performance, internally programmed system which is used to absorb the function of communications control and data input/output processing. Its high speed, internal operation, and multipurpose I/O channels provide high throughput rates and interface with communications facilities and terminals. All tasks associated with communications processing are completed at maximum efficiency because the C/SP is a dedicated system designed to effectively process communications. In assuming control of all communications operations, the C/SP relieves the host computer of storage allocated to terminal handler programs and of the time associated with communications interrupt processing, data formatting,

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

data editing, data translation, and other communication tasks. System throughput is thus increased and user turnaround-time is decreased because of the system performance improvement. The C/SP simplifies expansion of the communication system, either lines or different types of terminals, as changes can be made without affecting the host processor.



The introduction of the C/SP by Sperry Univac in November 1970 was the first of its several major commitments to the concept of distributive processing. Attacking a combined front of handling both communications and paper peripheral subsystems, the product thus sought to remove the task of driving peripheral and terminal devices from the central processor. The concept has since been accepted industry wide and will continue to grow throughout the next decade.

The enhancements will permit the user to take fuller advantage of the capabilities inherent in the C/SP. The addition of tape and disk subsystem will allow the user to implement a fully recoverable front-end processor, capable of performing both front-ending tasks and message switching.

The improved host interfacing both in hardware and software will provide increased performance of the total C/SP host configuration and provide greater flexibility in system design from both a host system and network viewpoint.

The increased terminal support allows for better utilization of the host system, communication lines and terminal resources, while increasing the terminal selection available to the user.

Flexibility in network control is provided for through dynamic reconfiguration of the network, on-line, utilizing the operator's console.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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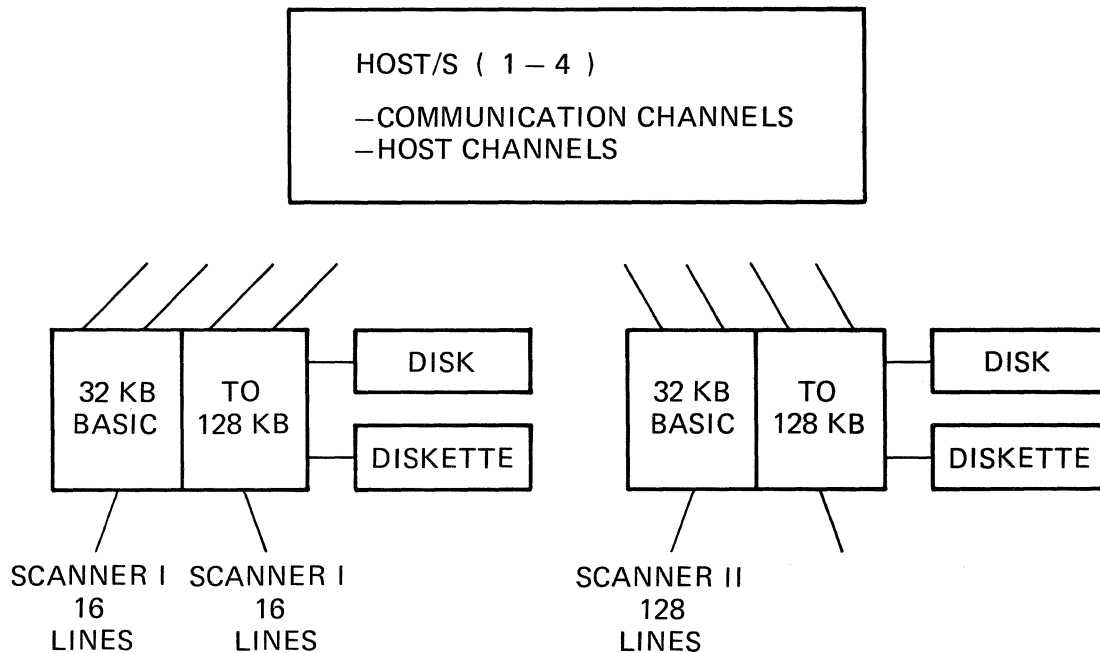
The reliability of the total system is greatly enhanced by the improved C/SP recovery, from both host and C/SP failure, and stand-alone capability of the C/SP to continue communication during host outages.

The enhanced C/SP provides for a significant improvement in the user's total price/performance through increased utilization of the C/SP and more efficient utilization of the host system and network resources.

4.3.4 SPERRY UNIVAC Distributed Communications Processor (DCP)

The DCP is a programmable preprocessor that gives you full network control capabilities. Network control capabilities include: auto-polling, switched line procedures, error recovery, diagnostics, critical situation notification, code translation and network statistics. With Sperry Univac network control, the customer can maintain a high degree of system integrity through automated error-recovery procedures that compensate for intermittent transmission errors. Under network control, the DCP will provide for full-duplex operation and will perform message switching and store-and-forward operations. If the customer has a variety of data terminals, the DCP offers the flexibility of handling, in addition to Sperry Univac terminals, IBM and Teletype terminals with equal ease. It is also designed to accommodate new terminal disciplines, transmission speeds, control conventions and data codes as new requirements are introduced into the system — this allows the customer to select terminals on a cost/performance basis.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------



CHARACTERISTICS

Processor:

Memory – 32 K Bytes expandable to 128 K Bytes
 Word Length: 16 Bits plus 2 parity (one per byte)
 Registers: 32 Registers
 Direct Memory Accessing/Full Memory Addressing
 Instruction Repertoire:
 40 Basic Instructions with modifiers
 200 unique instructions

Scanner:

Interface between Processor and Terminals
 Scanner I: Up to 16 Full or Half-duplex lines; two may be configured
 Scanner II: 128 Half-duplex or 64 Full-Duplex lines; two may be configured

Line Interface:

Asynchronous – 2400 BPS
 Synchronous – 9600 BPS
 Wideband – 19.2 – 230.4K BPS
 DDS – 56K BPS

Bit Oriented Protocol:

UDLC, SDLC, HDLC, ADCCP

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

4.4 TERMINALS

The logical substitute for the keyboard/printer on the console of a computer system is a visual display. It can be directed by the central computer at high speed and coupled to the operator by means of the keyboard and display. It can also time share the communications facilities and keep line costs to a minimum. Sperry Univac has developed the line of terminals to provide an efficient and effective means of implementing the rapidly growing number of dynamic applications and to provide an over-all reduction in total systems cost.

Since the applications are so varied, cover so many industries, and include a myriad of functions, it is impossible to describe them in detail and also very difficult to put them into categories. There are three categories, however, that will provide an adequate breakdown for examination of the broad ideas involved in the utilization of terminals. These categories are Information Retrieval, Direct Data Input, and Dialogue. Applications for a visual communication terminal or cathode ray tube display will soon be universal.

Application Categories

- Information Retrieval
 - Management Problems
 - Services
 - File Inquiry
- Direct Data Input
 - Simplified File Maintenance
 - New Data Entry
- Dialogue
 - Simulation
 - Inventory and Sales
 - Training, Education and Programming

Industries and Business Firms that Utilize these Applications

- Manufacturing Firms
- Retailers
- Insurance Companies
- Schools, Colleges, Universities
- Communication Companies
- Transportation Companies
- Distributors
- Savings and Loan Companies
- Public Utilities
- Wholesalers
- Banks
- Hospitals
- Federal, State and Local Government Agencies

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

4.4.1 SPERRY UNIVAC Data Communications Terminal (DCT) 1000

The SPERRY UNIVAC Data Communications Terminal (DCT) 1000 is a fully buffered 30 character per second incremental printer which can be expanded to include a keyboard, card reader, card punch, paper tape reader/punch, and an auxiliary printer. The DCT 1000 transmits data or receives data from a local or remote processor or to a remote DCT 1000 in conversational or batch mode.

The SPERRY UNIVAC DCT 1000 data communications terminal provides multimedia capabilities. The terminal can be built up in a modular fashion from a basic receive-only printer to a full terminal with keyboard, card, and paper tape capabilities. The unique characteristics of the DCT 1000 terminal facilitate full utilization of common carrier communications at speeds up to 4800 bits per second. An unlimited variety of configurations is possible via point-to-point, multipoint, or multiplexed operation on switched or private lines. To insure accurate communications, validity of transmissions is increased by character and block parity checking and automatic retransmission of messages. The DCT 1000 data communications terminal fits into many application environments. It interfaces directly with SPERRY UNIVAC, IBM computer systems, or any other computer system. You can arrange station-to-station batch communications between DCT 1000 terminals. You can also intermix DCT 1000 terminals and UNISCOPE 100/200 display terminals on the same transmission line. This flexibility of configurations and the versatility of communications permits you to organize and coordinate geographically separate facilities and operations. . .to communicate the information that is needed to function responsively and efficiently.

4.4.2 SPERRY UNIVAC Data Communications Terminal (DCT) 500

The SPERRY UNIVAC Data Communications Terminal (DCT) 500 is an unbuffered, asynchronous keyboard/printer terminal similar in operation to a teletypewriter. The DCT 500 is, however, two to three times faster than a teletypewriter and it provides up to 132 print positions and five carbons. The DCT 500 can replace existing teletypewriters with little or no changes in the software handlers for point-to-point communications networks over voice-grade telephone toll lines or private lines. In a multiparty, polled environment, the DCT 500 operates in accordance with ASCII procedures.

The SPERRY UNIVAC DCT 500 data communication terminal is a low-cost, interactive keyboard printer terminal which is two to three times faster than conventional teletypewriter terminals. Built-in dependability and versatility provide for both present and future customer requirements. The DCT 500 interfaces with all SPERRY UNIVAC computer systems, IBM systems, as well as with many other computer systems. The operating versatility of the DCT 500 data communication terminal meets the customers need for fast, accurate information in unlimited applications. Using this interactive terminal within an integrated information system, the customer can get up-to-the-minute data on financial status, competitive position, inventory status, deliveries, and product development. In banking, insurance, and informational industries, the DCT 500 offers

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

quick response to customer requests, monitors and simplifies work flow and personnel deployment. It can offer immediate presentation of retail credit, medical case histories — any type of information references needed to operate more efficiently. It will make your customers records a working tool that can be updated instantly.

4.4.3 SPERRY UNIVAC UNISCOPE 200 Display Terminal

The UNISCOPE 200 Display Terminal offers a variety of presentation formats which provide a total display capacity of 1536 or 1920 USA Standard Code for Information Interchange (ASCII) characters.

UNISCOPE 200 Display Terminals may be mixed in any combination with UNISCOPE 100 Display Terminals and SPERRY UNIVAC Data Communications Terminals (DCT) 1000 on a single line.

The UNISCOPE 200 display terminal is an economical, large-screen, cathode-ray-tube, self-contained, alphanumeric desk-top device that works on-line to a central computer, either locally or remotely through communication lines. It answers the need for larger display area in a compact unit, with high performance, ease of operation and the versatility to adapt to almost every business for display of information. The UNISCOPE 200 is designed to make your central computer more useful, more available and more versatile. In itself, it is ideal for file updating and maintenance, file retrieval, immediate inquiry and real-time interaction.

Whatever the customer needs are — immediate retail credit information, inventory status, medical case history information, travel reservations, insurance claims control — any kind of accounting, recording, file maintenance, data manipulation or text editing.

The UNISCOPE 200 gives the customer highly efficient output of large blocks of information in response to just about any inquiry you can name — whatever business or service the customer is in — whatever his size. Displaying large financial reports, rather than distributing them in hard copy, can save considerable time and money for any business, industry, institution or government agency. Any kind of data can be retrieved as desired and formatted for easy reference with the help of the UNISCOPE 200.

4.4.4 SPERRY UNIVAC UNISCOPE 100 Display Terminal

The UNISCOPE 100 Display Terminal offers a variety of presentation formats which provide a total display capacity of 480, 512, 960, or 1024 USA Standard Code for Information Interchange (ASCII) characters.

The UNISCOPE 100 display terminal is a low-cost, self-contained alphanumeric display terminal. It's a business tool that puts all the power and speed of a computer at your fingertips, on site or at a remote station. It is fast, accurate, and boasts many features usually found only in more expensive cathode-ray tube units. Anyone who types can quickly learn to operate the UNISCOPE 100 display

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

terminal. The keyboard has been designed for ease of operation and resembles a standard selectric typewriter. The UNISCOPE 100 gives you instant access to information that will help you to make decisions quickly and accurately. For functions, you can scan, compare, interrogate, edit, roll and scroll, all on your own personal Executive Information System network. An optional Sperry Univac communications output printer can deliver hard copy.

With the UNISCOPE 100, you are on-line to the computer, in real-time – for information you want. You can get up-to-the-minute picture of financial reports, competitive position, program milestones, inventory status, deliveries, and product development. In banking, insurance and informational industries the UNISCOPE 100 display terminal is invaluable for answering customer requests, centralizing records, monitoring and simplifying work flow and personnel deployment. It can offer immediate presentation of retail credit or inventory status, medical case histories and references. It makes your records a working tool that can be updated instantly.

4.4.5 SPERRY UNIVAC Universal Terminal System (UTS) 700

The UTS 700 is a low cost, powerful intelligent remote batch terminal system that uses large-scale integrated circuitry and MOS technology and has an operating system comparable to those found on large systems. Disk based, the UTS 700 operates both as a batch system or as a Remote Batch Terminal. An RPG II compiler, available with the system, allows the user to write freestanding programs. Emulators are provided which permit the UTS 700 to communicate with a host system as if it were the emulated terminal.

- Sales Strategy
 - Sell Sperry Univac as a total system vendor.
 - Sell the concept of distributed processing.
 - Sell as a solution of user's application requirements.
 - See features and benefits of UTS 700.
- Targeted Markets
 - Current Sperry Univac networks
 - Large IBM networks using 2780 or 3780 remote batch terminals.
 - Any prospect for a Sperry Univac mainframe requiring distributed processing capability.
- Area of uses for UTS 700
 - Any application function which a company would like to run at a remote company location such as a warehouse, sales office, job site or other plant.
 - Order Processing and Sales Analysis
 - Inventory Control
 - Payroll
 - Job Accounting
 - Financial Reporting

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

4.4.6 SPERRY UNIVAC Universal Terminal System (UTS) 400

The UTS 400 is a general purpose, programmable, microprocessor-based, remote display terminal designed to accommodate a wide range of applications requiring direct operator intervention. The UTS 400 can operate as an intelligent remote terminal station or as a cluster of stations. UTS 400 can be used for data entry, data processing, control and monitoring, conversational interaction and off-line operations.

A special-purpose model of the UTS 400 is the UTS 400 Text Editor. This terminal was designed for the Printing and Publishing Industry Applications.

- Sales Strategy
 - Sell Sperry Univac — leading supplier of total data processing systems.
 - Sell concept of distributed processing.
 - Sell the UTS 400 as solution to users applications problems.
 - Sell UTS 400 features and benefits.
 - Sell UTS 400 in proposals for "Total Systems".
- Target Markets
 - Expansions to current UNISCOPE networks.
 - Displacement for non Sperry Univac terminals on Sperry Univac mainframes.
 - Prospects for SPERRY UNIVAC host systems with distributed processor requirements.
- UTS 400 Applications
 - Order Entry
 - Data Entry
 - Inventory Control
 - Software Development
 - Text File Maintenance

4.5 SPERRY UNIVAC PAPER PERIPHERALS

The following paper peripherals now available on current 1100 Series Systems will also be available on the 1100/80 Systems. Together with the Console and Maintenance Processor, these paper peripherals can be connected to the Byte Channel up to a maximum of 128 units.

The simplicity of these units reflects a design approach by Sperry Univac that will assure consistent and reliable performance.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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4.5.1 Printer Family Subsystems (0770)

- 0770 Printer Subsystem is a family of printers with members to fit your operational and financial needs.
- three print-rate choices are available; rates of 800, 1400, or 2000 lines per minute in reliable, easily interchangeable print cartridges.
- more than 20 standard print cartridges are available in up to four print fonts – from the Scandinavian “nationals” to the Japanese Katakana.
- in addition to the standard 132 print position, an optional 160 print-position feature is available with either 6 or 8 line per inch spacing.
- controls are simple, convenient and “up-front” to provide quick set-up.

Printer Subsystem (0776)

- Superior Price/Performance
- Strong Mid-range Performance
- “Proven-in-use” Band Technology
- Excellent “Second” Low Priced Printer
- 750 and 900 LPM
- Excellent Print Quality
- Reduced Floor Space
- Ease of Operation
- 0770 Compatible Print Bands

PRICE/PERFORMANCE

PRINTER	PRINT RATE	PRINT POSITIONS	MONTHLY RENTAL	PRICE/ PERFORMANCE*
0776-00	760 LPM	136	\$1,080	1.42
0776-02	940 LPM	136	\$1,230	1.31
0770-00	800 LPM	132	\$1,465	1.83
0770-02	1400 LPM	132	\$1,723	1.23
0770-04	2000 LPM	132	\$2,456	1.22

*PRICE/PERFORMANCE = MONTHLY RENTAL ÷ PRINT RATE (\$/LPM)
PRINT RATE BASED ON 48 CHARACTER SET.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

4.5.2 Card Reader Subsystem (0716)

- self-contained control unit and synchronizer that regulates the flow of data and control signals to and from the reader.
- reader operates at a speed of 1000 cards per minute and has a standard read-check feature.
- information read from the card is transferred to the processor in either image mode or translate mode, which includes EBCDIC, ASCII, or compressed code.

4.5.3 Card Punch Subsystem (0604)

- card punch operates at a rate of 250 cards per minute, punching on a row-by-row basis.
- standard feature allows you to punch the cards in either punched card code or main-storage-image code images.
- self-contained control unit and a synchronizer which regulates the flow of data and control signals to and from the punch.
- the read/punch optional feature allows prepunched cards to be sensed and read into the punch buffer from a prepunch station.

4.5.4 Paper Tape Subsystem (0920)

- Self-contained Control Unit
- Simultaneity of Read/Punch Operations
- Spooling Feature for Tape Reader and Tape Punch
- Accepts 5, 6, 7, or 8 Level Paper Tape Codes

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

5 1100 SERIES MARKETS

5.1 INTRODUCTION

The SPERRY UNIVAC 1100 Series, 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 1100 Series has been very successful in both the pure scientific and pure business environments. Because of its strength in both of these major areas, the 1100 Series is uniquely suited for today's marketplace which typically requires both 'number crunching' and 'data processing' applications on the same system. Extensive time sharing, remote job entry and communications capabilities combine with the above to make the 1100 Series an excellent choice for any environment.

Software products such as DMS, TIP, QLP/QRW, and RPS are important features of the 1100 Series 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 1100 Series Sales can be grouped into four general markets. These are Sperry Univac equipment upgrades, competitive replacement, new applications, and consolidation. We will discuss each of these areas in some detail. Section 6 addresses specific opportunities in the various industry segments.

5.2 SPERRY UNIVAC UPGRADES

The SPERRY UNIVAC 1100 Series 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. During FY'75, FY'76, and the first half of FY'77, approximately one third of the 1100 Systems booked went to existing Sperry Univac customers. Although there are no predefined growth paths which fit all situations, some general situations can be discussed.

5.2.1 1106 Upgrades

Generally the next step for an 1106 user would be to a 1100/41 or 1100/42. This affords a substantial increase in power (2 to 5 times the compute power of an 1106 UP), and a long range growth path without further processor replacement. Although the 1100/40 is the most likely upgrade for an 1106, do not ignore the possibility of an 1100/12, 1100/21, 1100/22, or even an 1100/81 as the most effective upgrade for your customer's particular situation.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

5.2.2 1108 Upgrades

There are approximately 300 1108's currently at customer sites worldwide. Of these, approximately 250 are purchased and most 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 (2.5 to 4.5 times the compute power of an 1108 UP), long range growth potential, and state of the art technology.

5.2.3 1110 Upgrades

1110 users will generally be better served by moving up to the 1100/40 and continued expansion in that series. Where 524K of high speed storage is insufficient to meet their needs, the 1100/80 is called for.

5.2.4 1100/40 Upgrades

Most 1100/40 users still have considerable growth potential within the series. Expansion to an 1100/44 with 524K of main storage will provide them with approximately the same compute power (MIPS) as an 1100/82 with 16K of Buffer storage. Unless storage capacity or physical space requirements are a problem, the 1100/40 is still an effective tool for them.

5.2.5 494 Series Upgrades

It is Sperry Univac's strategy to migrate 494 users to the 1100 Series when they require additional power or capabilities. While it is expected that most 494 Series users will upgrade to either an 1100/42 or 1100/81, many factors (such as throughput and redundancy requirements) must be considered, and the entire 1100 Series could be considered viable replacements for the 494 Series.

5.3 COMPETITIVE REPLACEMENT

Opportunities abound for replacing competitive systems with the 1100 Series. Replacement efforts in the low end of the line are more generally successful, but carefully selected high end situations should not be ignored. Situations like:

- A large user who has decided that extensive re-systemization is a necessity to continue growth.
- A user who knows that major new functions or applications are going to be incorporated on his next system.
- The emphasis of a user's system is changing from batch to time sharing or transaction processing.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

- The prospect is dissatisfied with, or unsure of the future of his current vendor.
- The prospect desires features or software that is not available on his current system.

In FY75, only 10% of the 1100 Systems sold involved competitive replacement. During FY76 and the first half of FY77, 34% of 1100 sales replaced competitors' equipment. This trend demonstrates the competitiveness of the 1100 Series and the ability of Sperry Univac to support successful conversions.

5.4 NEW APPLICATIONS

New application areas are continuously arising in large corporations and institutions. Changing technologies, new services, mergers, acquisitions and many other reasons are responsible for the need for new applications. The greatest chance for a successful sale will come from new applications which are controlled by independent organizational structures, such as a division profit center. The decision makers in these organizations are not tied tightly to other divisions or departments which might have a strong influence on the decision.

We have seen successes with the new applications approach. Once we have an 1100 system "in-the-door", growth to other parts of the organization comes quickly because of the excellent performance of the 1100 and the respectability it gains.

Also, smaller companies which are just beginning to computerize their business, or are using Service Bureaus to process their applications, can be a fruitful area for a small system sales effort. Here, you have outstanding software such as DMS, QLP/QRW, RPS, and UNIS to offer your prospect.

The new applications/new user market has been a very lucrative one for the 1100 Series, accounting for about 40% of our bookings from FY'75 thru the first half of FY'77. It has been estimated that less than 5% of the possible applications for computer systems have currently been implemented. New opportunities are constantly being created and the 1100 Series has a proven record of success in this marketplace.

5.5 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. The standardization achieved also facilitates the transferability of systems, programs, and personnel.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

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

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.

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

Contributing to the growth of centralized systems has been the move to data base oriented applications. A recent survey showed that about one-third of the large users in the Fortune 1000 (the top 1000 firms listed annually by Fortune Magazine) are engaged in data base activity. DMS and QLP, as well as TIP and CMS make Sperry Univac extremely competitive in these situations. The same survey also showed that the move to centralized data base management has also begun in the medium sized firms, with one out of ten firms already committed.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

7 PROSPECT QUALIFICATION

7.1 INTRODUCTION

The medium and large scale computer system marketplace is highly competitive. The 1100 Series System competes with the IBM 370/135, 138, 145, 148, 158, 158 MP, 168 and 168 MP as well as with new medium and large scale computer systems introduced by Honeywell, Burroughs, Control Data, Digital Equipment, ICL, Unidata and Facom-Hitac.

The Sperry Univac philosophy toward the design and implementation of the 1100 Series System has been to provide a price-performance competitive product. However, an important criterion is that the design must be able to meet the changing data processing needs of the user while providing investment protection for both hardware and applications software.

The market opportunities for the 1100 Series System are found because a user has the following:

1. The need to introduce data processing or expand his existing EDP functions due to a dynamic business environment; and/or
2. The need to remove the constraints in his present hardware/software system.

In a most general sense, a user, with a requirement for change, looks toward a computer system which:

- Allows consolidation of medium scale machines into a central system with on-line capability.
- Provide for more reliable hardware and fast direct access devices for data-bases.
- Must be able to concurrently handle both local and remote batch time-sharing and real-time applications. The user wishes to serve as many applications as possible in his consolidation effort.
- Has a viable Data Base Management System for handling centralized on-line files.

The functional richness in the 1100 Series System gives you, the sales representative, the tools to address the real EDP needs of your customers and prospects.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

Key to selling the 1100 Series System is that you, as a Sales Representative, must:

1. Identify your customer/prospect's needs and their priorities;
2. Customize your responses to these needs. Sell the benefits of your solution to your customer/prospect;
3. Sell yourself, develop rapport with the prospect, use your management team, call on the EDP department users in your customer/prospect's organization;
4. Reference other SPERRY UNIVAC 1100 Series success stories.

How do you know if your prospect is an 1100 Series prospect? Obviously, sound financial, operational, and even psychological reasons must provide the basis for user to consider change — even if its to a larger Sperry Univac System.

The next section presents questions to assist you in determining whether or not your prospect is an 1100 prospect. The goal is to develop a means of evaluating an 1100 prospect so that you can rank your opportunities for success and act accordingly.

7.2 COMMON 1100 PROSPECT CHARACTERISTICS

The following fifteen questions are suggested to assist the sales representative in determining whether or not your prospect is an 1100 prospect. These questions should aid you in determining what product can provide the best solution for your prospects' requirements in your competitive situation. These questions do not obviate the need for proper sizing of your customer's requirements.

Question number 1 is really the only question that requires a positive answer for putting your prospect in the 1100 category. Positive or 1100 oriented answers to questions 2 through 10 are extremely strong indications that you should be bidding an 1100 Series System. Positive or 1100 oriented answers to questions 11 through 16 are also good 1100 indicators but would only be used as additional qualification after answering questions 2 through 10.

1. IS YOUR PROSPECT IN THE 1100 PRICE RANGE?

There are at least 3 ways to determine if your prospect can afford an 1100 System. The first of the following 3 ways is the easiest:

- (a) Ask him what his D.P. budget is! How much is he spending on hardware, software, communications, etc.
- (b) Do some homework to determine roughly how much he is spending or should be spending. For example, generally most industries are spending between 35% to 50% of their EDP budget on hardware. In addition, you can usually find information that will tell you what percent of a specific industry's sales volume is spent on

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

EDP. As an example, a diversified manufacturing industry company spends about 1.75 to 2.1% of sales dollars on EDP. Therefore, a diversified manufacturing company with a sales volume of \$50 million would be spending \$875,000 to \$1,050,000 annually on EDP. 35% to 50% of the total EDP figure would then bring their hardware costs into the range of \$306,000 to \$525,000 annually or \$35,000 to \$44,000 per month — definitely in the 1100 price range. A similar comparison may be made for State and Local Governments. From 1.0 to 2.5% of the fiscal budget is spent on EDP. This percentage varies with the size of municipality and the need and level of EDP services.

- (c) If he is currently underspending (relative to the rest of his industry) or his budget is not quite in the 1100 ballpark, can you justify additional expenditures for an 1100 via cost savings with new methods, new applications, and/or services?

It is important to note that ownership of a system or peripheral may pose a financial barrier to replacement. Accounts that have purchased their equipment within the past several years will be reluctant to sell their system in the used computer market. For example, computer systems of the 360 vintage are probably fully depreciated, where 370 systems are probably not. Hence, a 360 user is potentially a better prospect.

A word of caution should also be voiced for users with systems or peripherals under long-term lease.

It is important for you, as a sales representative, to determine the price range under consideration and the type of financial arrangement.

2. DOES HE HAVE A CURRENT OR FUTURE NEED FOR MULTIPROCESSING?

Companies with critical applications and fail-safe/soft requirements are naturals for the 1100 Series MP capability. Every system in the 1100 Family can be a multiprocessor. The 1100 family has years of experience with multiprocessors — since 1965!

3. DOES YOUR PROSPECT HAVE OR NEED A MULTIMODE ENVIRONMENT?

The 1100 Series System hardware and software has been designed to process real-time, timesharing and batch applications under one environment and under one operating system. The multimode capability is a standard feature on all of the 1100 Series Systems.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

4. WHAT KIND OF SYSTEM IS TO BE REPLACED?

The kind of system that is to be replaced will tell you a lot about the kind of capabilities and the kind of throughput power your prospect requires. For instance, if your prospect presently has a 370/145 processor or larger, the 1100 family offers a viable replacement alternative. Even the 1100/11, the smallest member of the 1100 family, is rated higher in performance.

5. WHO IS YOUR COMPETITION?

Although the system that you bid depends upon an accurate analysis and sizing of your customer's requirements, a decision to bid the 1100 can be heavily influenced by your competition.

If Honeywell, Burroughs and/or DEC are bidding medium scale systems, the odds are that you should be bidding an 1100 system. All of these vendors have multiprocessing capability at the medium scale level which could put you at a severe disadvantage if you do not bid the 1100 Series. Even if initial requirements are only for a unit processor, the psychological effect of having growth capability via multiprocessing can be tough to sell around. Selling the 1100 in these situations is your only viable alternative. In addition, Burroughs and Honeywell especially are noted for their flexible pricing via repackaged, renumbered older equipment or special discounts.

6. IS THERE A CURRENT OR FUTURE REQUIREMENT FOR A LARGE AMOUNT OF COMMUNICATIONS?

The 1100 Series product line provides the GCS (General Communications Subsystem) and the DCP for meeting small and large communications requirements. Each GCS provides the capability to terminate up to 32 half or full duplex lines at varying data rates from 45.45 to 50,000 bits per second with a total device throughput of 250,000 characters per second. Although multiple GCS's can be configured on each 1100 system, the DCP provides better price performance for large communication networks. The 1100 series continues to be a very strong competitor in pure and heavy communications environments. Worldwide the average number of terminal per 1100 system is over 100 which further proves the communications strengths of the 1100 systems.

7. WHAT ARE THE CONVERSION REQUIREMENTS?

Your prospect's conversion requirements will also help you determine whether or not he is an 1100 Series System prospect. Installation involvement in a major conversion, a commitment to vendor software, and/or recently announced peripherals pose operational barriers to replacement. For example, if the user has a very large library of programs and data files and is planning a 1 for 1 conversion of all or a major part of his existing applications, such system changes for the

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

purpose of achieving cost savings or increased throughput may not be sufficient to warrant conversion. Chances are that this is not a good 1100 prospect since there is no real justification for going through a major conversion.

If, on the other hand, the user is planning a well balanced mixture of resystemization and 1 for 1 conversion with a long range plan for total resystemization, then this user can be considered a good 1100 Series System prospect. *By far, the best opportunity lies where the user is planning extensive new applications, reprogramming, or system changes.*

8. IS THERE A LARGE SCIENTIFIC REQUIREMENT?

The 1100 Series product line is equally proficient in a scientific and/or commercial processing environment. It is not unusual to find 1100 Systems in pure "number crunching" environments. The 1100 Series has an excellent reputation in the scientific community. There are many good 1100 Series reference accounts which you can point to if your prospect has scientific processing requirements.

9. WILL A BENCHMARK OR DEMONSTRATION BE REQUIRED?

Always try to avoid a benchmark where possible. They are expensive, require a lot of resources and in many cases are not a true measure of the system's capabilities. However, if a benchmark or demonstration is in your prospect's plans, try to find out specifically what he has in mind as early as possible. This requirement could significantly effect the product that you will bid. Demonstration or benchmarking of software capabilities which are recently announced should be carefully considered.

10. WHAT IS THE SIZE OF THE PROSPECT'S DP STAFF?

The smallest 1100 Series will require a staff to properly support and maintain the system. If your prospect does not now have an adequate staff or is not willing to staff his D.P. department properly you probably do not have a good 1100 prospect. Your system-analyst manager can estimate the staffing required for your prospect based on the projected use of the 1100 System.

11. IS TOP MANAGEMENT RECEPTIVE TO CHANGE?

By far the most promising indicator is the receptiveness of senior management to change vendors on the ground of cost-effectiveness or, in a very large organization, the advantages of introducing a second-source supplier. It is obviously helpful if support is forthcoming at the EDP management level and this is more likely if senior management interest can be cultivated at an early stage. At higher levels of management a

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

particular opportunity may result from appointment of a new individual, anxious to "make his mark". It is important for you to know the decision process, the decision makers and the politics involved in making the selection for the 1100. *The influence of an EDP manager may be such that, if he remains hostile even after senior management has expressed interest, no real opportunity may exist.*

12. WHAT KIND OF INDUSTRY IS YOUR PROSPECT IN?

There are nearly 800 1100 Series Systems installed worldwide today representing nearly all major industries. With this kind of success you can usually find several reference accounts for the industry that your prospect is in. The 1100 Series is particularly strong in the Education, Manufacturing, Communications, State and Local Government, Energy, Distribution, Public Utilities, and Service Center Industries.

13. IS YOUR PROSPECT PLANNING TO CENTRALIZE OR CONSOLIDATE HIS EDP OPERATIONS?

There may be many reasons for centralizing or consolidating his EDP facilities including the need for better customer service, cost reduction and better reflection of the company's organization. This kind of move however, usually means the need for a multimode environment. The multi environment is a key strength of the 1100. Centralization was a characteristic of many of our 1100 users as early as 1965. Because Exec 8, the original version of today's 1100 OS, was designed for a multimode environment.

In addition, a consolidation may mean installation of a multiprocessor, with the prime consideration being backup achieved through redundancy, or the ability to at least run a user's applications during any given processor outage.

14. IS YOUR PROSPECT'S REQUIREMENT A WHOLE NEW APPLICATION AREA?

The 1100 Series has had tremendous success where justification for the system has been in a new application area. The 1100 offers excellent programming languages and development tools, and has mature, stable software which has been proven in over 6 billion hours of actual customer use. A prospect who is about to embark on a large development effort does not want to contend with problems and instability of the vendors software in addition to debugging his own application programs. Another beneficial aspect of the new application situation is that the prospect cannot raise a real or imaginary obstacle relative to conversion since no conversion is required. The products and financial plans you can offer will stand up to the best the competition can provide.

DOCUMENT NO	TITLE	PAGE REV.	PAGE
-------------	-------	-----------	------

A procurement situation which is based primarily, or entirely, upon a new application should be aggressively pursued. New applications should be judged on the basis of return on investment. The quicker the return, the better the opportunity.

15. IS THE PROSPECT'S DATA PROCESSING RESPONSIBILITY GROWING IN SCOPE AND/OR VOLUME?

The 1100 Series family is unparalleled in the industry for growth capability. The good 1100 Series prospect's data processing operation will be growing in either scope or volume or perhaps both. In many instances, a single installation may be enlarging as a result of a consolidation of divergent data processing facilities.

A growth in scope usually accompanies an expansion into new types of business or the automation of current procedures. This user is planning to place new applications on the computer system which will probably involve communications, data base, transaction processing, or some form of extending the use of the computer system to more members of the organization. What does the five year plan of the EDP department look like? Is it in step with the company's growth plans?

The user with a different set of requirements is one who expects that the business will be doing basically the same thing tomorrow as it is doing today, but substantially more of it. This type of user may feel that the current software is capable of handling the increased volume of work and all that is needed is additional or more powerful hardware. In reality, however, it might be a simple matter to show this user that, not only will the current software restrict him technologically, but that processing a greater volume of work under the current procedures might not be very beneficial to him now, or in the future, as volume continues to grow. Since application development and operational procedures had been designed around a much smaller workload, considerable redesign and/or conversion of existing applications might be required if the system drawbacks are recognized.

Growth oriented organizations are naturals for the 1100 Series System.

16. IS THERE A POTENTIAL FOR ADDITIONAL BUSINESS IN REPLACING COMPETITIVE SYSTEMS IN OTHER PARTS OF THE CORPORATION BEYOND YOUR INITIAL TARGET?

Assume that you sell and install an initial system to a prospect who is a department, division, or subsidiary of a larger corporation. The reputation gained by your initial installation will spread rapidly throughout the corporation and will provide you with the best leverage possible for getting into other departments and divisions to replace other systems.

You can use your initial system for a reference account!

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

With the broad range of performance and capabilities of the 1100 Series, you can be assured that you will have a compatible product in the same product line to replace any medium to large scale system you encounter in a large corporation or governmental structure.

A careful analysis of realistic responses to each of these questions should provide a baseline for evaluating your potential opportunity for success in making this prospect an 1100 Series customer.

7.3 DETERMINING WHAT 1100 SERIES SYSTEM TO PROPOSE

At least two factors help determine what 1100 Series System you should propose:

1. An accurate analysis and sizing of your prospect's requirements — both current and projected.

It is important to determine the number of application systems, frequency, and volumes (number of transactions) on both your prospect's current system(s) and his projected workload. If your prospect is not capable of sizing his new applications, use your pre-sale system analyst support to assist the prospect. The more accurate the definition of the prospect's requirements, the better your opportunity for success. The 1100 Series System cost to performance ratio is the best in the computer industry.

2. What is your competition bidding?

Section 9, Competition, of this manual will give you a good indication for what competition should be proposing and your competitor's strategy in addressing your prospect. Ask your prospect what your competition is for his business! Your rapport with your prospect is most important. If your prospect has confidence in you, in your solution to his requirements, and in your company, the sale is almost assured.

It is a fact of life that many vendors will "low ball" a bid by proposing a system that will not (well, maybe just barely), meet the prospect's requirements. The attempt is to obtain the business on the basis of cost alone. Your rapport with your prospect and an accurate analysis of the projected workload is most important so that you may caution your prospect of your competitor's tactics.

In your response to the bid, you might propose multiple configuration — an entry level through an expansion system.

For example, if the growth requirement is for an 1100/22, your entry level might be an 1100/11 system.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

Make sure your prospect evaluates total costs (hardware, software, and support) over the term of the planned installation. Help your prospect justify your solution.

IF YOU ARE NOT WORKING CLOSELY WITH YOUR PROSPECT,
YOU CAN BE ASSURED THAT YOUR COMPETITOR IS!

7.4 SUMMARY

The objective of this section is to present a way of developing a baseline for evaluating potential 1100 Series prospects. You can rank the probability of closing a prospect(s) and prioritize your time and marketing efforts accordingly.

However, the underlying key to success is *you* — that is, your ability to win the confidence of a prospect and sell your solution to his problems.

SELL yourself, SELL solutions, SELL benefits, SELL SPERRY UNIVAC to your customers and prospects. SUCCESS will beat a path to your door!

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

8 SELLING SOLUTIONS

Your prospect for an 1100 Series System will be an experienced, technically knowledgeable computer user, and usually 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.

8.1 RETURN ON INVESTMENT (ROI)

Furthermore, 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 only be weighed against other EDP proposals, but non — EDP investment alternatives as well!

Other problems may be more readily addressed, but you must consider the ROI question as Problem Number 1. Developing a quality ROI argument is not easy. 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 1100 Series allow exceptional scope for ROI related solutions. You will not put yourself at a disadvantage by pursuing them.

What sort of opportunities should you seek?

Solutions which will allow the prospect to run his business better, increase sales 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 inflation than a non-computerized one. Thus,

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

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.

Let us see how the 1100 Series Systems can help you provide these benefits. The following subsections deal with various aspects of the products in a general sense. Section 6, under the heading "Specific Industry Markets", deals with special characteristics and requirements of the major industries.

8.2 PROGRAM DEVELOPMENT

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.

Conversational Time Sharing (CTS 1100) provides all the facilities for programmers to enter, compile, and test programs using conversational terminals while the computer system is engaged in routine production. CTS on the 1100 Series System is one of the most comprehensive implementations available and has been field-proven on customer systems for several years.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

The major advantage of CTS 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 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 CTS 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. CTS also lends itself well to "blitzing" problem areas.

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

8.3 APPLICATIONS DEVELOPMENT

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, program or application development.

An outside consultant firm has stated, "RPS 1100 currently has sufficient capability to satisfy a vast majority of applications covering the gamut of industry sectors. It represents a forward step in the evolution of software products which enhance the competitive stance of the SPERRY UNIVAC 1100 Series."

The Remote Processing System (RPS 1100) is a general purpose data-management and file-processing system. It allows the user to build and manipulate private files, format reports, perform computations, cross footing, etc.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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The new user of RPS is presented with a "shopping list" or a multiple choice of functions. He is guided through these functions in a tutorial manner with the system providing a clearly defined menu of the options available. Thus RPS tends to be self-teaching.

Once a file is built, the user can browse through the file and eventually specify the printing of a report based on multiple selection criteria. He can perform such functions as build files, send messages, match records, sort, print and format reports.

Complete applications, of suitable types, can be created by knowledgeable RPS users by pre-store functions used through the Tutorial Processor.

The Query Language Processor (QLP 1100) is another interactive processor, providing the remote terminal user a means of directly accessing data — in this case the generalized DMS 1100 database. By using DMS 1100 to access the database, QLP takes advantage of the full flexibility of its data structures.

The user is allowed to correct mistakes by utilizing a rollback command which, in effect, undoes the last command.

At the simpler end of the problem spectrum, RPS 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 1100 Series' "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 time-sharing. 1100 Series users have found that our system supports both of these processing modes on the same mainframe excellently, as this eliminates any conversion problems. Thus, full support of batch remote batch, and time sharing 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, time sharing and realtime. The 1100 Series systems thrive on this variety of production execution.

Some of the most complex applications in existence today were developed on 1100 Series systems. This is largely due to the tools available for application development.

8.4 ON-LINE DATA BASE

Data is becoming a more and more valuable corporate resource. If there is anything that can bring the modern day corporation to a screeching 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.

There are a number of advantages to this approach.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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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 from 20% to 40% 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 1100 Series 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. *Univac's implementation has followed their specifications very closely.*

We, at Univac, feel that the CODASYL approach (that is, pulling together representatives from the user community and the computer industry to sit down and thrash out the functions and capabilities of data management) 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 RPS 1100 and QLP 1100. RPS is a screen image oriented "fill in the blanks" type interface into a user's private data base controlled by DMS 1100. QLP provides for the more traditional syntax driven entry into the integrated data base.

The Transaction Interface Package (TIP 1100) provides *ready-made communication support* to enable rapid development of on-line 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 queing. Programs may activate other programs through TIP or construct their own messages which would, in turn, be qued by TIP to activate other programs. This facilitates a modular approach to system design.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

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 terminal device. TIP user programs may operate in any MODE: batch, demand, or real time.

The on-line data base concept within the 1100 Series provided by DMS 1100, TIP 1100, QLP 1100 and RPS 1100 is collectively known as *Total Information Management System (TIMS)*.

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 TIMS is a small investment when compared to the benefits derived. You, as a marketer, can approach both the end user and data processing professional with a plan your competitors will find hard to match. Here are the key benefits of the TIMS on-line data base.

- 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 on-line 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 TIMS on-line data base is certainly the most solution-oriented package available. Your prospects will listen most attentively to a plan which includes the TIP, QLP, RPS and CODASYL based DMS 1100.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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9 COMPETITION

The Competition Section to the 1100 Sales Information Manual is organized according to various competitors. The following competitors are included:

<u>Subsection</u>	<u>Competitor</u>
9.1	IBM
9.2	Honeywell
9.3	Burroughs
9.4	DEC
9.5	CDC
9.6	Amdahl
9.7	NCR
9.8	ICL
9.9	Siemens
9.10	Fujitsu
9.11	Hitachi
9.12	Third Party

The information pertinent to each competitor is presented in condensed and updatable format. It is organized as follows:

9.X.1. Models that compete with 1100's; Benchmark results

Identification of the newest systems marketed by a given competitor that compete with SPERRY UNIVAC 1100 Series systems. Relative performance is estimated based on system specifications and benchmark experiences

9.X.2. Replacement Opportunities

A competitor's installed systems that afford replacement opportunities. Suspect qualification criteria.

9.X.3. Reasons Why Prospect Should Buy An 1100

Strengths and unique features and capabilities offered by 1100 Series Systems and Sperry Univac.

9.X.4. Hardware Specifications

Summary data and figures depicting more significant hardware capabilities. Multiprocessing capabilities are described. Cache implementations are compared.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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9.X.5. Software Specifications

Salient features of major system software products

9.X.6. Product Strategy

Synopsis of competitor's overall product strategy

9.X.7. Market Strategy

Synopsis of competitors overall market strategy

9.X.8. Contracts and Pricing

Available contracts and their salient features

9.X.9. Sample Configurations

Representative configurations with pricing

9.X.10. Customer List

List of accounts that have installed or ordered competitor's systems

Information will be expanded and revised and updates issued as major new competitive announcements occur.

It is important to realize that the information contained herein with regard to equipment or programs of another supplier was obtained from sources believed to be reliable. However, it should be borne in mind that the features, operation and prices may be changed from time to time. Misrepresentations or misleading statements regarding competitor's equipment or programs shall not be used to mislead the buyer or prospect.

A special subsection 9.0 is included for reference purposes. It contains summary features of SPERRY UNIVAC 1100 Series systems in the same tabular form as is used in the subsections for the various competitors. The following tables are provided:

- 9.0.4.1 1100 Series System Specifications
- 9.0.5.1 General Characteristics of 1100 OS
- 9.0.5.2 CTS
- 9.0.5.3 DMS/TIP

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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9.1 IBM SYSTEMS THAT COMPETE WITH 1100

Series	IBM Competition	Performance Estimates
1100/10	370/138 370/148 SD	1100/11 (with overlap) performance is roughly commensurate with 370/148 performance. 1100/11 (without overlap) should outperform 370/138. 370/148 is roughly 2 x 370/138. 370/138 may be proposed as "low ball" against 1100/11 with or without overlap. SD multiprocessing configurations may be proposed against an 1100/12, where availability and functionality and not performance are primary concerns.
1100/20	370/148 SD 370/158-3	1100/21 performance is superior to 370/148 performance but substantially less than 1100/158-3 performance. SD multiprocessing configurations may be proposed against an 1100/22. A tightly coupled 370/158-3, while it will outperform an 1100/22, is substantially higher priced. An 1100/22 should outperform a 370/158-3.
1100/40	370/158-3 MP 370/168-3	1100/41 (all primary) and 1100/42 performance are roughly commensurate with 370/158-3 and tightly-coupled 370/158-3 MP performance, respectively. 1100/43 performance is roughly commensurate with 370/168-3 performance.
1100/80	370/158-3 MP 370/168-3 AP, MP	1100/81 should outperform a 370/158-3 MP but fall substantially short of 370/168-3 performance. 370/168-3 is roughly 3 x 370/158-3. 1100/82 should substantially outperform a 370/168-3 but fall short of 370/168-3 AP or MP.

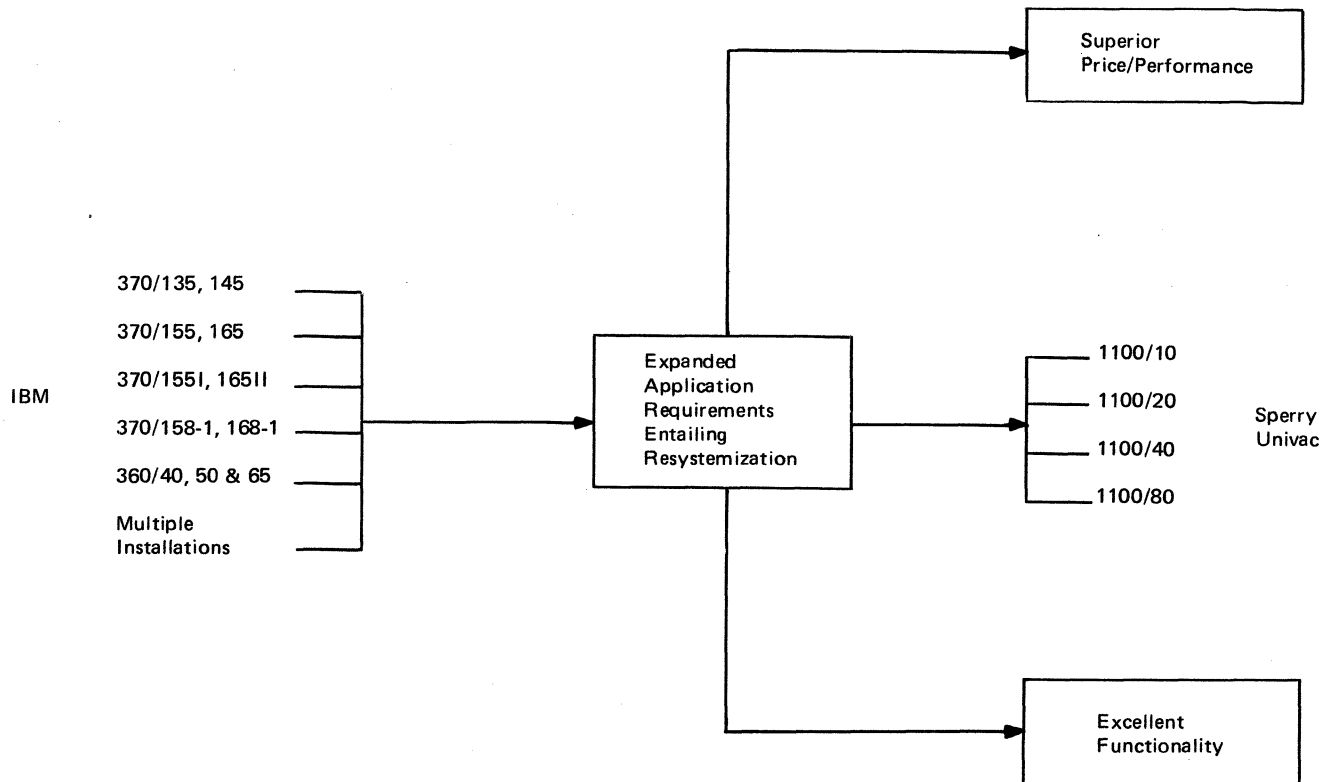
SD — Shared Disk

MP — Tightly Coupled

AP — Attached Processor

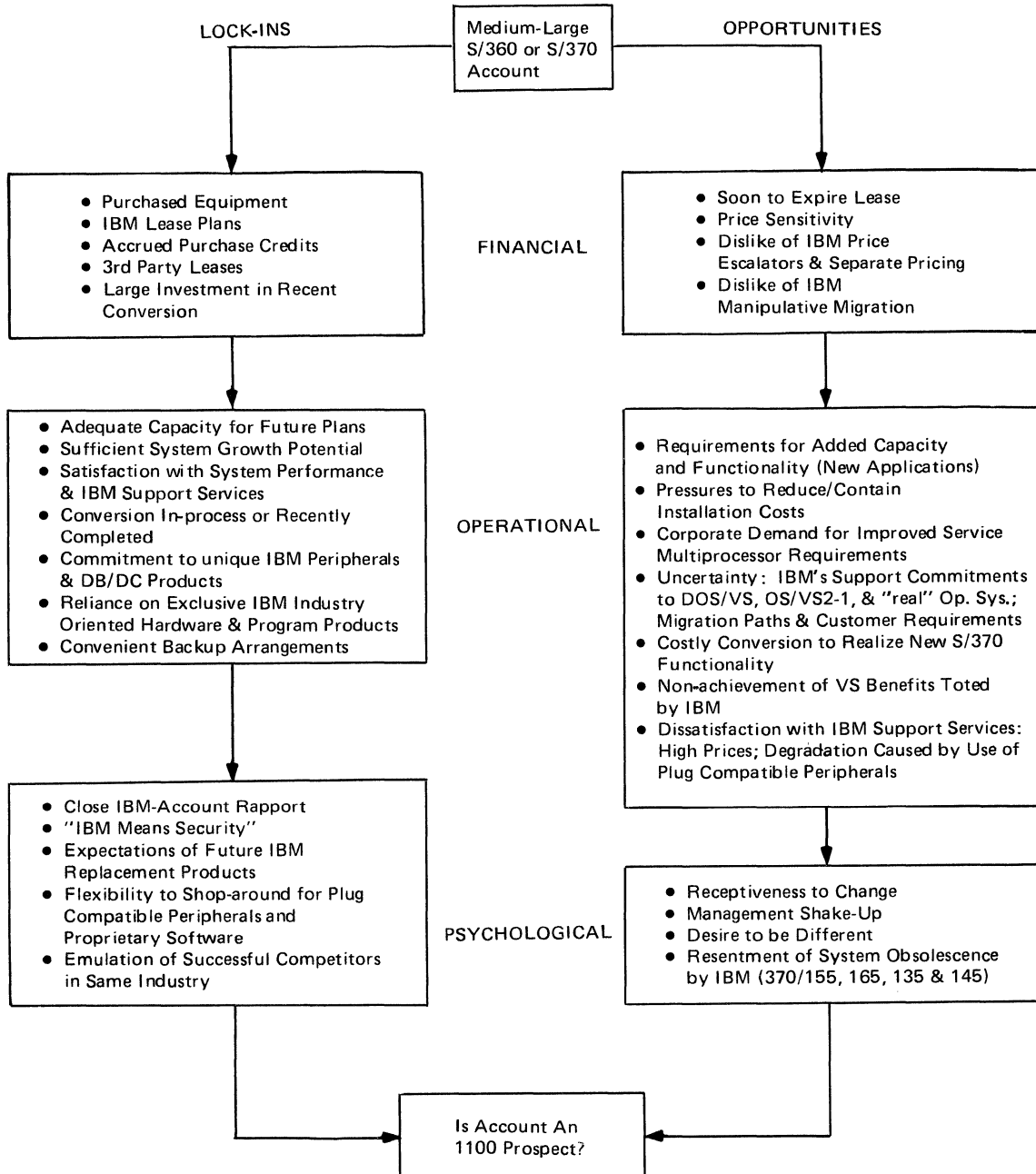
The above IBM S/370 models are marketed worldwide.

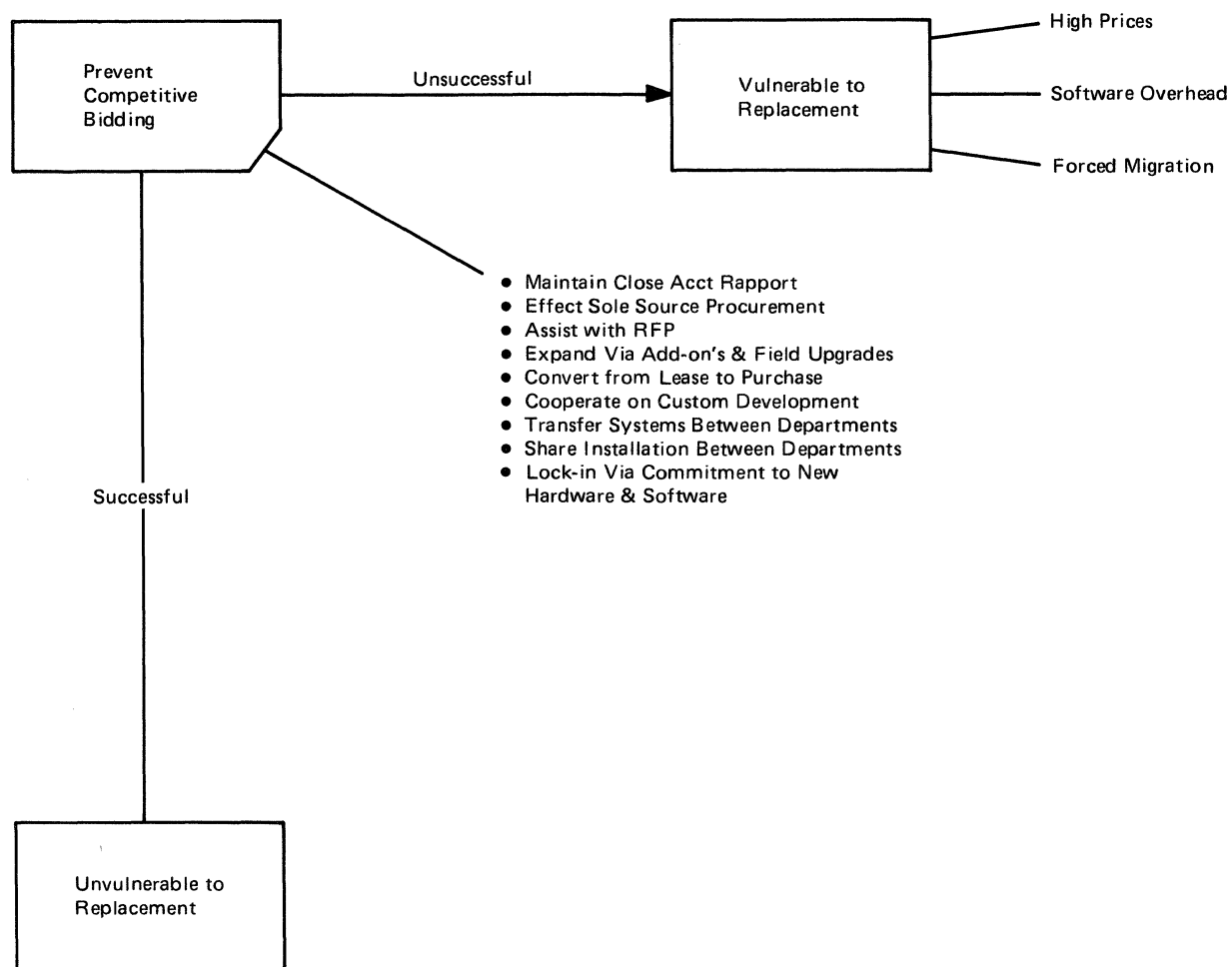
IBM Replacement Opportunities



IBM Replacement Opportunities

IBM Replacement Suspects



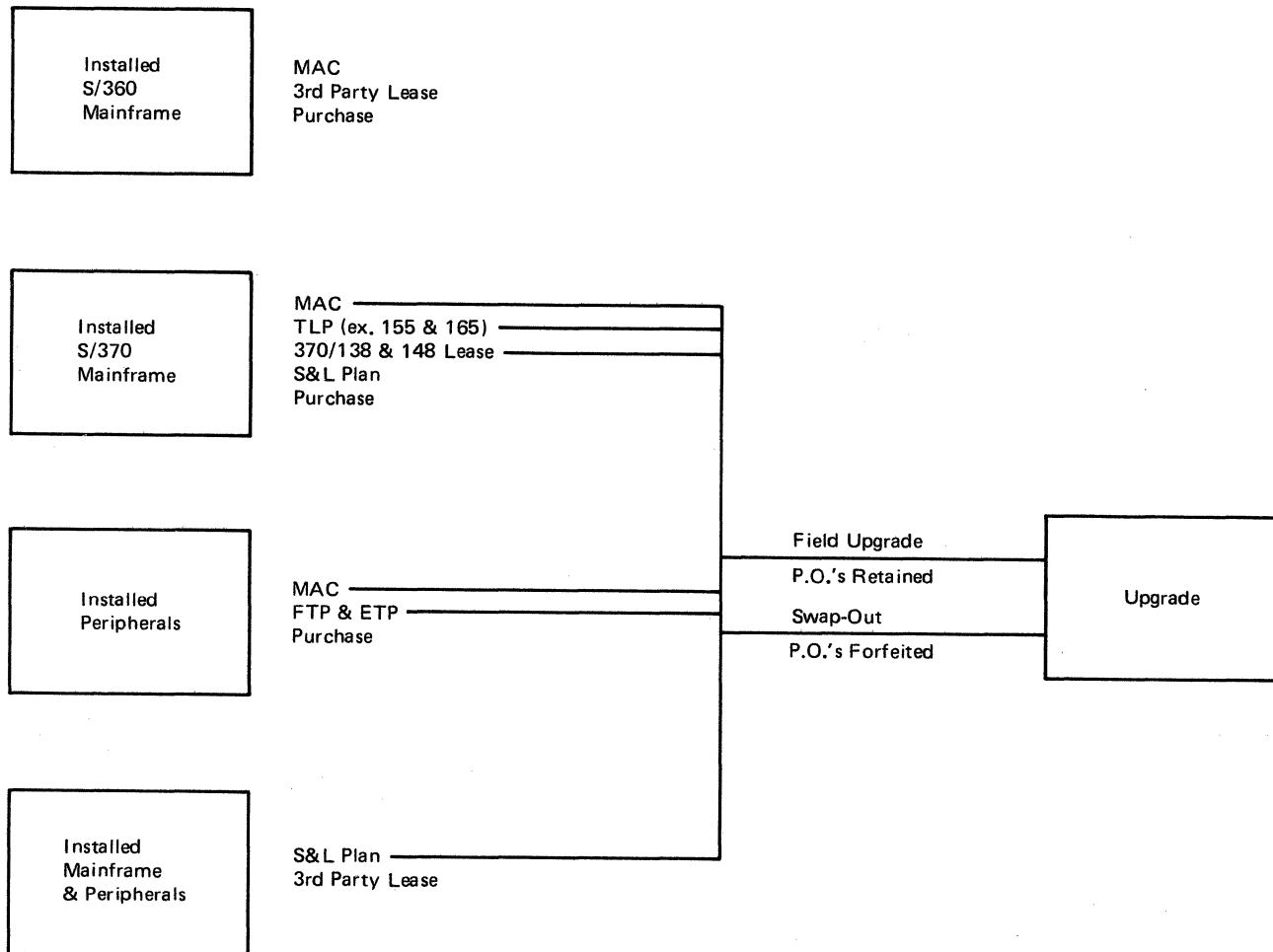
IBM Account Protection Strategy

**Way IBM Can Lower Price
In Competitive Bid**

- Conversion Advantage
- Proprietary Application Package
- Low Ball Via Virtual
- Liberal Maintenance Policy
- Purchase Option Policy
- High Residuals
- Special Support Concessions

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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**Purchase Option Accruals
A Financial Lock-In**



DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Why a prospect should buy an 1100/10 over an IBM 370/148

1. Low price threshold to tightly-coupled multiprocessing — the rapid expansion of communications based applications is causing many prospects to become conscious of system availability. IBM's price threshold to tightly coupled MP with the 370/158 is very high in contrast to that for the 1100/12. 370/148 shared disk MP is inferior to tightly coupled MP in terms of resource sharability, asynchronous program execution, and overhead (2-copies of operating system must be maintained).
2. Convenient modular growth potential — the 1100/10 presents more price/performance options than the 370/148, e.g. overlapped main store, 2nd CPU, and up to 524K words of main store. 370/148 configurability is relatively rigid. Whereas the 1100/10 user can upgrade all the way into the 1100/80 series without an operating system change, the IBM S/370 user may confront successive, inconvenient changes, e.g. DOS/VS → OS/VS1 → MVS, etc.
3. Hardware supported reentrancy — 1100/10 multibanking support offers an efficient mechanism for reentrancy, ensuring optimum main store utilization. No comparable mechanism exists in S/370 design; S/370 reentrant support is achieved via software devices.
4. Channel & device switching support — S/370 does not support SPI's, per se. All channel switching is performed programmatically. IBM disks are accessible and switchable on a string rather than individual basis.
5. 8405 disk — the 8405 when used as a backing store is a reasonably priced and practical high performance disk relative to IBM's 2305 and fixed area versions of the 3340/44/50. The 2305 is very expensive and generally too fast to configure with a 370/148. The fixed area versions of the 3340/44/50 offer fast access areas that are too small and insufficiently accessible for most applications.
6. 1100 OS — 1100 OS offers functionality commensurate with OS/MVS — functionality that is superior to that available with OS/VS1, the operating system IBM promotes for use with the 370/148. OS/MVS overhead generally prohibits its use with the 370/148.
7. CTS — Whereas CTS offers facilities for both on-line problem solving and program development, VSPC, a virtualized and performance-improved successor to TSO, provides only problem solving facilities. On-line program development requirements are currently served by TSO and VM/370. Both alternatives impart substantial overhead to system performance.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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8. DMS & TIP — outstanding program products that are easier to use and install and lower in overhead than their IBM counterparts, i.e., CICS/VS and IMS/VS. Sperry Univac salesmen tend to be unnecessarily defensive with regard to the overhead requirements of DMS and TIP. Look at the requirements for CICS/VS and IMS/VS.
9. Sympathetic migration policies — whereas Sperry Univac has continued to support 1100 systems that preceded the 1100/XX Series with the latest releases of 1100 OS and new peripherals, IBM, as part of its overall migration strategy, abruptly obsoleted systems such as the 370/135 and 145 and the 370/155 and 165. IBM customers who purchased these models have had their investments seriously comprised.
10. One price service — all 1100/10 programming aids, including compilers, applied software such as DMS and TIP, and some application packages are provided without additional charges. Sperry Univac's visible pricing policy enables customers to perform long-term budgetary planning with certainty and enables them to capitalize on a wide range of software support without incurring added charges.
11. Price protected 5-year lease — IBM's extended term leases have escalator clauses affording IBM options to raise prices during the term of a lease.

**Why a prospect should buy an 1100/20
over a 370/148 or 370/158-3**

1. Intermediate performance — the 1100/21 offers performance above the 370/148 and below the 370/158-3 — performance within the large price: performance gap that exists between the 370/148 and 370/158-3.
2. Low price threshold to tightly-coupled multiprocessing — the rapid expansion of communications based applications is causing many prospects to become conscious of system availability. IBM's price threshold to tightly coupled MP with the 370/158 is very high in contrast to that for the 1100/22. 370/148 shared disk MP is inferior to tightly coupled MP in terms of resource sharability, asynchronous program execution, and overhead (2-copies of operating system must be maintained).
3. Convenient modular growth potential — 1100/20 is expandable to a 1100/40 and 1100/80 without a change in operating systems. The IBM S/370 user may confront successive inconvenient changes, e.g. DOS/VS → OS/VS1 → MVS, etc.
4. Hardware supported reentrancy — 1100/20 multibanking support offers an efficient mechanism for reentrancy, ensuring optimum main store utilization. No comparable mechanism exists in S/370 design; S/370 reentrant support is achieved via software devices.
5. Channel & device switching support — S/370 does not support SPI's, per se. All channel switching is performed programmatically. IBM disks are accessible and switchable on a string rather than individual basis.
6. 8405 disk — the 8405 when used as a backing store is a reasonably priced and practical high performance disk relative to IBM's 2305 and fixed area versions of the 3340/44/50. The 2305 is very expensive and generally too fast to configure with a 370/148. The fixed area versions of the 3340/44/50 offer fast access areas that are too small and insufficiently accessible for most applications.
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PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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DOCUMENT NO	TITLE	PAGE REV.	PAGE
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**Why a prospect should buy an 1100/40
over a 370/158-3**

1. Convenient modular growth potential — 1100/40 supports more than two processors enabling orderly expansion without a mainframe swap-out
2. Hardware supported reentrancy — 1100/40 multibanking support offers an efficient mechanism for reentrancy, ensuring optimum main store utilization. No comparable mechanism exists in S/370 design; S/370 reentrant support is achieved via software devices.
3. Channel & device switching support — S/370 does not support SPI's, per se. All channel switching is performed programmatically. IBM disks are accessible and switchable on a string rather than individual basis.
4. 8405 disk — the 8405 when used as a backing store is a reasonably priced and practical high performance disk relative to IBM's 2305 and fixed area versions of the 3340/44/50. The 2305 is very expensive and generally too fast to configure with a 370/148. The fixed area versions of the 3340/44/50 offer fast access areas that are too small and insufficiently accessible for most applications.
5. 1100 OS — 1100 OS offers functionality commensurate with OS/MVS — the operating system IBM generally promotes for use with the 370/158-3.
6. CTS — Whereas CTS offers facilities for both on-line problem solving and program development, VSPC, a virtualized and performance-improved successor to TSO, provides only problem solving facilities. On-line program development requirements are currently served by TSO and VM/370. Both alternatives impart substantial overhead to system performance.
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PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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DOCUMENT NO	TITLE	PAGE REV	PAGE
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Why a Prospect Should Buy an 1100/80 Over an IBM 370/168

1. Superior price: performance — the 1100/81 and 1100/82 bracket the performance of the 370/168-3: the 1100/81 delivers less raw performance and the 1100/82 more. Mainframe prices are well below those of the 370/168-3; in most cases, they are below those of the 370/158-3. The 1100/81 fits in the price: performance gap that exists between the 370/158-3 and 370/168-3. The 370/168-3 is approximately three times as fast as a 370/158-3 and substantially more expensive.
2. Lower price threshold to very large scale multiprocessing — 1100/82 mainframe prices are less than 370/158-3MP prices. Performance is substantially superior: a 370/158-3 MP falls far short of a 370/168-3 but is higher priced. The high performance and low pricing of the 1100/82 should prove attractive to prospects with high availability requirements for real-time applications.
3. Superior cache implementation — the 1100/80 cache provides more storage capacity than the 370/168-3 cache (32KB); is designed for a higher hit % (> 95% versus 90-95%); and features a more efficient implementation. I/O results can be stored directly in cache without being stored first in main store. Redundant information storage is avoided because cache in the 1100/82 is implemented as a single entity sharable by multiple CPU's. Separate caches are not associated with different CPU's.
4. Hardware supported reentrancy — 1100/80 multibanking support offers an efficient mechanism for reentrancy, ensuring optimum main store utilization. No comparable mechanism exists in S/370 design; S/370 reentrant support is achieved via software devices.
5. Channel & device switching support — S/370 does not support SPI's, per se. All channel switching is performed programmatically. IBM disks are accessible and switchable on a string rather than individual basis.
6. 8405 disk — the 8405 when used as a backing store is a reasonably priced and practical high performance disk relative to IBM's 2305 and fixed area versions of the 3340/44/50. The 2305 is very expensive and generally too fast to configure with a 370/148. The fixed area versions of the 3340/44/50 offer fast access areas that are too small and insufficiently accessible for most applications.
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PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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12. Price protected 5-year lease — IBM's extended term leases have escalator clauses affording IBM options to raise prices during the term of a lease.
13. Air cooled — The 370/168 is water chilled. Customers incur high, one-time charges for plumbing.

IBM System Specifications

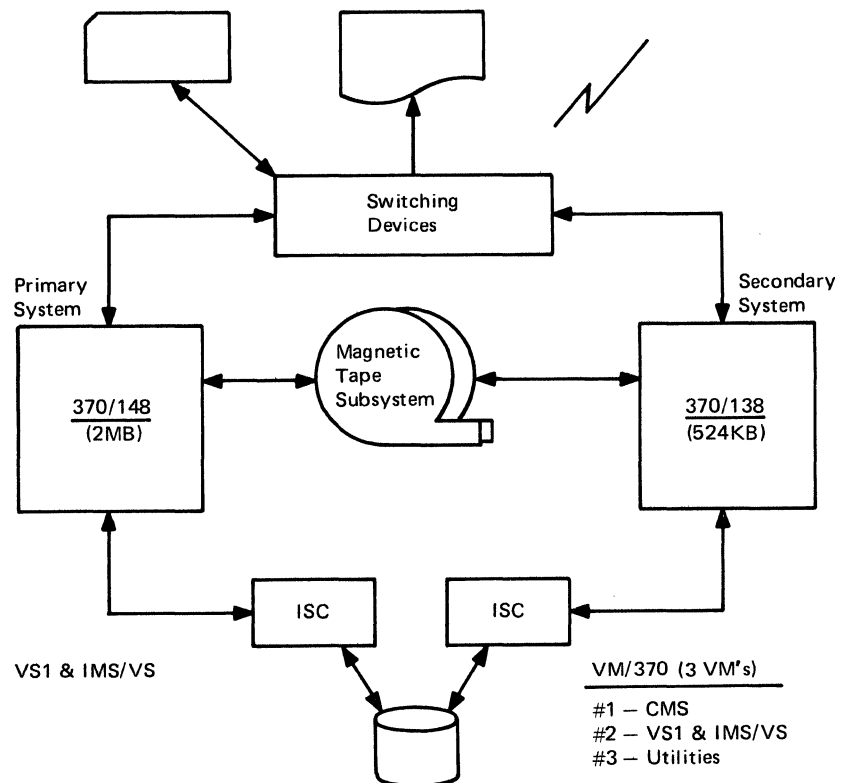
	370/138	370/148	370/158-3	370/168-3
PROCESSOR				
Cycle Time	275-1485 ns	180-270 ns	115 ns	80 ns
Instructions Type	General Purpose Variable Length	Same	General Purpose Variable Length	Same
Number Options	168 Standard	Same	168 Std or Non-Chargeable	Same
Control Memory Use	None	Same	None	High Speed Multiply
	• Instruction Microcode • Extended Ctrl Prog. • Support for OS/VS1 & VM/370 • Assists for APL, VSPC, etc. • Channel & Emulator Control	Same	• Instruction Microcode • VM/370, APL/SV Assists • Channel & Emulator Control	• Instruction Microcode • Channel & Emulator Control
Size	128 KB (expandable for integral disk support)	Same	72 KB (expandable for integral disk support)	33,7 KB (expandable for integral disk support)
Pipeline Design	No	Same	Yes	Same
Cache				
Type	Not Applicable	Same	Store-Through	
Size			16 KB	32 KB
Cycle Time			115 ns	80 ns
Hit %			90-95%	Same
Modes of Operation	Virtual-std Real-opt	Same	Virtual-Std Real-opt	Same
MAIN STORE				
Type	MOS	Same	MOS	Same
Self Correcting	Yes	Same	Yes	Same
Word Width	2 or 4 bytes	4 or 8 bytes	8 or 16 bytes	8
Read Time	715 ns for 2, 880 ns for 4	1035 ns for 8	1035 ns	480 ns
Write Time	935 ns	690 ns	690 ns	480 ns
Interleave	No	Same	No	4-way
Min Capacity	524 KB	1,048 KB	524 KB	1,048 KB
Max Capacity	1,048 KB	2,096 KB	4,194 KB	8,384 KB
Increments	524 KB	1,048 KB	524 KB & 1,040 KB	1,048 KB
RELATIVE MAINFRAME PERFORMANCE (EST)	1.0	2.0	4.0	9.2
INPUT/OUTPUT				
Design	Channels integrated into CPU & controlled programmatically via Control Store	Same	Channels integrated into CPU & controlled programmatically via Control Store	Same
No. of Channels	1 Byte Mpxr 2 Block Mpxrs	1 Byte Mpxr 4 Block Mpxrs	1-2 Byte Mpxrs 2-5 Block Mpxrs	Same 1-11 Block Mpxrs
Channel Data Rates	Byte Mpxr: 41 KB/s in Byte Mode & 149 KB/s in Burst Blk Mpxr: 1.3 MB/s	Byte Mpxr: 50 KB/s in Byte Mode & 180 KB/s in Burst Blk Mpxr: 1.85 KB/s	Byte Mpxr: up to 200 KB/s Blk Mpxr: 1.5 MB/s (3.0 with opt. fea.)	Byte Mpxr: up to 670 KB Blk Mpxr: 1.5 MB/s (3.0 with opt. fea.)
Aggregate Data Rate	2.4 MB/s	5.3 MB/s	—	16 MB/s
SYSTEM CONSOLE				
Type	1920 char CRT	Same	2000 char CRT with light pen	Combined system (CRT) & maintenance console
Options	66 cps hard-copy printer	Same	85 cps hard-copy printer	Same

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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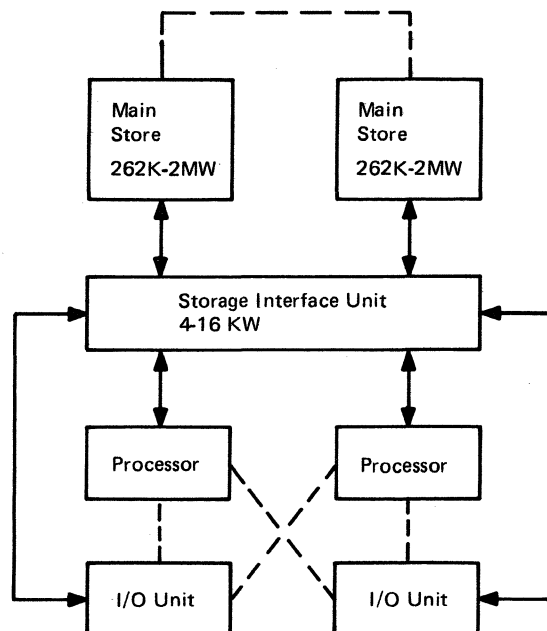
IBM S/370 Multiprocessing Capabilities

Multiprocessing Capability	Support		Features
	Systems	Software	
1. Shared Disk	370/138 370/148	OS/VS1, VM/370, ACP	Two separate mainframes (2-138's or 148's or 1-138 and 1-148) arranged to share common disk subsystem. May be proposed when availability requirements are stringent and 370/158MP pricing is prohibitive. One mainframe can run real time workload under OS/VS1 or Airlines Control Program (ACP) while other stands-by in backup mode and fulfills subordinate processing such as on-line program development and real-time environment testing under VM/370.
2. Shared MSS	370/138 370/148 370/158-3 370/168-3	OS/VS1, OS/SVS & MVS	Four uniprocessor systems or two MP system arranged to share a common 3850 Mass Storage System. May be proposed when multiple S/370 installation consolidation is desirable. 370/135, 145, 155II and 165II can also be arranged to share MSS along with newer S/370 models.
3. Loosely Coupled	370/138 370/148 370/158-3 370/168-3	OS/MVS	Up to eight systems, uniprocessor or MP models, attached via channel-to-channel interfaces to function as a single system under OS/MVS. Loosely coupled is extension of S/360 OS/HASP and ASP support.
4. Tightly Coupled	370/158-3 370/168-3	OS/MVS	Two processors arranged to share common main store in much the same fashion as 1100 Series multiprocessor implementation. Special MP processor versions are required and interconnected via a Multisystem Communications Unit. The processors can include the same (symmetric) or different (asymmetric) main store capacities. The second processor contributes 60-90% more performance. Both processors attach I/O. Hence either can continue to function should the other fail.
5. Attached Processor	370/168-3	OS/MVS	Two processors arranged to share common main store. The Attached Processor, however, does not support I/O. It contributes performance comparable to the 2nd processor in a tightly coupled configuration but cannot continue to function (no I/O) should the main processor fail. The Attached Processor is proposed when performance and price and not availability are main concerns. An Attached Processor is substantially lower priced than the 2nd processor in a tightly coupled configuration.
6. Telecommunications Control System/ Advanced Function (TCS/AF)	370/148 370/158-3 370/168-3	OS/VS1, SVS, & MVS	Multiple systems arranged to communicate with each other via TCS/AF supported communications links. Any terminal can access a data base resident on any system through any system. No need for "host" per se. Proposed for large-scale message switching; distributed data base, and load-leveling applications with stringent availability requirements.
7. Networking	S/370 3790 Terminals	OS/VS1, SVS, & MVS IMS/VS	IMS/VS will support distributed database networks. IBM is marketing and installing RPQ minicomputers for distributed network applications.

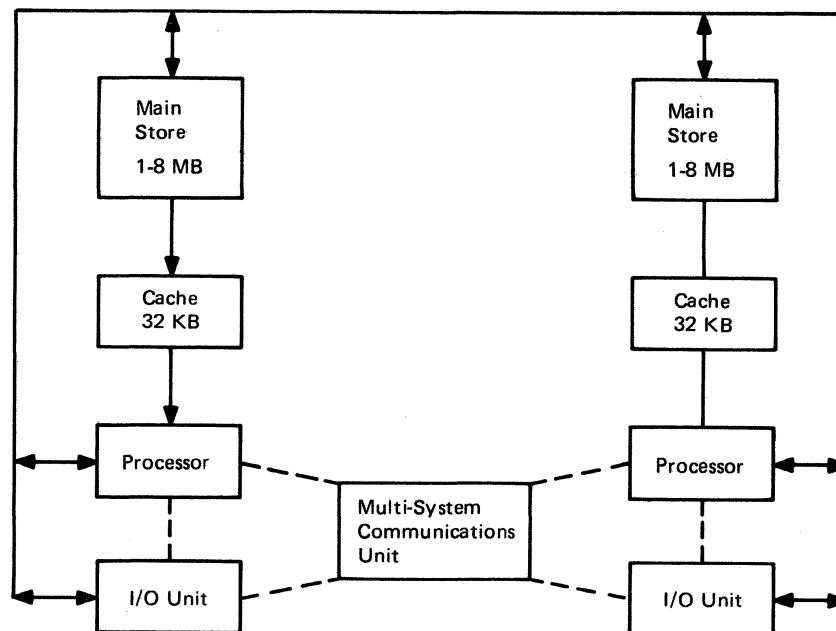
IBM "Shared Disk" Multiprocessing



1100/82 Cache Architecture



370/168-3 MP Cache Architecture



1100/82 Advantages

- Larger Capacity
- Higher Hit % Achievable (> 94-95% vs 90-95%)
- Non-Store-Through Design
 - Selected Data Input Stored Directly in SIU for Fast Retrieval by Processor
 - Frequently Used Data Can be Modified Directly in SIU
- No Redundant Information (SIU is Sharable by Processors)
- 4K SIU Module Can be Isolated and Remaining Modules Continued to be Shared

General Characteristics of IBM S/370 Operating Systems (Part 1 of 4)

	DOS/VS	OS/VS 1	SVS	MVS	VM/370
General					
Systems	370/115-158; 155II	370/135-168; 155 & 165II	370/145-168; 155 & 165II	370/145-168; 155 & 165II	370/135-168; 155 & 165II
Multiprocessing	No	Shared disk; shared 3850 MSS	Shared 3850 MSS	Loosely and tightly coupled	Shared disk
Min Viable System	65K	144KB (240KB recommended); 4 MB is maximum	384KB	768KB (1.5 – 2.0 MB recommended)	245KB
Status	Installed	Installed	Installed; new functions are being restricted to MVS in an effort to obsolete SVS	Installed; Rel 2 was unstable and poor performing; Rel 3.7 (2Q76) is improved	Installed; VM/370 like support may be integrated with MVS in future
Design					
Basic Design	Virtualized version of DOS written in BAL	Virtualized version of OS/MFT written in BAL	Virtualized version of OS/MVT written in BAL	New; written in PLS (PL/1 based); uses structured programming	Enhanced version of CP-67/CMS
VS Implementation	Single address space < 16 MB installation defined at SYSGEN and alterable at IPL; demand paging using 2 KB fixed pages; V = R option	Basically same as DOS/VS; Single Virtual Storage; Multiple Virtual Storages; features more function and OS/MFT compatibility	Single address space fixed at 16 MB; demand paging using 4 KB fixed pages; V = R option	Multiple address spaces < 16 MB; one/user and 3 for MVS dynamically assigned; demand paging using 4 KB fixed pages; V = R option	Virtual machine support; VM/370 monitor capable of multiprogramming DOS, DOS/VS, OS, and OS/VS as well as Conversational Monitor System (CMS)
CPU Hardware Assists	S/370 DAT and EC/BC Modes; channel indirect addressing; special instructions	Same as DOS/VS; Extended Control Program Support (ECPS) for 370/138 & 148	Same as DOS/VS	Same as DOS/VS	Same as DOS/VS; also VM/370 Assist Feature (microcode) for 370/135, 145 & 158; ECPS for 370/138 & 148
Objectives	Small-medium scale batch and transaction processing	Medium scale batch and transaction processing	Medium-large scale batch and transaction processing	Large-very large scale batch, transaction and interactive processing	Compatibility bridge for S/360 and backup conscious S/370 users

General Characteristics of IBM S/370 Operating Systems (Part 2 of 4)

	DOS/VS	OS/VS 1	SVS	MVS	VM/370
Supervisor Facilities					
No. of Initiators	1-5	1-16	1-64	1-1,024	Hierarchical execution environment
Data Management	VSAM	VSAM	VSAM	VSAM; Virtual I/O	Based on other operating systems
Nucleus (Min/Typical)	26-30 KB/45-55 KB	60 KB/130 KB	128 KB/384 KB	615 KB/800-1,000 KB	108 KB + 2 KB/virtual machine and requirements for operating system(s) run under VM/370
Job Entry Services Spooling	POWER/VS (consumes one initiator)	JES (also schedules) (consumes one initiator)	JES 2 (also schedules) (consumes one initiator)	JES 2 (also schedules); JES 3 (JES 2 + MP Support) (consumes one initiator)	Integral support (also VM/VS handshaking support)
Remote	RJE feature of POWER/ VS (support for 1-25 terminals)	RES feature of JES	JES 2 feature	JES 2 and JES 3	RSCS
Sizing	A 98 KB (minimum viable) system is required to run POWER/VS	JES included in nucleus; a 144 KB system can support single terminal under RES; 3704/5 support requires a 384 KB minimum viable system	JES 2 included in nucleus	JES 2 included in nucleus	Support included in VM/ 370 nucleus and Job Entry Service provided by operating systems run under VM/370
Data Communications Access Methods	VTAM for 3704/5; BTAM for ICAs on 370/115 & 125 (also CRJE option)	VTAM with or without TCAM (also CRJE option)	VTAM with or without TCAM	VTAM with or without TCAM; TCAM	OS/VS TCAM
Sizing	A 128 KB (minimum viable) system is required by VTAM	A 256 KB (minimum viable) system is required by VTAM	Supported on minimum viable system	Supported on minimum viable system	Supported on minimum viable system

General Characteristics of IBM S/370 Operating Systems (Part 3 of 4)

	DOS/VS	OS/VS 1	SVS	MVS	VM/370
Supervisor Facilities (continued)					
System Security	Passwords via VSAM	Passwords; Authorized Program Facility (APF)	Passwords; APF	Passwords; APF; Resource Access Control Facility (RACF)	Passwords; read-only for disk files; virtual machine design isolated machines
Diagnostic Aids	OLTEP, TOLTEP, and wide variety of other aids	OLTEP, TOLTEP, Generalized Trace Facility (GTF) and wide variety of other aids	More elaborate support than OS/VS 1; RETAIN/370	More elaborate support than OS/VS Ref 1	Simulated Hands-on Console Debugging; OLTEP and wide variety of other aids
Recovery Management	Recovery Management Support (RMS) and RMS Recording (RMSR), options for 370/115 & 125 and standard for larger models); checkpoint/restart (task level)	More elaborate support than DOS/VS	More elaborate support than OS/VS 1	More elaborate support than OS/VS 2 Ref 1; Failsoft support for MP configurations	Full RMS support; automatic retry of control program; console invoked facilities based on virtual machine design; VM/370 system can serve as back-up for other systems
Accounting	Via POWER/VS	System Management Facilities (SMF)	SMF	SMF; Measurement Facility (MF/1) - for performance tuning	Data collection and recording facility
Compatibility					
System/360	Upward compatibility with 360/370 DOS; DOS data management and data command facilities are supported; VSAM and VTAM are supersets of ISAM and BTAM; V = R option	Upward compatibility with 360 OS/MFT; MFT data management and data command facilities are supported; VSAM and VTAM are supersets of ISAM and BTAM; V = R option	Upward compatibility with 360 OS/MVT & MFT, MVT & MFT data management and data command facilities are supported; VSAM and VTAM are supersets of ISAM and BTAM; V = R option	Same as OS/VS 2 Ref 1	Upward compatible with CP-67/CMS; all of S/360 operating system environments can be executed under VM/370
Performance	To derive optimum performance, S/360 programs and data should be re-programmed and reblocked	Same as DOS/VS	Same as DOS/VS	Same as DOS/VS	Not applicable

General Characteristics of IBM S/370 Operating Systems (Part 4 of 4)

	DOS/VS	OS/VS 1	SVS	MVS	VM/370
Compatibility (continued)					
Emulation Support	360/20 (Models 115-135) 1401/1440/1460 (all models) 140/7010 (Models 145, 155II & 158)	All compatibility features on models 135-168 including 1400 and 7000 series	All compatibility features on models 145-168 including 1400 and 7000 series	Same as OS/VS 2 Ref 1	All compatibility features on models 135-168 sup- ported under DOS/VS and OS/VS
System/370	To OS/VS 1 & MVS: sub- stantial reorientation and retraining required; program/data conversions can be minimized if VSAM/VTAM are used; VM/370 can be used as conversion vehicle	To OS/MVS: Reorientation and retraining required but not prohibitive; VM/370 can be used as conversion vehicle	To OS/MVS: reorientation and retraining is minor		VM/370 can be used as a vehicle for DOS and OS users to convert to DOS/VS and OS/VS; Conversations Monitor System (CMS) supports most TSO processing features

Major IBM System 370 Time-Sharing Alternatives (Part 1 of 2)

	Time Sharing Operation (TSO)	Conversational Monitor System (CMS)	Virtual Storage Personal Computing (VSPC)
Support	MVS, OS/VS 2, OS/VS 1 (Non-IBM)	VM/370	MVS, OS/VS 1, DOS/VS
General Description	Full scale T/S capability. Carry-over from 360/TSO. MVS implementation accommodates interactive processing but not 360/TSO because of incompatible real-memory based design. TSO runs under OS/VS 2-1 in a similar manner to OS/MVT. Informal support only under OS/VS 1 via proprietary software from Tone Software Corp. in California (\$200 per month). No APL support. VSPC offers superior performance and function than TSO and will eventually succeed TSO.	Full scale T/S capability. Successor to 360/67 — CMS. Executes in logically isolated virtual machine under VM/370 enabling on-line program development and conversion to ensue concurrently with DOS, DOS/VS, OS and OS/VS machine environments. Batch programs can be assigned to CMS background environment, where they execute serially, or to other virtual machine under DOS, DOS/VS etc., where they can execute in multiprogrammed mode. Limited use of VTAM & VSAM vs VSPC.	Full scale T/S capability but lacks COBOL and PL/1 support. This support may be added in future or offered separately. VSPC is replacement for TSO wherein implementation is virtualized (VTAM, VSAM) and more integrated to provide better performance and added flexibility. Assembler support excluded and APL support included signifying important trends. Numerous protection features and easy-to-use JCL. No OS/VS 2-1 support to encourage migration to MVS. VSPC will probably support 5100 terminal in future.
Pricing	No charge for TSO systems support. Compilers and optional components are separately priced.	No charge for CMS systems support. Compilers and optional components are separately priced.	DOS/VS VSPC (\$900); OS/VS 1 VSPC (\$1,100); MVS VSPC (\$1,200). Compilers and optional components are separately priced and additional.
Optional Components	Prompters: TSO Assembler, COBOL and FORTRAN (\$32 each); compilers are separately priced. Interactive Debugs: COBOL (\$78) and FORTRAN (\$173) Data Utilities: COPY, FORMAT, etc. (\$159) Code & Go FORTRAN: in-core (\$317) PL/1 Checkout Compiler: (\$392) VS BASIC: (\$385) Business Analysis/BASIC (\$50)	All TSO components are supported under CMS as well VM/370 Assembler: (no charge) VS APL: (\$400) — Not available under TSO. TSO user must resort to APL/Shared Variable, a program RPQ, and support it as a separate subsystem. VS FORTRAN IV (\$400) — Single pass compiler. Not available under TSO. Earlier S/360 real storage versions of FORTRAN are offered under TSO.	Following include syntax checking and debugging facilities as well as compilers: VS APL: (\$400) also available under CMS VS BASIC (\$385) available under CMS and TSO VS FORTRAN IV (\$400) also available CMS A wide selection of application products are available under VSPC. Additional products will be released in future.
Sizing Performance	TSO, less optional components, requires about 240 KB, exclusive of operating system requirements. As a rule of thumb, a TSO environment requires about 1 MB, exclusive of operating system requirements. Performance under MVS has been less than desirable. VSPC requires less real storage than TSO and offers superior performance.	A minimum 512 KB system can support the VM/370-CMS environment. Layered overhead resulting from VM/370's hierarchal structure is alleviated by VM/370 Assist (microcode/no charge) feature available with 370/135, 145 and 158.	Minimum viable systems: DOS/VS: 256 KB (370/115 & 125: Test mode only) OS/VS 1: 384 KB MVS: 2048 KB A VS APL Assist (microcode/no charge) feature available with 370/135 and 145. VSPC performance markedly superior to TSO.

Major IBM System 370 Time-Sharing Alternatives (Part 2 of 2)

	Entry T/S System	Interactive Terminal Facility (ITF)	McGill University System for Interactive Computing (Music)
Support	DOS/VS	DOS/VS, OS/VS	Standalone, self contained
General Description	Foreground T/S monitor providing problem solving an on-line programming services via following facilities: • On-line source program and data entry, update and maintenance • On-line library maintenance • Context editing system • Immediate job execution and submit to batch facilities • Facilities to implement interactive programs in Assembler, BASIC, FORTRAN, COBOL, PL/1 and RPG • Multiple security levels (passwords, public and private volumes, etc.) • Support for multidropped terminals (2740-½, 3767, 3777-2 and 3275).	Foreground T/S monitor providing problem solving services via BASIC or PL/1 subset or both. ITF was designed for S/360 DOS/OS systems and carried over to S/370 virtual systems background/foreground compatibility established via CONVERT command, ITF, a Class C product, is obsoleted by VSPC.	Full-scale, dedicated T/S capability offering problem solving and on-line program preparation facilities. MUSIC includes a general editor and supports BASIC, IBM Type III APL and OS FORTRAN, COBOL and Assembler. APL has desk calculator. Programs prepared under MUSIC are compatible with and execute under OS/VS.
Pricing	\$250/month for 24 months (paid-up license); a Field Developed Program offered on an "as is" basis (programming services end 2/77); compilers are separately priced.	No charge for ITF systems support. Components below are separately priced.	\$1,285 for 12-months (paid-up license) including BASIC and APL facilities; a Field Developed Program offered on an "as is" basis; OS FORTRAN (\$300 + \$102 for Library) is required.
Optional Components	Interfac: to Minimum Telecommunications Control System (MTCS) for transaction processing support (\$528 for 12-months for MTCS)	ITF-BASIC (OS or DOS version — \$130) ITF-PL/1 subset (OS or DOS version — \$130) ITF-BASIC & PL/1 (\$195)	OS COBOL (\$201)
Sizing Performance	24-40 KB of real storage are required to support monitor; at least 80 KB (Total) are required to run a subtask; Entry T/S System is intended primarily for 370/115 and 125 users.	ITF runs in Virtual = Real Mode. Storage Requirements are 52 KB for OS/VS1, 64 KB for OS/VS 2, and 40 KB for DOS/VS. ITF is functionally deficient facility used by few IBM customers.	MUSIC requires 110K for system code and buffers. A 240 KB S/370 can support up to 60 users while a 384 KB S/370 can support up to 120.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Major IBM S/370 Data Base/Data Communications Facilities — (Part 1 of 3)

	Customer Information Control System (CICS/VS)	Information Management System (IMS/VS)
Support	DOS/VS, OS/VS 370/125 (128 KB) and larger scale 370's	OS/VS (DB-only for OS/VS2 Release 1) 370/145 (512 KB for DB and 1 MB for DB/DC) and larger scale 370's.
General Description	CICS/VS is a combined DB/DC system for transaction and message switching applications. CICS/VS and the earlier versions of CICS are the most widely used DB/DC systems. Many CICS users have DOS and DOS/VS systems; IMS is supported only on large-scale systems under OS and OS/VS. DB support (variety of file organizations, file hierarchies, etc.) under CICS/VS is weak. Users that need added DB support can use DL/1 in conjunction with CICS/VS under DOS/VS or IMS/VS-DB, with integral DL/1, under OS/VS. The appropriate interfaces are available. CICS/VS is a major rewrite of the earlier real storage version of CICS. It offers superior performance and function: VTAM, VSAM, added recovery and restart facilities, and more tunability. CICS/VS improvement in an ongoing IBM effort. Version 1 Rel 3.0 offers: • High Performance Option (HPO) under OS/MVS • Dynamic Transaction Backout (DTB) • High Level Programming Interface (HLPI) for COBOL & PL/1 • Preamsembled modules	IMS/VS is a data base management system designed for large-scale 370 users. An optional data communications feature provides combined DB/DC support. In lieu of IMS/VS-DC support, a user can use CICS/VS-DC support. The former offers more extensive functionality than the latter. CICS/VS-DC, however, while not as elaborate, imparts less overhead to systems operations. IMS/VS data base features Data Language (DL/1). DL/1 supports elaborate hierarchical file structures. A subset of DL/1 is available for use with CICS/VS under DOS/VS. DL/1 DB (and DC) services are accessed by programming sub-routine calls into COBOL, PL/1, and Assembler programs. IMS/VS is a major rewrite of the earlier real storage version of IMS. It offers superior functions: VTAM, VSAM, added recovery and restart facilities, and more tunability. Use of additional IMS/VS functions offsets and negates IMS/VS performance improvements over IMS. IMS/VS improvement is an ongoing IBM effort. Version 11 Rel. 1.3 offers: • Fast Path Feature Option • Multiple Systems Coupling Feature Option • 3790 Support
Design	CICS/VS is a large library of modules. After defining their application requirements, installations enact a sysgen procedure whereby those modules required to support their applications are packaged into a DB/DC monitor with links to the operating systems. Application programmers write macros into their COBOL, PL/1, or Assembler programs to establish interfaces to the monitor for DB/DC services. Interface code becomes embedded in object programs upon compilation and link edit. <i>Changes to the data base and datacomm network necessitate retailoring the monitor and modifying the application programs.</i> The monitor and application program(s) generally execute in a common virtual partition/region. Intercommunication between partitions/regions is supported.	IMS/VS is similar in design to CICS/VS. Installation entails comparable procedures. Instead of macros, however, application programmers use call statements in COBOL, PL/1, and Assembler programs to access DL/1 DB-(and DC) services. Changes to the data base and datacomm network may not necessitate retailoring the IMS/VS monitor and modifying the application program(s). Like the CICS/VS monitor, the IMS/VS monitor generally co-exists in a common virtual partition/region along with the application programs. Application (transaction processing) programs under IMS/VS are generally larger and more elaborate than those under CICS/VS (e.g., 20-40 KB versus 2-6 KB). Intercommunication between regions is supported.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Major IBM S/370 Data Base/Data Communications Facilities — (Part 2 of 3)

	Customer Information Control System (CICS/VS)	Information Management System (IMS/VS)
Installation Requirements	<i>CICS/VS is a complex system requiring substantial systems expertise and training to install and maintain.</i>	<i>IMS/VS is even more complex to install and maintain than CICS/VS.</i>
Pricing	OS/VS version of CICS/VS Version 1 Rel. 3.0 is \$1,000 per month while the DOS/VS version is \$475 per month. A pre-installation test allowance of two months is provided with both versions.	IMS/VS-DB is \$808 per month. DC feature is \$982 per month. A pre-installation test allowance of two months is provided with IMS/VS-DB; none with the DC feature.
Sizing	Real storage requirements depend upon facilities selected and which facilities installations elect to hold resident to ensure acceptable response time. A minimum CICS/VS system (including application program and buffers) requires about 48 KB of real storage while a typical CICS/VS system requires about 134 KB. Full scale CICS/VS systems can use upwards of 300-400 KB. These figures disregard the DB/DC components that must be sysgened with the operating system to support CICS/VS and the language processors and libraries that must be used to prepare and execute the application programs.	Real storage requirements depend on facilities selected and which facilities installations elect to hold resident to ensure acceptable response time. IMS/VS requires about 90 KB for DB while only about 350 KB is required for DB/DC. Practical minima for DB only, including application programs, are 384 KB for OS/VS1, 512 KB for OS/VS2 Release 1, and 768 KB for MVS. With datacomm, the practical minima increase to 512 KB for OS/VS1 and 1 MB for MVS. Datacomm is not available with OS/VS2 Release 1.
Optional Features	DL/1 (\$346) and DL/1 Entry (\$315) for DOS/VS (see IMS/VS for description of IMS/VS). - FASTER (\$108) for DOS/VS and OS/VS (compatible with earlier FASTER transaction descriptions; offers added functions: additional terminal support, password security, etc.). - Extended Communications (no charge) for DOS/VS (supports 3600 industry-oriented terminals). - Display Management System — DMS II (\$311 for DOS/VS version and \$425 for OS/VS version) — set of programs designed to simplify the implementation of on-line processing programs used in conjunction with 3270 CRT's. - Storage and Information Retrieval System — STAIRS/VS (\$737); a query facility for accessing and displaying document abstracts in on-line archival storage. Interface for Advanced Text Management — ATMS/OS (\$567) is available for OS/VS users with CICS/VS installed. IBM is actively promoting STAIRS with 3850 Mass Storage System.	- Generalized Information System — GIS/VS (\$907 per month): a simplified, easy-to-use query language facility. Chargeable options to GIS/VS include Advanced Query Feature (\$183), Update and Create Feature (\$595), and Modify Feature (\$142). - Interactive Query Facility — IQF (\$353 per month): a query facility originally offered with the real storage version of IMS. Obsoleted by GIS/VS, IQF offers only limited terminal support, e.g., 2260/3270 CRT's, 1050's, and 2740's. - STAIRS/VS (\$737) — no interface to ATMS/VS is currently available under IMS/VS. - Fast Path Feature (\$1,250) — performance enhancement. - Multiple Systems Coupling Feature (\$875) — message routing facility

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Major IBM S/370 Data Base/Data Communications Facilities — (Part 3 of 3)

	Customer Information Control System (CICS/VS)	Information Management System (IMS/VS)
Compatibility With Earlier Version	Inefficiencies — lack of function and high overhead — in initial CICS for 360 caused proliferation of real storage based CICS versions: subsetting versions for small-scale systems and extended versions with interfaces to other DB/DC facilities, e.g., DOMP, FASTER, MTCS, VANDL-1, DL/1, etc. <i>It also prompted many CICS users to modify and customize CICS for their own purposes and also resort to alternatives available from proprietary software firms.</i> CICS/VS represents a move to standardize. While CICS/VS supports and is upwards compatible with the earlier IBM-supported CICS versions, users are encouraged to migrate (convert) to native CICS/VS support to derive the functional benefits of VSAM, VTAM, and other features, and improved performance. <i>Users with non-IBM supported versions of CICS may confront major conversion efforts.</i>	IMS/VS is upwards compatible with the real storage based IMS versions. Users of these earlier versions are, however, encouraged to migrate to native IMS/VS support to derive the functional benefits of VSAM, VTAM, and other features, and improved performance. Because of its complexity and elaborate capabilities, fewer users of IMS have modified standard IBM versions. Use of DL/1 with CICS/VS by DOS:VS facilities upgrades to IMS/VS and OS/VS as DL/1 is a subset of IMS/VS-DB.

PAGE	PAGE REV	TITLE	DOCUMENT NO.
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UNIVAC REAL-TIME VERSUS IBM REAL-TIME

SPERRY UNIVAC 1100 Series Systems provide particularly significant advantages as compared to IBM systems used in real time, transaction oriented applications. In high volume transaction processing environments IBM offers their Airline Control Program (ACP) as the operating system together with PARS (Programmed Airline Reservations System), or IPARS an International version of PARS), or PARS-F, the F denoting a Financial off shoot of PARS adapted for use in real-time, transaction oriented, banking applications.

ACP, IBM's high volume, transaction processing operating system, although providing high transaction throughput, is extremely limited functionally. ACP provides no batch processing capabilities and a shop using ACP must also have a separate IBM batch system to perform even the most rudimentary batch functions required to maintain the real-time system. This requirement for the user to support two operating systems can be costly in comparison to 1100 OS which provides full function batch processing, demand processing, and real-time interactive processing within a single executive system. The enhancements made to 1100 OS in mass storage I/O handling, dispatcher operation, memory management, and the TIP scheduler, as well as other areas, to improve transaction processing efficiency now allow 1100 OS systems to aggressively compete with ACP based systems.

ACP is no longer supported on 360 series systems and is not supported on machines smaller than the 370/135. It is also not supported on the 370/155 and 370/165.

ACP, being a simple, high throughput, low overhead, very limited function operating system does not have multi-processor capability and is not directly supported on any of IBM's various MP, AP, or ASP configurations. ACP will operate in at least some of IBM's virtual machine arrangements but real-time throughput in these systems may be so poor apparently due to the inefficiencies and overhead of the virtual machine control program that this mode of operation appears to have only proved acceptable for low volume testing purposes.

PARS, IBM's airline reservations application software package, is an outgrowth of SABRE developed by IBM and American Airlines in the early 1960s. Essentially all users of PARS have significantly modified the package to suit their own interests and today there appear to be no two PARS application systems that are alike.

PARS, embodying early 1960's software technology, is written in a very low level language and is largely monolithic making it very difficult (and expensive) to modify, enhance, fix, document, and maintain. Adding new functions and new application features to PARS appear to be quite difficult.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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BOAC, now integrated as a part of British Airways, spearheaded the development of IPARS, the international variant of PARS. IPARS is similar to PARS in that it is based on very old software technology, is written in a low level language, is generally not organized in a modular fashion, has been extensively modified by most users, and is quite expensive to enhance, fix, document, and maintain.

Although some users have implemented special schemes to alleviate the situation, neither PARS nor IPARS are full-time on-line systems since both must suspend real-time operations for, typically, several hours per day to perform file maintenance and schedule change type functions.

IBM's airline application software systems do not appear to be vendor supported systems anymore. The enhancements, modifications, improvements that are being made to these application packages today are being made by users, not by IBM. The work that the users are doing on PARS and IPARS is generally uncoordinated between the various users with resulting duplication of effort and the development of "almost compatible" new features.

Both PARS and IPARS systems still use a synchronous communications discipline called SABRE that was developed by IBM for use with airline reservations agent sets long before the first CRT based terminals were available. The SABRE communications discipline, like the ACP operating system, is fast, efficient, has low overhead, but is considerably lacking in functional capability. SABRE uses a 6 bit character and, after dedicating 16 codes to control characters, provides the user with only 48 graphic characters that can be used for information interchange.

The SABRE discipline has no communications error recovery capability. Messages containing errors received at the host processor are simply discarded and ignored with the expectation that the operator who entered the message will reenter the message again after not receiving a response within a reasonable amount of time. Messages containing errors received at terminal sets are either ignored or cause an error indicator to be lighted depending on the type of error, with corrective action again being an operator responsibility. The SABRE discipline provides no protection against missing or duplicated communications blocks and provides only a limited amount of status reporting capability, characteristics that are particularly disturbing when airline tickets having a relatively high monetary value are being automatically prepared at terminal locations.

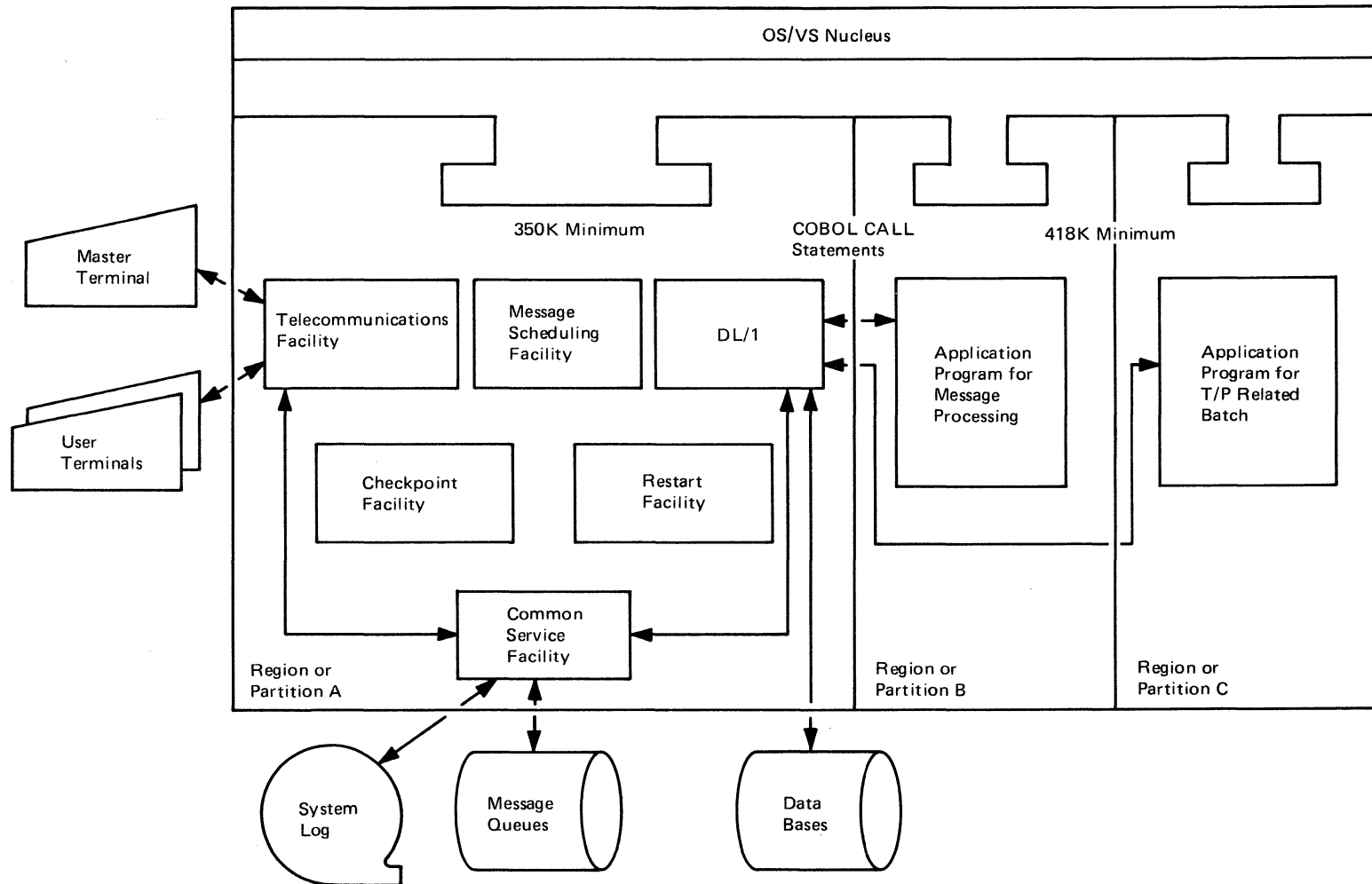
In summary, the particular advantages of SPERRY UNIVAC 1100 Series systems as related to the real-time, transaction oriented, airline system user include:

- Multi-processor airline systems that provide significant cost/performance advantages, maximize system availability to the end user, provide smooth, modular growth characteristics, and minimize the cost of required redundant system components.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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- Full vendor support of a comprehensive library of airline application software packages developed using contemporary software technology by airline specialists from both the data processing and airline industry's addressing both international and domestic airline requirements.
- A mature, full function operating system that provides high volume transaction processing as well as complete batch, demand, and interactive processing capabilities in a single system.
- Modular, compatible airline application packages written in ASCII FORTRAN providing long term economies to the user in application documentation, training, development, maintenance, and enhancement.
- Communications disciplines providing the high level of data integrity warranted by applications involving high value airline tickets and other sensitive information.
- Full support for all members of the 1100 Series family from the smallest to the largest 1100 Series system as well as all 1100 Series peripheral subsystems.
- Systems designed to operate around-the-clock and that do not have to be interrupted for schedule change or file maintenance activities.
- 1100 Series systems in the airline industry are backed by Sperry Univac's commitment to this industry as evidenced by the Airline Operations organization headquartered in Minneapolis. This organization, staffed with technical, marketing, product, and financial specialists, is dedicated solely to fulfilling the needs of the world's airlines for data processing products and services.

Teleprocessing and Related Batch IMS/VS System Flow



IBM Product Strategy

- S/370 Extensions – until 1978-1979

Customers have to be migrated to new software (OS/MVS, VTAM, CICS/VS, IMS/VS, VSPC, SNA, etc.) and peripherals (3344/50, 3850, 3800, etc.) before S/370 successors can be announced. Migration has been slower than IBM anticipated.

- Data Communications – high revenue potential

Most new hardware and software products are supportive of database/data communications applications

- Multiprocessing – a key strategy

Multiprocessing provides the availability insurance now demanded in many real-time applications.

- Installation productivity – to reverse increasing investments in EDP personnel

Products such as the 0800 Printing System, S/32, 3850 Mass Storage System, etc. are especially designed to lower EDP installation personnel requirements.

- Software – increasing importance

As hardware costs diminish, software costs are rising as a percent of total costs for an EDP installation. Organizations have become much more amenable to buying applied and application software outside as program development costs increase.

- Integrated hardware/software systems – competitive insulation.

Newer products such as the 370/138 and 148, VSPC, SNA, etc. comprise multiple, integrated hardware/software elements. Substitutability and emulation have become increasingly difficult.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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IBM Market Strategy

- Lease Orientation

New contracts for the 370/138 and 148 and the approximate 9% discount for TLP indicates a departure from rental (MAC) and a new orientation towards lease and eventual lease to purchase conversions.

- Scientific Selling

Complex products such as the 3850 Mass Storage Unit, SNA, and the 3800 laser-based Printing System require profound statistical and financial analyses to justify investment.

- Growth Market Development

Entry level and data communications markets are being addressed with a wide range of products and marketing support.

- Closer GSD—DPD Cooperation

IBM has enacted new policies to avoid GSD—DPD competition.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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IBM Hardware Contracts

Contract	Applicability	Features
Agreement for IBM Machine Service	370/158-3 & 168-3 mainframes; all peripherals	• Monthly Availability Charge (MAC) • 1-year term and then month-to-month rental • 176-hours of metered monthly use • Full (7-day, 24-hour) maintenance • No price protection • Purchase option accruals for 36-months up to 50% of purchase value
Term Lease Plan (TLP)	370/158-3 & 168-3 mainframes	• TLPMC approximately 9% less than MAC • 4-year term with optional extensions • Unlimited use • Full (7 day, 24-hour) maintenance • Price protection via escalator (5% in U.S., 10% in Europe) • Accrual % 5 points lower than that for MAC • Accruals for 36-months up to 50% of purchase value • Field upgrades only • Early termination penalties • Investment Tax Credit available (U.S.)
Agreement for Lease or Rental of IBM Machines	370/138 & 148 mainframes	• Lease has provisions similar to TLP above • Rental has provisions similar to MAC above • Different termination penalties than TLP • IBM's liabilities limited to \$100,000
Extended Term Plan (ETP) & Fixed Term Plan (FTP)	Most peripherals	• 2-year lease contracts for peripherals • Unlimited use • Full (7-day, 24-hour) maintenance • Price protection without escalator • Purchase option accruals for 36-months up to 50% of purchase value
Purchase	All mainframes & peripherals	• Separate monthly maintenance charges • One-year free maintenance on mainframe & 90-days on peripherals (No free maintenance for lease-to-purchase conversions) • Investment Tax Credit available (U.S.)
Installment Payment Plan	Mainframes incl. or excl. peripherals	• 25% downpayment (cash or purchase option accruals) • 12 to 48 month finance period • Fixed interest rate (1½% over prime) • Ownership after last payment • Investment Tax Credit available (U.S.)
State & Local Government Lease Plan (S & LGLP)	All mainframes & peripherals	• Lease-purchase plan • Monthly charge 10% higher than lowest monthly charge available in above lease contracts • 5-year term • Unlimited use • Full (7-day, 24-hour) maintenance • Full purchase price protection • Lease price escalator same as TLP except based on fiscal anniversaries • Accrual % 15 points higher than that for rental contract • Accruals for 60-months up to 75% of purchase value • Field upgrades only • Liberal executory privileges

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Large 370/148

Model	Description	Qty	Gross Rental*	Gross Lease*	Purchase**	MMMC
8076 8100	Small M148 Conf	1	\$21,682	\$19,745	\$ 812,330	\$2,457
	3148-K (2MB)	1	5,900	5,370	170,000	170
	2nd Printer Attach	1	180	164	5,940	30
	2-Chan Switch	(1)	(228)	(208)	(11,110)	(11)
			\$27,538	\$25,071	\$ 977,160	\$2,646
3340A2	Dual Disk	2	\$ 2,200	\$ 1,872	\$ 72,000	\$ 160
3338-70F	Data Module-70MB ea	4	328	280	8,800	T&M
3344-B2	Dual Drive-560MB	2	2,702	2,300	99,000	300
8150	String Switch	2	440	374	14,400	21
6202	RPS	2	50	42	1,728	1
3830-2	Disk Control	1	2,270	1,907	74,340	126
2150	Ctrl Store Ext	1	526	442	17,190	11
6111	Register Exp.	1	31	26	1,000	4
3420-7	MT - 320KB	6	3,930	3,300	123,120	465
6631	Single Density	6	564	474	17,940	105
3803-1	MT Control	2	1,514	1,272	47,340	208
1792	2-Ctrl Switch	1	223	187	7,020	11
			\$14,778	\$12,476	\$ 419,078	\$1,412
3203-4	LP (1200 lpm)	2	\$ 2,714	\$ 2,310	\$ 88,200	\$ 564
1416	Interch Train Cart	2	202	202	5,330	T&M
3505-B1	CR (800 cpm)	1	634	634	24,940	101
8105	Read Punch Adapter	1	140	140	5,830	4
3525P3	CP (300 cpm)	1	684	684	22,870	110
			\$ 4,374	\$ 3,970	\$ 147,170	\$ 779
4718	Small M148 FE Config	1	\$ 1,815	\$ 1,546	\$ 55,987	\$ 275
	Line Set - 1H	2	218	186	6,970	28
			\$ 2,033	\$ 1,732	\$ 62,957	\$ 303
			\$48,723	\$ 43,249	\$1,606,365	\$5,140

*Provide round-the-clock maintenance coverage at no additional charge

**One year maintenance on mainframe and 90-days on peripherals

Four-year lease on mainframe; 2-year lease on peripherals

SOFTWARE CHARGES

OS/VS COBOL & Library \$ 236 per month

CICS/VS 866

VSPC 1,100

INSTALLATION SUPPORT &
EDUCATION

Separate Charges

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Large 370/148 MP (Shared Disk)

Model	Description	Qty	Gross Rental*	Gross Lease*	Purchase**	MMMC
	Small 370/148 Config.	2	<u>\$43,364</u>	<u>\$39,490</u>	<u>\$1,624,660</u>	<u>\$4,914</u>
3340A2	Dual Disk Drives	2	\$ 2,200	\$ 1,872	\$ 72,000	\$ 160
3338-70F	Data Module-70MB ea	4	328	280	8,800	T&M
3344-B2	Dual Drives-560 MB	2	2,702	2,300	99,000	300
8150	String Switch	2	440	374	14,400	21
6202	RPS Feature	2	50	42	1,728	1
3803-1	MT Control	2	1,514	1,272	47,340	208
1792	2-Ctrl Switch	1	223	187	7,020	11
8100	Two Chan Switch	2	166	139	5,265	5
3420-7	MT - 320KB	6	3,930	3,300	123,120	465
6631	Single Density	6	564	474	17,940	105
			<u>\$12,117</u>	<u>\$10,240</u>	<u>\$ 396,613</u>	<u>\$1,276</u>
3203-4	LP (1200 lpm)	2	\$ 2,714	\$ 2,310	\$ 88,200	\$ 564
1416	Interch Train Cartridge	2	202	202	5,330	T&M
3505-B1	CR (800 cpm)	2	1,268	1,268	59,880	202
8105	Read Punch Adapter	1	140	140	5,830	4
3525P3	CP (300 cpm)	1	684	684	22,870	110
			<u>\$ 5,008</u>	<u>\$ 4,604</u>	<u>\$ 182,110</u>	<u>\$ 880</u>
	Small 370/148 FE Config.	2	<u>\$ 3,630</u>	<u>\$ 3,092</u>	<u>\$ 111,974</u>	<u>\$ 550</u>
			<u>\$64,119</u>	<u>\$57,426</u>	<u>\$2,297,357</u>	<u>\$7,620</u>

*Provide round-the-clock maintenance coverage at no additional charge

****One year maintenance on mainframe and 90-days on peripherals**

Four year lease on Mainframe; 2-year lease on peripherals

SOFTWARE CHARGES	OS/VS COBOL & Library	\$ 236 per month
	CICS/VS	866
	VSPC	1,100

INSTALLATION SUPPORT & EDUCATION Separate Charges

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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IBM 370/158-3

Model	Description	Qty	Gross Rental	Gross Lease	Purchase	Monthly Maint
3158U34	M158-3, 2MB, Console	1	\$ 51,130	\$ 46,495	\$2,228,000	\$ 2,585
1433	3rd Blk Mpxr	1	463	421	16,160	14
1434	4th Blk Mpxr	1	432	393	15,040	11
4650	ISC's	1	2,510	2,285	121,250	258
2150	Control Store Extension	1	686	624	32,900	23
			<u>\$ 55,221</u>	<u>\$ 50,218</u>	<u>\$2,413,350</u>	<u>\$ 2,891</u>
3333-11	Dual Disk & Ctrl (400 KB)	2	\$ 4,852	\$ 4,130	\$ 159,660	\$ 440
3330-11	Dual Disk (400 KB)	4	8,560	6,956	271,440	748
3420-6	MT (780 KB, 6250 bpi)	6	3,972	3,336	153,900	393
6425	6250/1600 Density	2	164	138	6,320	71
6420	6250 Density	4	328	294	9,060	118
3803-2	Tape Control	2	2,202	1,850	78,840	286
1792	2 x 8 Switching	1	223	187	7,020	11
6410	6250/1600	2	220	184	7,060	3
3211-1	LP (2000 lpm)	2	3,810	3,200	127,260	804
3216-1	Train Cartridge	2	784	784	21,060	406
3311-1	LP Control	2	1,682	1,412	56,160	274
3505-B2	CR (1200 cpm) & Ctrl	1	752	752	30,980	137
8105	Punch Attach	1	140	140	5,830	4
3525-P3	CP (300 cpm)	1	684	684	22,870	110
3533	Card Read Attach	1	134	134	6,360	17
			<u>\$ 28,507</u>	<u>\$ 24,581</u>	<u>\$ 963,710</u>	<u>\$ 3,822</u>
3706-IIF3	DCP (96 KB)	1	\$ 1,968	\$ 1,675	\$ 62,330	\$ 323
1544	Chan Adapter - Type 4	1	176	150	5,800	14
1643	Comm Scanner - Type 3	1	687	585	22,640	52
1302	Attach Base - Type 2	1	19	16	641	1
4701	LIB - Type 1	2	86	74	2,910	8
4650	Business Mach Clock	1	12	10	424	1
4714	Line Set - 1D (2-lines)	12	492	420	16,260	54
			<u>\$ 3,440</u>	<u>\$ 2,930</u>	<u>\$ 110,995</u>	<u>\$ 453</u>
			<u>\$ 87,168</u>	<u>\$ 77,729</u>	<u>\$ 488,055</u>	<u>\$ 7,166</u>
			(2)	(3)		(4)

NOTES:

- (1) 370/158-3 with 2 MB, 4 Blk Mpxrs & 1 Byte Mpxr; 2.4 BB of 3330-11 type disk; 6-MT's @ 780 KB/6250 bpi; 2-3211 (2000 lpm) printers; and 12-lines up to 9600 bps.
- (2) MAC (176-hrs of use; round-the-clock maintenance)
- (3) TLP (4-yr on mainframe) & ETP (2-yr on peripherals) (unlimited use and round-the-clock maintenance)
- (4) Prime-shift coverage; purchase provisions: 1 yr. free maintenance on mainframe, 9-days on peripherals.

SOFTWARE CHARGES

	Monthly Fee
OS/VS1 or MVS	\$ 0
IMS/VS-DB	208
IMS/VS-DC	982
COBOL & Library	236

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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IBM 370/168-3

Model	Description	Qty	Gross Rental	Gross Lease	Purchase	Monthly Maint
3168U34	370/168-3 (4 MB)	1	\$ 88,900	\$ 80,845	\$3,824,000	\$ 5,800
3066-2	System Console	1	3,825	3,480	183,050	552
5760	Power Warning	1	142	130	5,725	1
3067-3	Pwr. & Coolant	1	2,875	2,615	137,650	132
2150	ISC Ctrl Store Ext	1	686	624	32,900	23
2151	Exp Ctrl Store	1	415	378	19,870	23
6111	Reg. Expansion	1	60	55	2,000	8
3624	Emerg. Pwr Off	1	0	0	0	0
4650	ISC's	1	2,510	2,285	121,250	258
7905	2-Chan Switch	1	458	417	22,230	23
2880-2	Blk Mpx (2)	4	21,240	19,320	997,200	1,984
1862	Indirect Addr	4	1,368	624	64,200	8
3851	Two Byte Interface	2	830	756	37,420	12
2870-1	Byte Mpxr	1	2,500	2,275	117,900	115
1861	Indirect Addr	1	228	208	10,790	2
6990	Selector Subchan	1	458	417	19,870	18
			\$126,495	\$114,429	\$5,596,055	\$ 8,959
2305-2	Fixed Disk (11.2 MB)	2	\$ 8,750	\$ 7,350	\$ 284,400	\$ 1,126
2825-2	Storage Ctrl	1	2,705	2,272	90,900	356
8171	2-Chan Switch	1	215	181	7,325	10
3350A2	Dual Drives (317.5MBea)	4	6,816	5,800	250,000	800
3350B2	Dual Drives (317.5MBea)	8	10,808	9,200	396,000	1,200
8150	String Switch	4	848	720	28,800	42
3830-2	Disk Ctrl	2	4,540	3,814	148,680	252
2151	Exp Ctrl Store	2	644	540	21,020	21
2150	Ctrl Stoe Exp	2	1,052	884	34,380	21
6111	Register Exp	2	62	52	2,000	8
8170	2-Chan Switch	2	446	374	14,650	21
3420-4	MTU (470 KB, 6250 bpi)	10	5,740	4,820	219,600	595
6420	6250 Density	8	464	392	18,360	236
6425	6250/1600 Density	2	164	138	6,320	71
3803-2	MT Ctrl	2	2,202	1,850	78,840	286
1792	2-Ctrl Switch	2	446	374	14,040	21
			\$ 45,902	\$ 38,761	\$1,615,324	\$ 5,066
3800	Printing System	1	\$ 7,344	\$ 6,250	\$ 310,000	\$ 445
1490	Burster-Trimmed-Stacker	1	1,058	900	44,640	120
5401	127 Writable Char	1	81	69	3,720	14
3211-1	LP (2000 lpm)	1	1,905	1,600	63,630	402
3811	LP Ctrl	1	841	706	28,080	137
3216-1	Train Cartridge	1	392	392	10,530	203
3505B2	CR (1200 cpm)	2	1,504	1,504	61,960	274
8103	Punch Adapter	1	112	112	5,300	4
3525P3	CP (300 cpm)	1	684	684	22,870	110
			\$ 13,921	\$ 12,217	\$ 550,730	\$ 1,709
3705IIF5	DCP (144 KB)	1	\$ 2,144	\$ 1,825	\$ 73,130	\$ 349
1544	Chan Adapter-Type 4	1	176	150	5,800	14
1643	Comm Scanner-Type 3	1	687	585	22,640	52
1302	Attach Base-Type 2	1	19	16	641	1
4701	LIB - Type 1	2	86	74	2,910	8
4650	Bus Mach Clock	1	12	10	424	1
4714	Line Set-1D (2 lines)	12	492	420	16,260	54
			\$ 3,616	\$ 3,080	\$ 121,805	\$ 479
			\$189,934	\$168,487	\$7,883,914	\$16,213

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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9.2 HONEYWELL SYSTEMS THAT COMPETE WITH 1100

Series	Honeywell Competition	Performance Estimates
1100/10	66/05 66/10 and 20 MP 66/40	1100/11 (without overlap) should generally outperform 66/05, 66/10 and 66/20, but fall short of 66/40. 1100/10 (with overlap) should perform comparably to a 66/40 or MP 66/10's or 20's in COBOL batch, T/S, and Transaction processing. 66/05, 10, 20 and 40 perform well in COBOL batch, T/S, and transaction processing but poorly in FORTRAN and scientific based processing. 1100/12, as a result of superior tightly-coupled MP design, should provide better performance than 66/40 MP, with its master-slave design.
1100/20	66/40 MP 66/60 MP	1100/21 should outperform a 66/40 MP but fail short of a 66/60 in COBOL batch, T/S, and transaction processing. It will substantially outperform a 66/60 in FORTRAN. 1100/22, due to superior MP design, should perform favorably against a 66/60 MP.
1100/40	66/60 MP 66/80 MP	1100/41 (all primary) will generally outperform a 66/80, but fall short of a 66/60 MP. 1100/42, 43 and 44 should substantially outperform 66/80's with two, three, and four CPU's, respectively.
1100/80	66/80 MP	1100/81 should provide performance comparable to a 66/80 with three CPU's.

In time sharing based applications, Honeywell may propose 66/07, 66/17, 66/27, 68/60 and 68/80 as alternatives to the above models. These models are optimized for time sharing operation.

The above models are marketed worldwide via various divisions including HIS Ltd (London), HIS Pacific (Tokyo), HIS Italia (Milan & Rome), HIS North American Operations (Wellesley Hills, Mass.), and Honeywell Bull (Paris).

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Current Level 66 and 68 Models

Models	Description
66/05	Low priced, packaged, configuration constrained, threshold model with integrated CPU, IOM, and System Control. CPU appears to be slowed 66/10 CPU. No MP capability announced to date.
66/10 66/20 66/40	Series of models that use a cache-less CPU. Performance is differentiated by CPU clocking and configuration constraints. A 66/10 can be field upgraded to a 66/20, a 66/20 to a 66/40, a 66/40 to a 66/60, and a 66/60 to a 66/80 via the installation of Power Features. Free-standing or integrated CPU's, IOM's, and System Controls. All models can be configured with 2 or 3 additional CPU's.
66/07 66/17 66/27	Self-contained series of packaged models optimized for time sharing operation: • 66/07 uses modified 66/05 CPU — it provides 66/05 batch performance and 66/20 T/S performance. • 66/17 uses modified 66/10 CPU — it provides 66/10 batch performance and 66/40 T/S performance. • 66/27 uses modified 66/20 CPU — it provides 66/20 batch performance and 66/60 T/S performance. All three models operate under enhanced T/S bases version of GCOS. Packaged Datanet processors provide support for 24, 48 and 64 lines, respectively. Field upgrades are possible within, but not outside the 66/07 — 66/27 series.
66/60 66/80	Models that use a cache based CPU. Performance is differentiated by CPU clocking. A 66/60 can be field upgraded to a 66/80. Small scale 66/60's can be configured with an integrated CPU, IOM and System Control. Larger scale 66/60's and all 66/80's use free-standing components. Both models are configurable with up to 4 CPU's.
68/60 68/80	Large-scale models optimized for time sharing operation under MULTICS.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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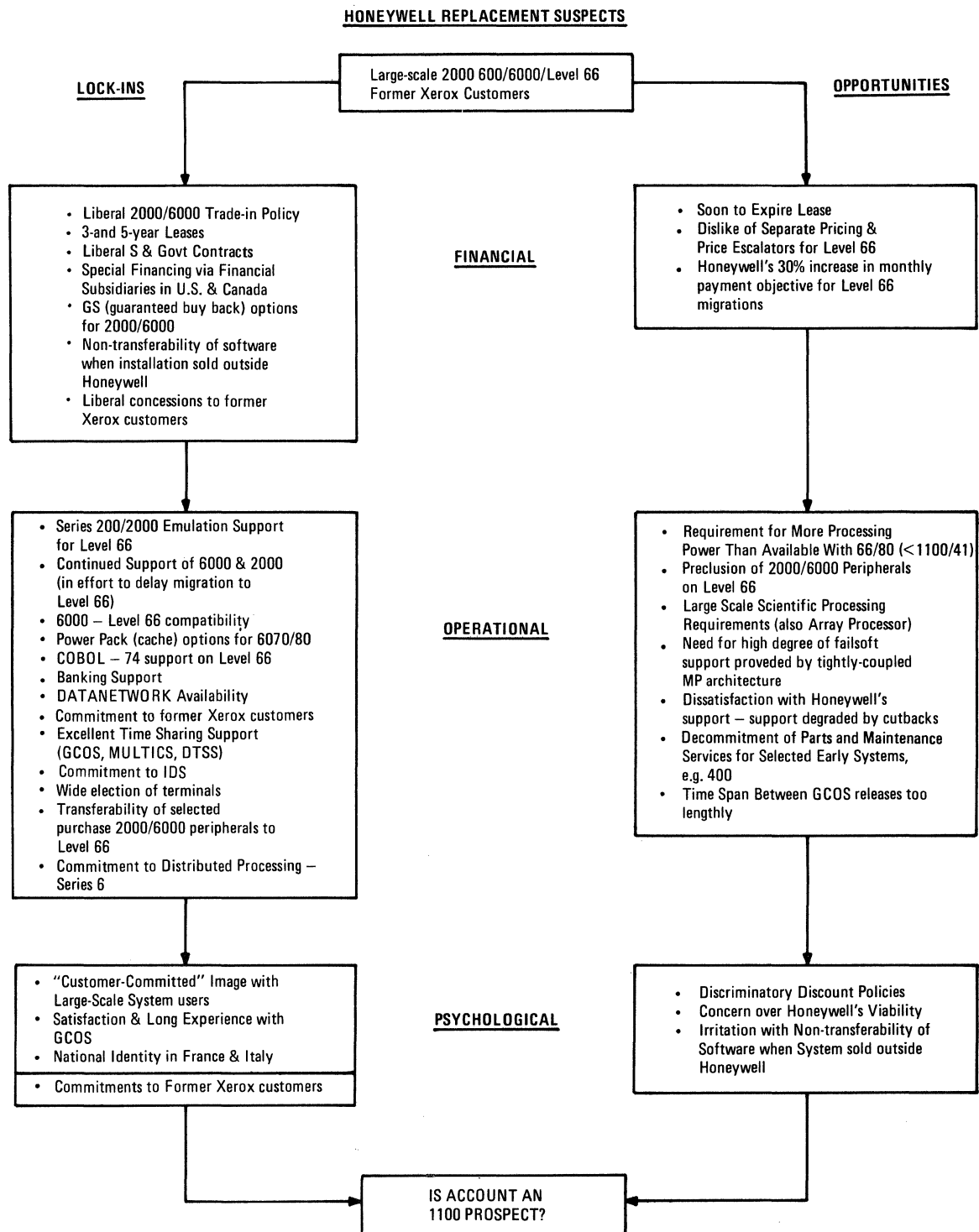
**Relative Internal Performance
Based On Honeywell Claims**

Honeywell		K Functions/Sec.		Sperry Univac	
Level 66	6000	COBOL	FORTTRAN	Earlier	New
		32.0	95.8	1106 (1.5 μ s)	
66/20	6025	32.4	39.0		
		—	139.3	1106 (1.0 μ s)	
	6040	42.4	56.0		
66/40		49.0	—		1100/11
	6060	51.8	92.5		
		61.6	250.0	1108 (Est)	1100/21
66/60		68.0	—		
	6080	72.7	174.2		
66/80		97.0	—		
		160.2	424.0	1110 (Best)	
					1100/41

Performance based on Processor Figure of Merit (PFM) computation, a modified Gibson Mix without I/O.

66/10 performance estimated to be 20% below that of 66/20.

Honeywell Replacement Opportunities



DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Level 66 Migration Strategy

- Large-Scale 200/2000 Accounts

With over 3100 200/2000 installations worldwide, Honeywell has been most anxious to protect this customer base. Since the Series 60 announcement in April 1974, Honeywell has converted most 200/2000 installations from lease-to-purchase under the GS2000 option, a guaranteed buyback program which provides up to a 25% reduction in the future lease/purchase of a Level 66 system. Some 80% of 200/2000 installations are now purchased. The lease-to-purchase conversions have furnished Honeywell with much needed cash and time to develop conversion/compatibility facilities. OS/2000 has been enhanced to include more of the characteristics of GCOS and, in 1976, 200/2000 emulator support was introduced. With native GCOS support for Level 64, emerging after long development delays, Honeywell is now in a position to provide a migration path for small-scale 200/2000 accounts as well as large-scale accounts.

- 6000 Accounts

Honeywell's migration strategy for 6000 accounts has been similar to its strategy for 200/2000 accounts. Migration has been delayed to enable Level 66 "attack" systems to be sold to new accounts. A GS6000 option has been offered to encourage lease-to-purchase conversions to furnish cash. Enhancement options such as the Power Pack (cache feature) for the 6070/80 and Level 66 peripheral support for 6000 systems have been extended to 6000 accounts. In 1976 Honeywell began to encourage migration from series 6000 to Level 66. The high degrees of compatibility between series 60 and Level 66 hardware and GCOS pose no major conversion problems.

- 600 and 400 Accounts

Honeywell has dropped full-fledged support for these accounts. Predominantly a purchase base; these accounts have been encouraged via liberal trade-in allowances to migrate to Level 66 since its introduction in April 1974.

- Xerox Accounts

CP VI, a new operating system, will be developed to bridge users to GCOS. The 560's may continue in production. In some cases, Honeywell is committed to providing a migration path to Level 66 for Sigma 6, 7, 8, 9 and 560 accounts. Honeywell has appeased Xerox accounts, predominantly a purchase base, by offering liberal concessions, e.g., upgrade of a Sigma 6 to a Sigma 9 at no increase in monthly payments, etc. The 66/07, 17 and 27 appear to address Xerox 940 and Sigma Time Sharing users.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

Why A Prospect Should Buy An 1100/10 Over A Honeywell 66/05 – 66/40

1. Superior Multiprocessor Implementation – 1100/12's "tightly-coupled" MP design offers both performance and failsoft benefits over Level 66's "master-slave" MP design.
2. Scientific Processing Performance – FORTRAN based processing on Level 66 models is weak relative to 1100 series.
3. 8405 Fixed Disk – No high performance fixed disk is available with Level 66 systems. Such disk can substantially improve performance when configured as an operating system storage facility or backing store.
4. High Volume I/O Support – A 66/40 configured with 2—IOM's can only sustain a data rate of $2 \times 2.7 \text{ MB/s} = 5.4 \text{ MB/s}$. 1100/11 can sustain a data rate of 6.7 MB/s; an 1100/12 a data rate of $2 \times 6.7 = 13.4 \text{ MB/s}$.
5. 8450 Disk and 6250 bpi Tape – Honeywell has yet to announce support for peripherals with capabilities comparable to the 8450 and UNISERVO 30. Honeywell does, however, have the potential to acquire comparable peripherals via Computer Magnetics, a company jointly owned by CDC (2/3) and Honeywell (1/3). Announcements are anticipated in the future.
6. Hardware Supported Reentrancy – 1100 series multibanking design accommodates reentrant code use, thereby ensuring efficient main store utilization. No comparable mechanism exists in Honeywell's Level 66 systems. Moreover, GCOS offers no software based support for reentrant code.
7. DMS/1100 – Level 66 customers can use TOTAL or IDS II. TOTAL lacks the full functional support offered by DMS/1100. IDS II, a full featured CODASYL based data management system, will be a viable DMS/1100 competitor when development is fully completed, sometime in 1977.
8. One Price Service – All 100/OS programming aids, including compilers, applied software such as DMS and TIP, and some application packages are provided without additional charges. Sperry Univac's visible pricing policy enables customers to perform long-term budgetary planning with certainty and enables them to capitalize on a wide range of software support without incurring added charges.
9. Price Protected 5-Year Lease – Honeywell's extended term leases have escalator clauses (currently 5%) affording Honeywell options to raise prices during the term of a lease.
10. OS/1100 Ease Of Use – OS/1100 incorporates about half of the job control cards as Level 66 GCOS.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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11. Sympathetic Customer Policies — Certain Honeywell policies are unsympathetic to customers:

- Support for earlier software version may be dropped when later versions are released. In 1975, Honeywell encountered serious problems when Management Data Query System DMQS/II became available. A large account had spent considerable time coding applications in DMQS/I. MDQS/II is incompatible with MDQS/I, necessitating substantial rewrite. Support for MDQS/I was dropped.
- Customers cannot transfer software should they sell an earlier, purchased Honeywell system. The new buyer must contract directly with Honeywell to procure software. Charges are expensive.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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**Why A Prospect Should Buy An
1100/20 Over A Honeywell 66/40
Or 66/60**

1. Superior Multiprocessor Implementation — 1100/20's "tightly-coupled" MP design offers both performance and failsoft benefits over Level 66's "master-slave" MP design.
2. Scientific Processing Performance — FORTRAN based processing on Level 66 models is weak relative to 1100 series.
3. 8405 Fixed Disk — No high performance fixed disk is available with Level 66 systems. Such disk can substantially improve performance when configured as an operating system storage facility or backing store.
4. 8450 Disk and 6250 bpi Tape — Honeywell has yet to announce support for peripherals with capabilities comparable to the 8450 and UNISERVO 30. Honeywell does, however, have the potential to acquire comparable peripherals via Computer Magnetics, a company jointly owned by CDC (2/3) and Honeywell (1/3). Announcements are anticipated in the future.
5. Hardware Supported Reentrancy — 1100 series multibanking design accommodates reentrant code use, thereby ensuring efficient main store utilization. No comparable mechanism exists in Honeywell's Level 66 systems. Moreover, GCOS offers no software based support for reentrant code.
6. DMS/1100 — Level 66 customers can use TOTAL or IDS II. TOTAL lacks the full functional support offered by DMS/1100. IDS II, a full featured CODASYL based data management system, will be a viable DMS/1100 competitor when development is fully completed, sometime in 1977.
7. One Price Service — All 1100 OS programming aids, including compilers, applied software such as DMS and TIP, and some application packages are provided without additional charges. Sperry Univac's visible pricing policy enables customers to perform long-term budgetary planning with certainty and enables them to capitalize on a wide range of software support without incurring added charges.
8. Price Protected 5-Year Lease — Honeywell's extended term leases have escalator clauses (currently 5%) affording Honeywell options to raise prices during the term of a lease.
9. OS/1100 Ease Of Use — OS/1100 incorporates about half of the job control cards as Level 66 GCOS.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Why A Prospect Should Buy An 1100/40 Over A Honeywell 66/80

1. Higher Performance CPU — An 1100/40 CAU will generally outperform a 66/80 CPU by at least 20%. A 66/80 customer may have to upgrade to a 66/80 MP while an 1100/41 customer may have sufficient processing capacity to avoid an upgrade.
2. More Growth Potential — An 1100/40 can be configured to include up to 1,573K 36-bit words of main store whereas a 66/80 can support 1,048K 36-bit words, maximum.
3. Superior Multiprocessor Implementation — 1100/40's "tightly-coupled" MP design offers both performance and failsoft benefits over Level 66's "master-slave" MP design.
4. Scientific Processing Performance — FORTRAN based processing on Level 66 models is weak relative to 1100 series.
5. 8405 Fixed Disk — No high performance fixed disk is available with Level 66 systems. Such disk can substantially improve performance when configured as an operating system storage facility or backing store.
6. High Volume I/O Support — A single IOAU can sustain the data rate of 4—IOM's, or 16MB/sec.
7. 8450 Disk and 6250 bpi Tape — Honeywell has yet to announce support for peripherals with capabilities comparable to the 8450 and UNISERVO 30. Honeywell does, however, have the potential to acquire comparable peripherals via Computer Magnetics, a company jointly owned by CDC (2/3) and Honeywell (1/3). Announcements are anticipated in the future.
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DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Why A Prospect Should Buy An 1100/80 Over A Honeywell 66/80 MP

1. Superior Price/Performance — 1100/80 CPU offers well over twice the internal performance of 66/80 CPU. 1100/80 system pricing is well below that for 66/80.
2. Larger Capacity Cache — 1100/80 storage Interface Unit provides substantially more storage capacity than the 66/80 cache: 4 to 16 KW versus 2 KW. The larger capacity ensures a higher hit %.
3. Superior Multiprocessor Implementation — 1100/80's "tightly-coupled" MP design offers both performance and failsoft benefits over Level 66's "master-slave" MP design.
4. 8405 Fixed Disk — No high performance fixed disk is available with Level 66 systems. Such disk can substantially improve performance when configured as an operating system storage facility or backing store.
5. 8450 Disk and 6250 bpi Tape — Honeywell has yet to announce support for peripherals with capabilities comparable to the 8450 and UNISERVO 30. Honeywell does, however, have the potential to acquire comparable peripherals via Computer Magnetics, a company jointly owned by CDC (2/3) and Honeywell (1/3). Announcements are anticipated in the future.
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DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Honeywell System Specifications

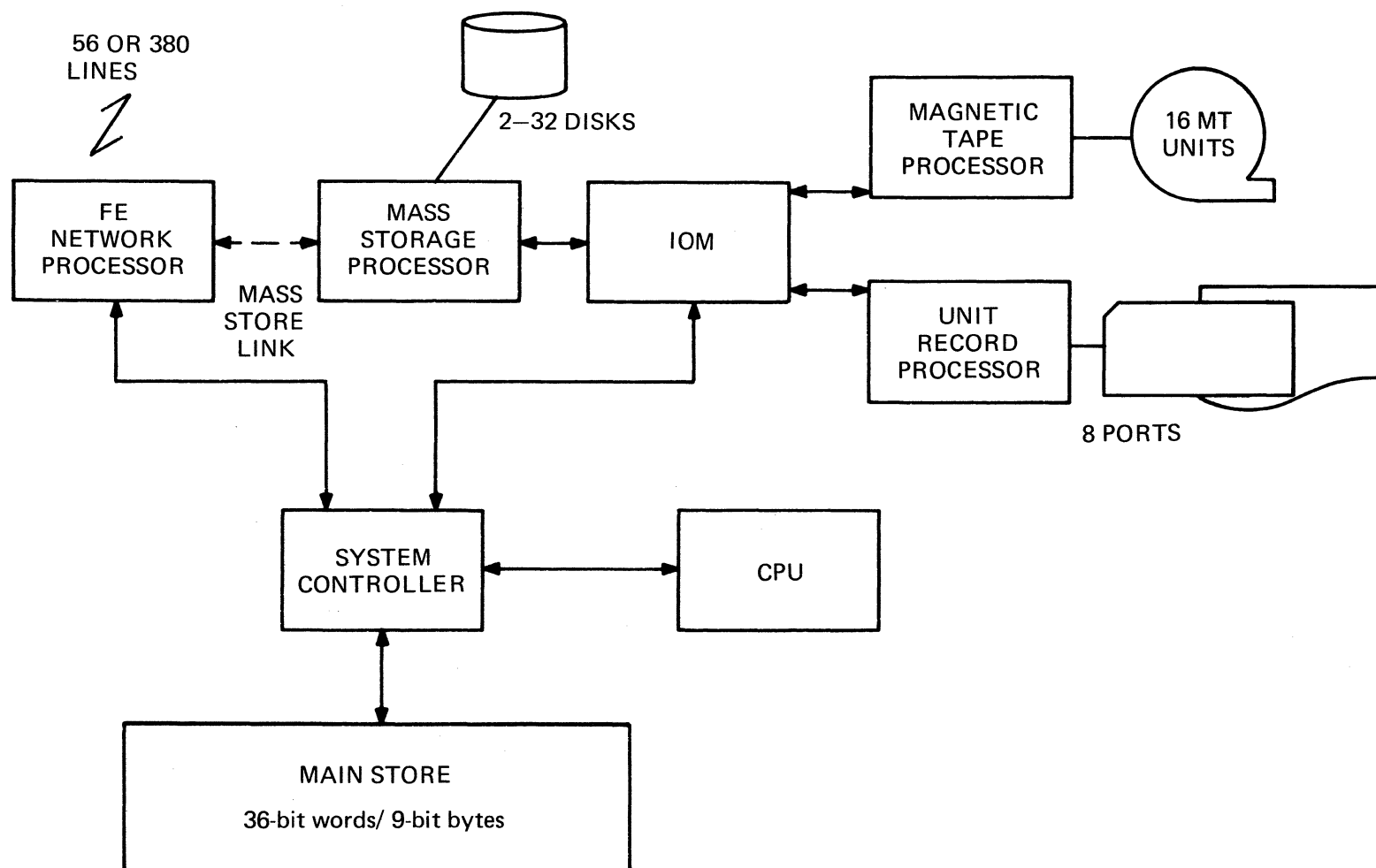
	66/05	66/10, 20 & 40	66/60 & 80
PROCESSOR			
Cycle Time			
Instructions			
Type	General Purpose Fixed, Single Address Extended Inst Set (EIS) facilitate byte operations	Same	Same
Number	—	—	—
Options	None	Same	Same
Control Store			
Use	EIS microcode; all other instructions are hardwired	Same	Same
Size	—		
Pipeline Design	No	Same	—
Cache			
Type	Not applicable	Same	Cache used to stage instruction for CPU and for working storage when CPU processes interactive routines; all I/O bypasses cache
Size			
Cycle Time			8,192 9-bit bytes
Hit %			90–95% Improves processor execution rates by 20–40%
Modes of Operation	Real	Same	Same
MAIN STORE			
Type	MOS	Same	Same
Self-Correcting	Yes	Same	Same
Word Width	36-bits	Same	Same
Read Time	—	1.4 sec/2 words	0.75 μ sec/2 words
Write Time	—	1.4 sec/2 words	0.75 μ sec/2 words
Interleave	—	—	—
Min Capacity	96KW 384 9-bit bytes	81,82 & 131KW 324, 324 & 524 9-bit bytes	196KW 784 9-bit bytes
Max Capacity	196KW 784 9-bit bytes	252,262 & 524KW 1,048; 1,048 & 096 9-bit bytes	1,048KW 4,192 9-bit bytes
Increments	31–64KW	16–32–64–131KW	131–262KW

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Honeywell System Specifications (Cont.)

RELATIVE MAINFRAME PERFORMANCE (EST)	—	66/10 = 0.28 66/20 = 0.35 66/40 = 0.60	66/60 = 1.0 66/80 = 1.4
INPUT/OUTPUT			
Design	Microprogrammed minis attach peripheral sub- systems to I/O mpxr; System Controller attaches IOM's & CPU's to main store	Same	Same
No. of Channels	1 — IOM (integrated)	1 — IOM for 66/10 & 20- 1 or 2 — IOM's for 66/40 IOM's can be integrated or free standing	1.4 IOM's small-scale 66/60 can use integrated IOM
Channel Data Rates	—	2.7 MB/IOM	4.0 MB/IOM
Aggregate Data Rate	—	2.7 MB/S for 66/10 & 20 2.7 or 5.4 MB/S for 66/40	Up to 16MB/S
SYSTEM CONSOLE			
Type	System Console incl: Keyboard (64 char); CRT (1920 char); and printer (30 cps). 2nd CRT is optional	Same	Same
Options		System Control Center incl. System Console components plus a special System Status Display and support for multiple CRT monitors	Same

Honeywell Level 66 Basic Architecture



DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Honeywell Multiprocessing Capabilities

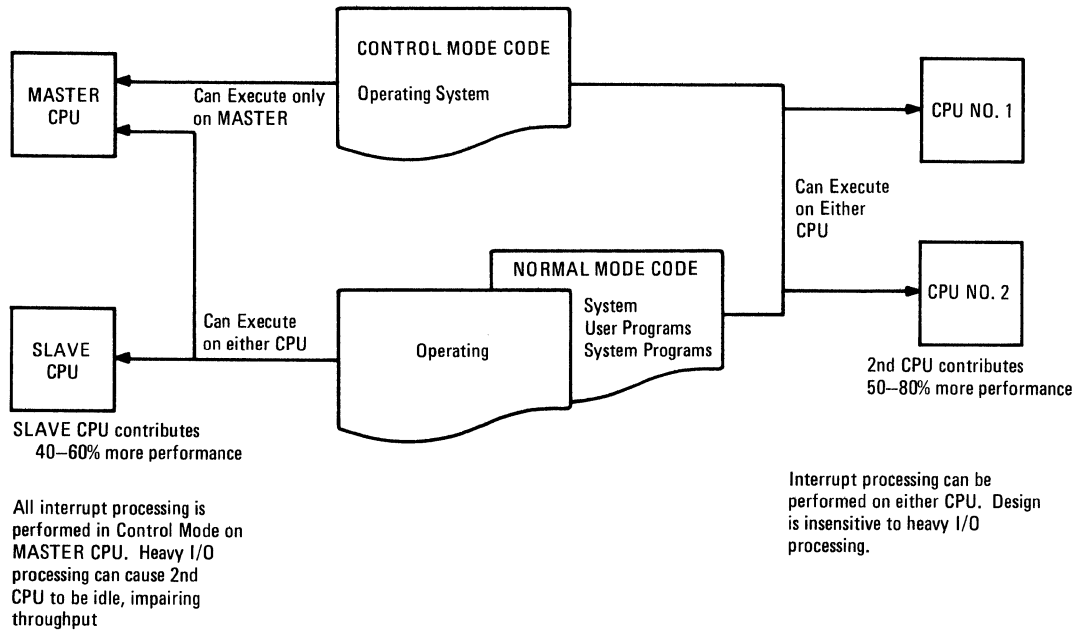
Multiprocessing Capability	Support		Features
	Systems	Software	
1. Master-Slave	66/10 – 66/80 68/60 & 80	GCOS Multics	2–4 CPU's share main store and single copy of GCOS. Designated MASTER CPU is only CPU that can execute those portions of GCOS (interrupt processing, memory management, etc.) written in MASTER (Control) mode code. Both MASTER and SLAVE CPU's can execute normal mode code, e.g. major portions of GCOS (data management, scheduling), compilers, and user programs. The MASTER:SLAVE constraint limits performance and failsoft capabilities relative to 1100 MP design.
2. Shared Disk	66/05 – 66/80	GCOS	Multiple uni- and multi- processor systems can be arranged to share a common disk subsystem. Each system uses separate copy of GCOS.
3. Delta Configuration	66/05–66/80	GCOS	A DATANET front-end and an IOM can attach to a common disk subsystem enabling a host and front-end to exchange information via a mail-box approach. A DATANET, arranged in this manner, can continue to operate in a degraded mode, should the host fail.
4. 2000 Emulator	66/05 – 66/80	GCOS	A 200/2000 series processor can attach to a 66/05 – 66/80 system via a micro-programmed interface to an IOM. 200/2000 emulation is conducted simultaneously, in a multiprogrammed environment under Level 66 GCOS.
5. Distributed Processing	66/05 – 66/80	GCOS NCP	Level 6 minicomputers can be arranged in a distributed processing network supported by a host 66/05 – 66/80 and the Network Control Program resident in a DATANET front-end. Multiple, remote 66/05 – 66/80 installations can also be arranged in a load leveling network.

Multiprocessor Design Comparison Honeywell Vs. Sperry Univac

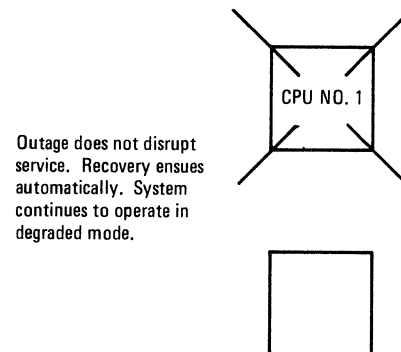
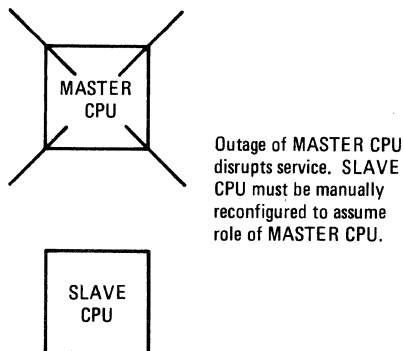
Honeywell Level 66 with GCOS

1100 Series with OS/1100

SUPERIOR PERFORMANCE



SUPERIOR FAILSOFT



DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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General Characteristics of GCOS-66

GCOS-66	
GENERAL	
Systems	Series 60 Level 66/10-66/80
Minimum Viable System	328KB(66/10 or 66/20)
Progenitor	Series 6000 GCOS and GE GECOS III
Status	Installed
DESIGN	
Objectives	Medium-large scale batch, transaction, and interactive processing (small FORTRAN/ COBOL jobs)
Implementation	Real memory (can be construed as virtual). Dynamic overlay using variable size segments. Activities ¹ allocated contiguous 1024-word blocks (4K bytes). User can dynamically request additional blocks. Activities can be compacted to make noncontiguous areas contiguous. Future NSA (New System Architecture) will feature distributed memory management with multiple address spaces and 4KB fixed pages.
CPU Hardware Assists	Future NSA will have new registers, special instructions, associative memory, stack processing facility. IOM will have paging mechanism to transfer pages randomly throughout main memory, obviating new lists of data control words (DCW's).
Multiprocessing	Tightly Coupled (66/40-66/80) and shared disk. Multiple copies of executive system.
SUPERVISOR FACILITIES	
Batch Multiprogramming	1–52 jobs (63 activities/job)
Nucleus (minimum)	32 + 0.5 – 1.0KW/user
Spooling	Integral
Device Independency	Yes
Remote Batch	Integral
Transaction Processing	Transaction Processing System (TPS), Transaction Driven System (TDS) Executive and Management Data Query System (MDQS/II) IDS-2 interface; datacomm constructs in COBOL '74
Time-sharing	Separate T/S Exec., slave to GCOS
Concurrent Users	1–200 (plus batch)
System Security	Centralized control via file system, user validation, passwords, monitor access attempts, lock-byte mechanism
Recovery Management	HEALS, TOLTS, POLTS, MOLTS, SOLTS, COLTS, fail-soft capability
Emulation Support	Series 200/2000

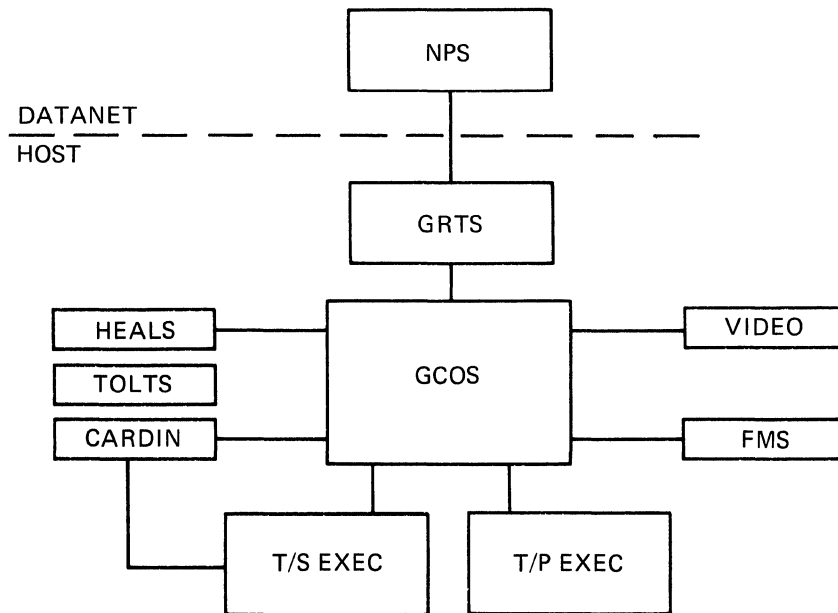
¹A GCOS activity is a single program operation such as FORTRAN compilation or an object program execution.
A GCOS job is a set of related activities that together constitute a logical computer application.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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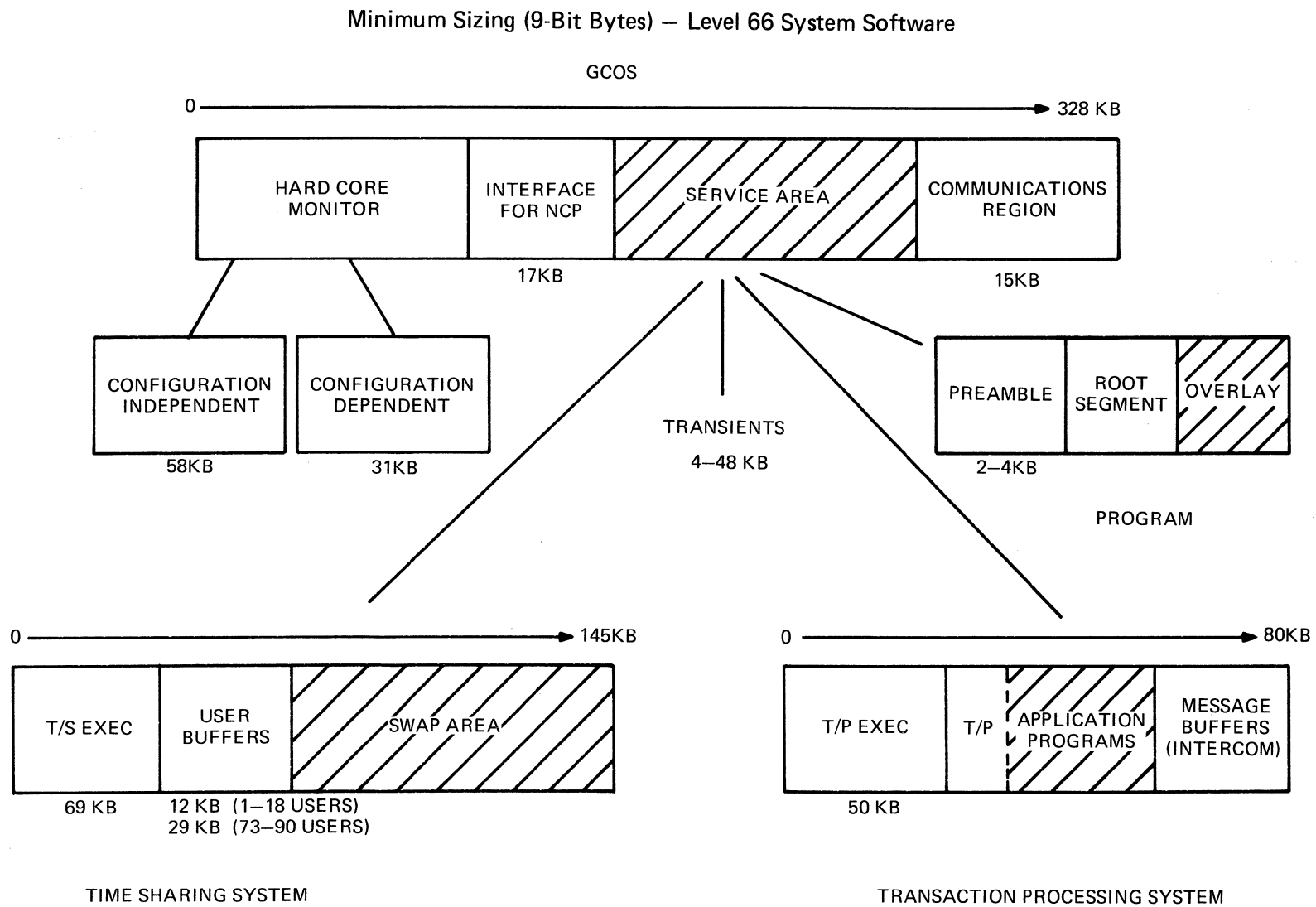
GCOS Software Size Estimator

Software Module	Resident Required (36-Bit Words)	Viable System (36-Bit Words)
Basic GCOS Monitor	32K + 0.5 to 1.0K/User	82K
Time-sharing Supervisor (TSS)	37K (minimum)	82K
Transaction Processing Supervisor	14K	82K
Transients	1–14K	—
File Management Supervisor	5K/Program	—
Runtime Module	32K	—
Utilities: File Create/Delete/ Modify/Catalog	4K/Program	—
Network Processing Supervisor (NPS) (DATANET 6600 Interface)	5K	—
IDS/I		
COBOL Preprocessor	32K	—
Runtime Processor	4–12K/Program	—
Data Query (under TSS)	4–7K	—
Management Data Query (MDQ)		
Under TSS	4–5K	—
Under Batch GCOS (for Creation of information used on-line)	16–32K 13K (minimum)	— —
Transaction Processor (entry)	13K (minimum)	—
COBOL '74	—	131K
PL/1	—	196K
Series 70 to Level 66 COBOL	33K	—
Computerized Publication System	16K	—
General Purpose Simulator System	32K	—
NASTRAN	60K	—
MATHPAC	10–20K	—
ASTRA-DISK (PERT/CPM)	36K	—
Advanced Numerical Control	40K	—
BMD Statistics	16–44K	—
Linear Programming System	36K	—
Bank Information System Network (BISNET)	62K	—
Check Handling Executive Central System (CHECKS)	—	131K

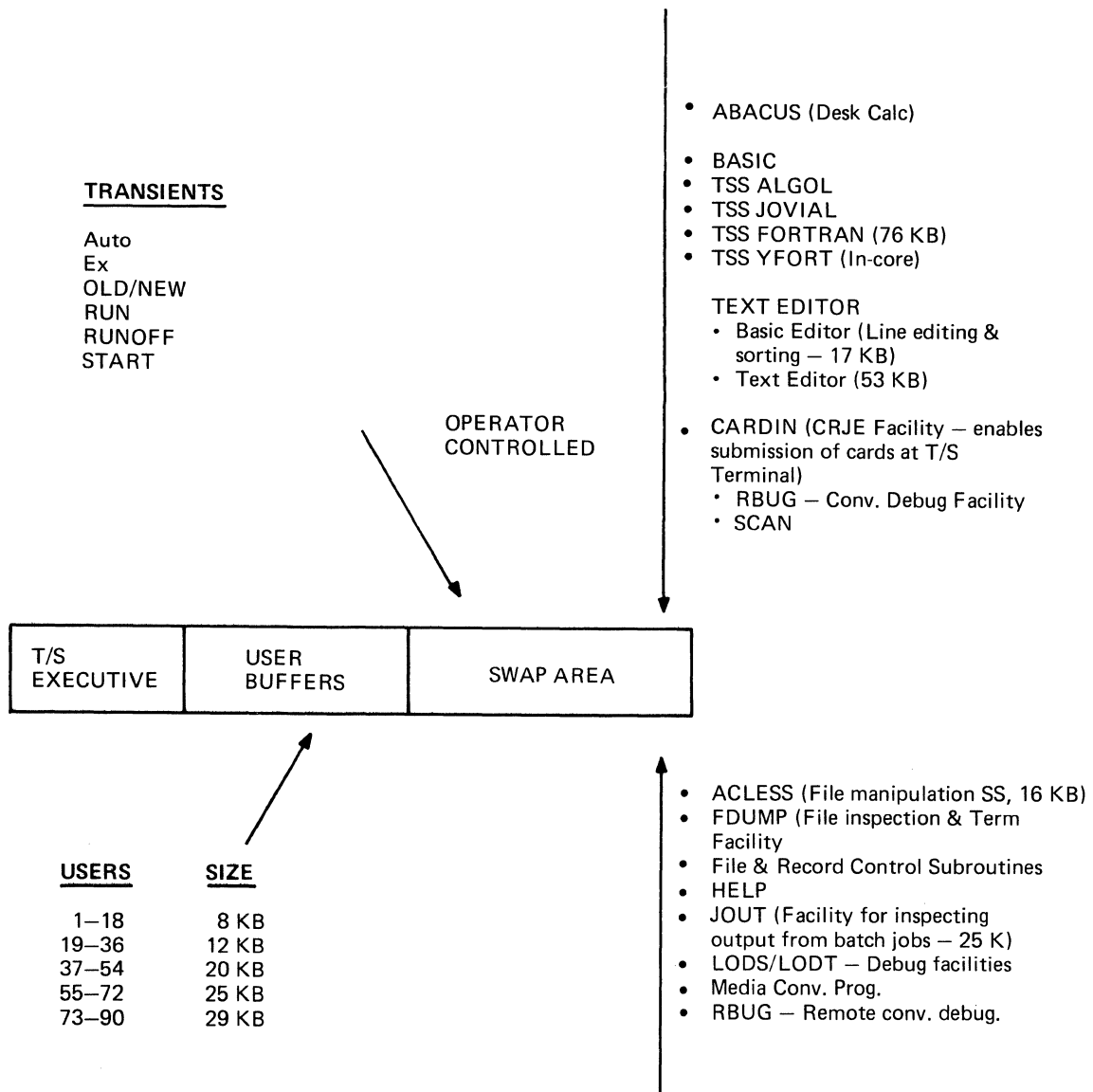
Major Level 66 System Software Components



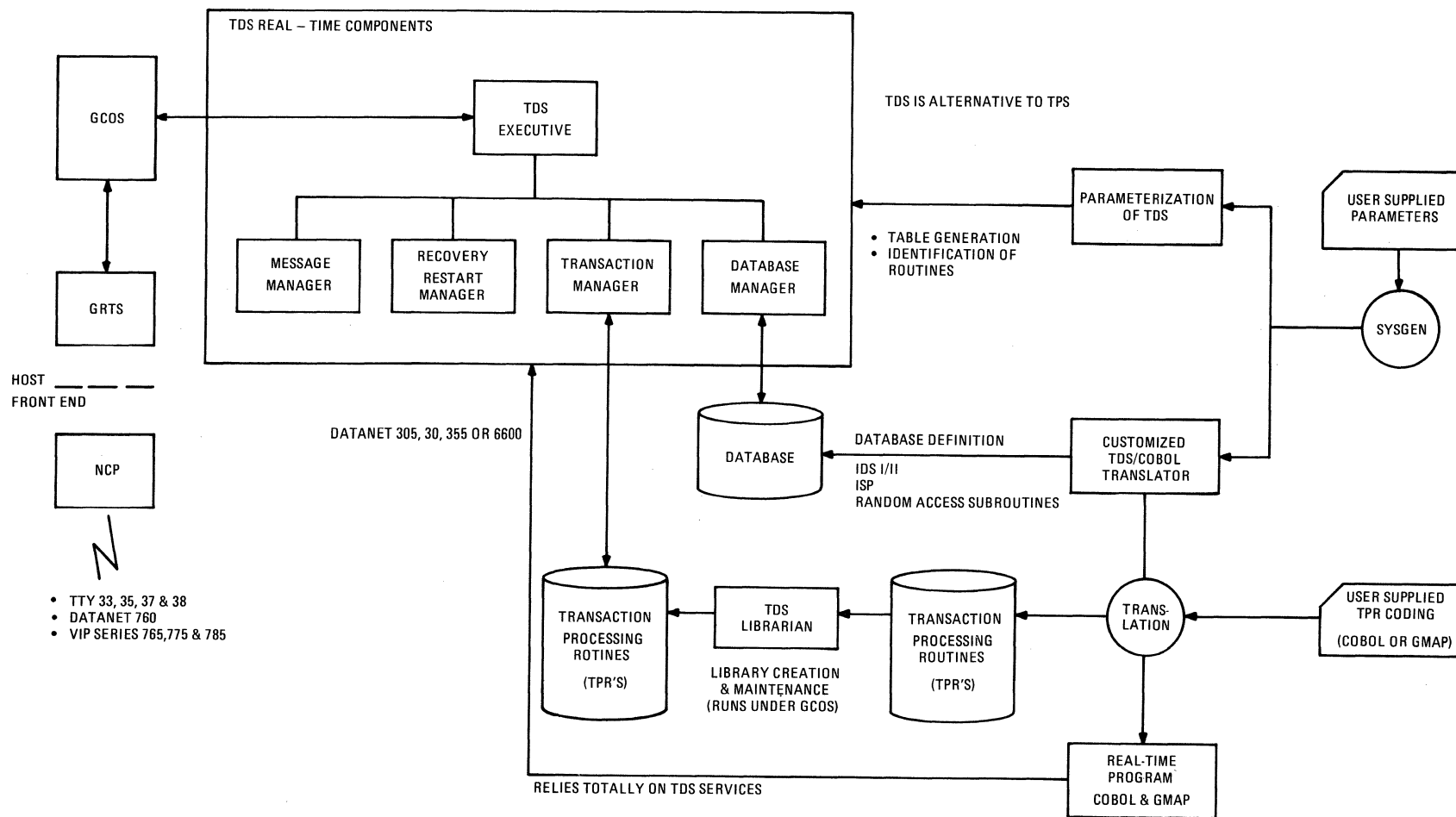
- GCOS:** Generalized Comprehensive Operating Supervisor
- T/S Executive:** Subsystem that runs under control of GCOS and controls total time sharing environment.
- T/P Executive:** Subsystem that runs under control of GCOS and controls transaction processing environment.
- GRTS:** Generalized Remote Terminal Supervisor.
- NPS:** Network Processing Supervisor; runs in DATANET 355/6600.
- HEALS:** Hardware Error Analysis and Logging System
- VIDEO:** Visual Information Display for Efficient Operation — program that displays system operating statistics on a VIP terminal or System Control Center.
- CARDIN:** Time sharing subsystem establishing a terminal/batch interface for conversational RJE.
- FMS:** File Management Supervisor — supervisor supplementing the file services in GCOS and GCOS subsystems, and providing centralized file control services including cataloging; control of mass storage space, prevention of unauthorized access, protection against incomplete or incorrect update, and protection against concurrent usage.
- TOLTS:** Total On-Line Testing System.



Level 66 T/S System

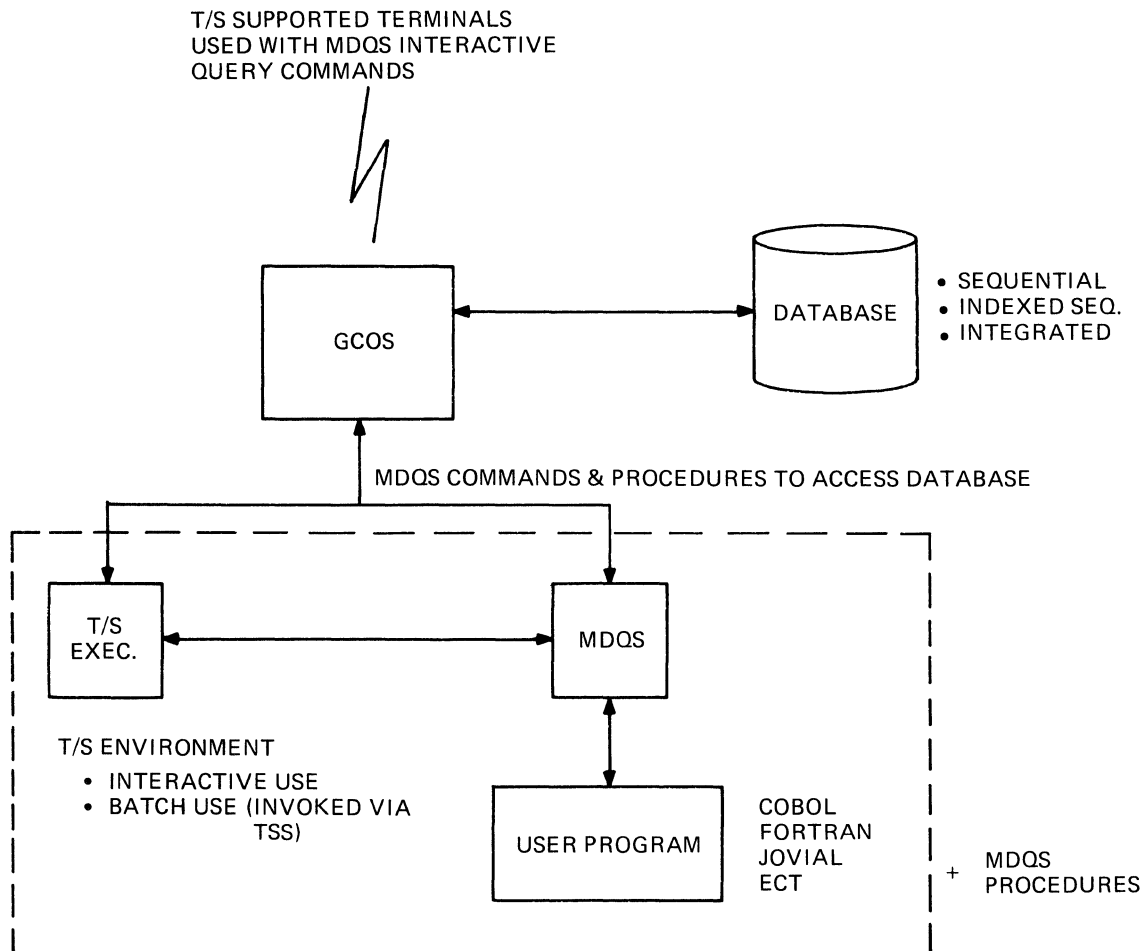


Honeywell Level 66 Transaction Driven System



- TTY 33, 35, 37 & 38
- DATANET 760
- VIP SERIES 765, 775 & 785

Honeywell Level 66 Management Data Query System – MDQS/II



SIZING INFORMATION

QUERY FACILITIES.	16 – 28 KB
BATCH PROGRAMS TO CREATE ON-LINE DATA.	16 – 128 KB
TSS INTERFACE.	16 – 20 KB

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Honeywell Product Strategy

- Building Block Architecture

Series 60 Level 64, 66 and 68 system designs feature the use of programmed mini's to attach all peripherals, data communication lines and a 200/2000 CPU for emulation. This building block or distributive processing design lowers manufacturing costs, provides flexible interfacing support, hedges against obsolescence, and improves performance via GCOS offloading and operational simultaneity.

- Flexible System Design

Level 66 systems use one basic processor that can be slowed or accelerated to define distinct models for marketing purpose. A proliferation of new Level 66 models is expected in the future. The new models will be slightly extensively enhanced versions of current Level 66 models.

- Time Sharing Emphasis

Level 68 models: 68/60 and 68/80 and Level 66 models: 66/07, 66/17 and 66/27 are optimized for time sharing. Developmental problems that have plagued the Level 68 MULTICS systems have been overcome. Many of the Xerox customers use time sharing. GCOS provides excellent time sharing support as does the Dartmouth Time Sharing System (DTSS). Honeywell uses time sharing extensively in-house and offers time sharing services via its DATANETWORK.

- Joint Agreements

In order to maximize its return on investments in R & D, Honeywell has entered into agreements with Control Data and Nippon Electric. Control Data (2/3's) and Honeywell (1/3) jointly own Computer Magnetics, a company that designs, develops, and manufactures disk and tape products. Nippon Electric supplies software for Level 64 systems. Additional joint agreements are anticipated in the future.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Honeywell Market Strategy

- Target Marketing — With its pre- and post-sales resources constrained due to cutbacks, Honeywell appears to focus its efforts only on prospects where its chances of success are 50/50 or better. In the U.S. Honeywell has recently re-aligned its sales force to include separate new business and existing business branch organizations, with more industry specialization, e.g., Government (S&L), Education, and Medical, Manufacturing, Financial, etc.
- Aggressive Marketing — After a prospect is qualified, Honeywell may try:
 - Low balling — GCOS is modular and relatively low in overhead
 - Offering “free” turnkey conversions — numerous soft conversion aids and captive T/S installations are used to perform conversions (and prepare benchmarks). In France, the French Government will underwrite the costs of converting from a competitor’s system.
 - Discounting 25 to 50% — because Level 66 build costs are low relative to series 6000 and Level 66 GCOS is essentially series 6000 GCOS, Level 66 profit margins are high permitting Honeywell to extend large discounts. Honeywell also appears to be willing to risk a lost leader if opportunities exist for substantial future add-on and upgrade business.
 - Last minute deals — if possible, Honeywell often may reserve its best deal until the last minute when all of its competitive responses are known.

Honeywell salesmen are often astute at biasing an RFQ in favor of Level 66 strengths: Time sharing, COBOL processing, and data communications.

- Proposing Unannounced Products and Capabilities — Since the introduction of Series 60 in April 1974, Honeywell appears to have become remiss in publicly announcing all of the products and capabilities it sells. The following “unannounced” products and capabilities have been encountered in sales situations:
 - Multiprocessing support for 66/10 and 66/20 (apparently an RPQ item).
 - Main store capacities beyond specified limits for 66/10 (most of the memory constraints on smaller scale Level 66 models are marketing constraints).
 - Large Core Storage support for Level 66 models.
 - 6008, a non-EIS 6030 CPU capable of using Level 66 peripherals.
 - 66/41, a special packaged time sharing version of the 66/40.
- Recycling Of Earlier Systems — Returned 6030’s and 6050’s are currently being recycled as 6031’s. 6031’s are price reduced fully packaged successors to the 6023’s offered on a purchase (outright or installment) basis.
- Establishing National Identities — In Europe, where strong nationalism exists, Honeywell has cultivated strong relationships with the French and Italian Governments and has become the “preferred” vendor.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Honeywell Discount Determinants

- Incumbent vendor
- Competition
- Conversion requirements
- Potential for add-on and upgrade business
- Experience value
- Chances of success
- Product fit — hardware and software
- Availability of pre- and post-sale systems support
- Branch and district sales records to date
- Time position within product cycle
- Unbundled charges
- Purchase or lease

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Honeywell Level 66 Contracts

- Leases
 - 1, 3, and 5-years (standard)
 - Unlimited use of peripherals
 - 176-hours use of mainframe (1 and 3-year leases)
 - Bundled prime shift (1-hours/day) maintenance
 - 5% price escalator
- Purchase option credits
 - Mainframe: 12 months @ 55% of net lease rate (less maint)
 - Peripherals: 12 Months @ 45% of net lease rate
- 10% Education discount on lease or purchase (66/10 and 66/05 excluded)
- Separately priced software and services (selected compilers and applications)
- Custom financing arrangeable via financial subsidiaries
- No specific S & L Government Plan
(Changes liberally made to standard contracts)

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Honeywell 66/10 Configuration

		Qty	Leases (Gross)*			Purchase	
			1-Yr	3-Yr	5-Yr	Price	Maint
CPS6106	66/10 (512 KB)	1	\$ 9,066	\$ 8,886	\$ 8,628	\$ 431,820	\$ 904
MXF6003	IOM Expansion	1	467	459	444	23,365	37
MXF6002	IOM Data Rate Exp.	1	516	499	459	23,720	35
CSU6001	System Console (no CRT)	1	718	703	681	36,239	59
MGS6001	Motor Generator	1	367	345	318	15,428	38
			<u>\$11,124</u>	<u>\$10,892</u>	<u>\$10,530</u>	<u>\$ 530,572</u>	<u>\$1,073</u>
MSP0600	Mass Storage Proc.	1	\$ 1,048	\$ 957	\$ 909	\$ 38,195	\$ 77
MSF1021	Dual Simult. Chan	1	1,170	1,068	1,015	37,400	157
MSF1023	Device Adapter	1	310	283	269	11,475	24
MSA1027	Addressing Capability	1	173	158	151	6,300	14
MSU0400	Disk Drive (117 MC)	4	2,344	2,140	2,040	87,600	344
MSF0002	Dual Access	4	236	216	204	8,280	40
MSF0004	Rot. Position Sensing	4	232	212	204	8,120	40
			<u>\$ 5,513</u>	<u>\$ 5,034</u>	<u>\$ 4,792</u>	<u>\$ 187,370</u>	<u>\$ 696</u>
MTP0600	Mag Tape Proc.	1	\$ 760	\$ 738	\$ 683	\$ 25,740	\$ 117
MTA1041	Addressing Capability	1	5	5	5	210	0
MTU0410	MT Unit (120 KC)	4	1,320	1,272	1,236	49,640	240
MTF0011	16 bpi Option	4	376	344	324	12,240	68
			<u>\$ 2,461</u>	<u>\$ 2,359</u>	<u>\$ 2,248</u>	<u>\$ 87,830</u>	<u>\$ 425</u>
URP0601	Unit Record Proc.	1	\$ 479	\$ 469	\$ 456	\$ 19,562	\$ 24
PRU1200	1200 lpm Belt Printer	1	1,296	1,182	1,126	44,420	310
URA0054	Addressing	1	190	174	165	6,826	15
CRU1050	1050 cpm Reader	1	546	495	473	19,240	108
URA0052	Addressing	1	201	197	190	7,209	29
			<u>\$ 2,712</u>	<u>\$ 2,517</u>	<u>\$ 2,410</u>	<u>\$ 97,257</u>	<u>\$ 486</u>
DCP6624	DCP (48KB), Console	1	\$ 1,843	\$ 1,683	\$ 1,603	\$ 81,780	\$ 179
DCU6202	Gen Comm Base	1	705	684	625	30,000	139
DCF6010	2-lines @ 2400 bps	4	296	272	252	12,480	44
			<u>\$ 2,844</u>	<u>\$ 2,639</u>	<u>\$ 2,480</u>	<u>\$ 124,260</u>	<u>\$ 462</u>
			<u>\$24,654</u>	<u>\$23,441</u>	<u>\$22,460</u>	<u>\$1,027,289</u>	<u>\$3,052</u>

Software Charges

ANS COBOL '74. \$178/month
IDS II 800/month

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Small Honeywell 66/40 System

Model Mainframe	Description	Qty	1-Yr Gross Lease	5-Yr Gross Lease	Purchase	Maint
CPS6402	CPU, IOM, 131KW	1	\$24,918	\$23,672	\$1,220,975	\$1,854
MXF6002	IOM Date Rate Exp	1	516	459	23,720	35
CSU6001	System Console	1	125	107	2,246	12
MGS6002	Motor Generator	1	428	291	10,800	16
			<u>\$25,987</u>	<u>\$24,529</u>	<u>\$1,257,741</u>	<u>\$1,917</u>
<u>Mass Storage</u>						
MSP0600	MS Processor	1	\$ 1,048	\$ 909	\$ 38,195	\$ 77
MSF1023	MSU0400 Adapter	1	310	269	11,475	24
MSA1027	MSU0400 Addressing	1	173	151	6,300	14
MSU0400	Disk Drive (8430)	4	2,344	2,040	87,600	344
MSF0004	RPS Feature	4	232	204	8,120	40
M4050	Disk Pack (100MB)	4	—	—	—	—
			<u>\$ 4,107</u>	<u>\$ 3,573</u>	<u>\$ 151,690</u>	<u>\$ 499</u>
<u>Magnetic Tape</u>						
MTP0601	MT Processor	1	\$ 760	\$ 683	\$ 25,740	\$ 117
MTA1042	MTU0600 Addressing	1	5	5	210	0
MTU0600	MT Unit (320KB, 1600 bpi)	4	2,412	2,100	81,720	308
			<u>\$ 3,177</u>	<u>\$ 2,788</u>	<u>\$ 107,670</u>	<u>\$ 425</u>
<u>Paper I/O</u>						
URP0601	Unit Rec Processor	1	\$ 479	\$ 456	\$ 19,562	\$ 24
PRU1200	Belt Printer (1200 lpm)	1	1,296	1,126	44,420	310
URA0012	PRU1200 Addressing	1	166	158	7,535	14
PRB0500	Print Belt	1	91	78	2,460	47
CRU1050	CR (1050 cpm)	1	546	473	19,240	108
URA0052	CRU1050 Addressing	1	201	190	7,209	29
			<u>\$ 2,779</u>	<u>\$ 2,481</u>	<u>\$ 100,426</u>	<u>\$ 532</u>
<u>Data Comm</u>						
DCP6624	Datanet (48KB)	1	\$ 1,843	\$ 1,603	\$ 81,780	\$ 179
DCF6001	Asynch Adapter	1	5	5	240	0
DCF6027	Asynch Chan Group	1	85	74	3,600	13
DCF6013	Synch Chan Interface	9	765	666	32,400	117
			<u>\$ 2,698</u>	<u>\$ 2,348</u>	<u>\$ 118,020</u>	<u>\$ 309</u>
			<u>\$38,748</u>	<u>\$35,719</u>	<u>\$1,735,547</u>	<u>\$3,682</u>

Software Charges

ANS COBOL '74 \$178/month
 IDS II 800
 Transaction Driven System 1,000

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Honeywell 66/40 Dual CPU Configuration

Model	Description	Qty	1-Yr Gross Lease	5-Yr Gross Lease	Purchase	Main
PS6403	66/40 (196K)	1	\$27,022	\$25,668	\$1,326,335	\$1,981
PU6400	2nd CPU	1	13,934	13,238	668,866	1,028
PA6001	CPU Addressing	3	1,050	999	54,045	75
XC6001	System Controller	1	584	555	28,300	39
XU6001	IOM	1	3,609	3,249	175,055	232
XA6001	IOM Addressing	3	1,050	999	54,045	75
XF6002	Data Rate Expansion	2	1,032	918	47,045	70
SU6001	System Console	1	718	681	36,239	59
GS6002	Motor Generator	1	428	383	18,236	46
			<u>\$49,427</u>	<u>\$46,690</u>	<u>\$2,408,561</u>	<u>\$3,605</u>
SP0600	Mass Store Processor	1	\$ 1,048	\$ 909	\$ 38,195	\$ 77
SP0601	Mass Store Processor	1	1,698	1,477	61,885	114
SF1019	Nonsimult Switched Chan	2	452	404	15,840	24
SF1023	Device Adapter	2	620	538	22,950	48
SA1027	Disk Addressing	4	692	604	25,200	56
SA1030	Dual Channel Addr	4	20	20	840	0
SF1031	Cross Bar	1	1,125	976	26,000	118
SU0451	Disk-200MB	16	13,744	11,935	509,120	1,456
SF0002	Dual Access	16	944	816	33,120	160
TP0600	Mag Tape Processor	1	760	683	25,740	117
TA1042	Addressing	2	10	10	420	0
TU0500	MT Drive	6	2,844	2,640	99,660	390
TF0012	800/1600 Density	6	714	624	23,640	174
			<u>\$24,671</u>	<u>\$21,637</u>	<u>\$ 860,210</u>	<u>\$2,734</u>
RP0601	Unit Rec Processor	1	\$ 479	\$ 456	\$ 19,562	\$ 24
RU1200	LP-1200 lpm, belt	2	2,592	2,252	88,840	620
RA0054	Addressing Capability	2	380	330	18,652	30
RB0500	Print Belt	2	182	156	4,920	94
PU1050	CR-1050 cpm	1	546	473	19,240	108
RA0052	Addressing Capability	1	201	190	7,209	29
CU0120	CP-100 to 400 cpm	1	495	427	17,470	70
RA0050	Addressing Capability	1	112	107	4,050	4
			<u>\$ 4,987</u>	<u>\$ 4,391</u>	<u>\$ 174,943</u>	<u>\$ 979</u>
CP6624	Datane (48KB)	2	\$ 3,686	\$ 3,206	\$ 163,560	\$ 358
CF6013	CommChan Interface-Synch	16	1,360	1,184	57,600	208
CF6025	Async Speed Adapter-300 bps	2	20	20	480	0
CF6027	Asynch Chan Group	2	170	148	7,200	26
			<u>\$ 5,236</u>	<u>\$ 4,558</u>	<u>\$ 227,840</u>	<u>\$ 592</u>
			<u>\$84,321</u>	<u>\$77,276</u>	<u>\$3,671,554</u>	<u>\$7,910</u>

Software Charges

ANS COBOL '74	\$178/month
IDS II	800
Transaction Driven System	1,000

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Honeywell 66/60 Configuration

Model	Description	Qty	1-Yr Gross Lease	5-Yr Gross Lease	Purchase	Maint
PS6624	66/60 (256K)	1	\$36,569	\$34,740	\$1,773,590	\$2,260
SU6001	System Console	1	718	681	36,239	59
SU6002	Sys Control Center	1	125	107	2,246	12
GS6001	Motor Generator	1	357	318	15,428	38
KF6002	IOM Data Rate Exp	1	516	459	23,720	35
			<u>\$38,385</u>	<u>\$36,305</u>	<u>\$1,851,203</u>	<u>\$2,414</u>
SP0601	Mass Store Processor	2	\$ 3,396	\$ 2,954	\$ 123,770	\$ 228
SU0451	Disk Drive — 200MB	12	10,308	8,952	381,840	1,092
SF1023	Adapter	2	620	538	22,950	48
SA1027	Device Addressing	3	519	453	18,900	42
SA1030	Dual Channel Addressing	3	15	15	630	0
SF0007	Rot. Position Sensing	12	696	612	24,300	120
SF0002	Dual Access Feature	12	708	612	24,840	120
SF1031	Dual Access X-Bar	1	1,125	976	36,000	118
GF1019	Switched Channel	1	226	202	7,920	12
TP0600	MT Processor	1	760	683	25,740	117
TF1041	Dual Channel	1	1,229	1,097	41,580	141
TU0500	MT Drive — 200KB, PE	12	5,688	5,280	199,320	780
TA1041	Device Addressing	3	15	15	630	0
			<u>\$25,305</u>	<u>\$22,389</u>	<u>\$ 908,420</u>	<u>\$2,818</u>
RP0600	Unit Record Processor	1	\$ 620	\$ 589	\$ 25,319	\$ 32
RU1050	CR—1050 cpm	2	1,092	946	38,480	216
RA0052	CRU1050 Addressing	2	402	380	14,418	58
CU0120	CP—100 to 400 cpm	1	106	101	4,030	28
RA0050	PCU0120	1	112	107	4,050	4
RU1200	LP—1200 lpm belt	4	5,184	4,504	177,680	1,240
RA0054	PRU1200 Addressing	4	760	660	27,304	60
RA0012	LP Addressing Expansions	1	166	158	7,535	14
RB0500	63 Character Belt	4	364	312	9,040	188
RF0040	Unit Record Addressing	1	22	20	936	2
			<u>\$ 8,828</u>	<u>\$ 7,777</u>	<u>\$ 308,792</u>	<u>\$1,842</u>
CP6624	FE Processor	1	\$ 1,843	\$ 1,603	\$ 81,780	\$ 179
CF6001	Asynch Adapter	1	5	5	240	0
CF6027	Asynch Chan Group	1	85	74	3,600	13
CF6013	Synch Chan Interface	9	765	666	32,400	117
			<u>\$ 2,698</u>	<u>\$ 2,343</u>	<u>\$ 118,020</u>	<u>\$ 309</u>
			<u>\$75,216</u>	<u>\$68,819</u>	<u>\$3,186,435</u>	<u>\$7,383</u>

Software Charges

ANS COBOL '74	\$178/month
IDS II	800
Transaction Driven System.	1,000

PAGE	PAGE REV	TITLE	DOCUMENT NO.
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**Honeywell Worldwide
600/6000/Level 66 & 68
Installations As of 3rd
Quarter 1976**

United States	450
France	110
Italy	65
Canada	35
Germany	30
U.K.	25
Iran	20
Finland	15
Australia	15
Spain	15
Switzerland	12
Russia	10
Belgium	10
Norway	10
Yugoslavia	10
Sweden	10
Netherlands	10
15 Other Countries	1—5 each

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Honeywell Customers

Government

State of Colorado (Employment Security)	Dual	66/40
State of Illinois (Secretary of State)	Dual	6060
State of Michigan (Welfare)	Triple	6080
State of Louisiana	Dual	6080
State of Louisiana	Dual	6060
State of Arizona	Dual	6060
State of Maine	Dual	6060
State of Oregon		6060
State of Texas		66/10
State of New York		6060
State of New Hampshire		6060
City of Phoenix	Dual	6040
City of Houston	Dual	6060
City of Llobrega, France		6025
City of Tulsa, Oklahoma		6040
City of Buffalo, New York		66/10
City of Oklahoma City		66/10
City of Zurich, Switzerland	Dual	6060
City of Glasgow, Scotland		6040
City of Waco, Texas		6025
City of Scottsdale, Arizona		6025
City of Vancouver, Canada		6040
Town of Hospitalet, Spain		6025
Maricopa County, Arizona	Dual	6040
Montgomery County, Pennsylvania		6008
Lanarkshire County		6040
Toluca Provine, Mexico		66/20
Charleston County, South Carolina		66/20
Iraq	(4)	66/10
U.S. National Geological Survey	(3)	68/80
NASA, Virginia	Dual	600
National Capitol Commission, Ontario		6030
Washington Naval Shipyard, D.C.		6060
Naval Avionics, Indianapolis		600
JTSA, Virginia		6060
Long Beach Naval Shipyard, California		6060
Mare Naval Shipyard, California		6060
Traffic Management Command		6060
NASA, Florida		600
DIA, Washington, D.C.		600
DOD, Maryland		600
FCC, Washington, D.C.		6025
Wright Patterson AFB, Ohio		600
NORAD, Colorado	Dual	6080
SAC, Nebraska	Dual	6080

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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ADI, Nebraska		6080
Bernalille County, New Mexico		66/20
Shelby County, Tennessee		66/40
Jefferson County, Colorado	Dual	66/20
USAF Communications Service, Kansas City		6060
USAF Data Service Center, Washington		600
Air Force Design Center, Alabama		6060
Charleston Naval Shipyard, South Carolina		6060
CONAD, Colorado		6080
Military Air Transport, Illinois		6080
Army Corp of Engineers, Mississippi		600
Maritime Administration, Washington, D.C.		6060
NMCSSC, Washington, D.C.	Dual	6080
U.S. Treasury, Washington, D.C.		6060
U.S. Department of Interior, Colorado		66/60
Ministry of Transportation, British Columbia		66/60
Civil Service Commission, Virginia	Dual	66/80
NASA, Florida		66/80
Naval Sea Systems Command		6060
Philadelphia Naval Shipyard, Pennsylvania		6060
Portsmouth Naval Shipyard, New Hampshire		6060
Puget Sound Naval Shipyard, Washington State		6060
Rome ADC, New York		68/80
Revenue Taxation, Ontario	Dual	6040
TAC/ADU, Virginia		6060
ATC/ACDS, Texas		6060

Education

Massachusetts Institute of Technology		68/80
University of Kansas		66/60
U.S. Military Academy		600
U.S. Naval Academy		6060
Milwaukee Area Technical College		66/20
University of Alaska		68/80
University of S.W. Louisiana	Dual	66/40
Dartmouth College		6030
Universita Pavia, Italy		6040
University of Portland		600
Calvin College		6025
Hayward Schools		6023
Middle Tennessee State University		6025
Oakland Public Schools		6025
City College of San Francisco		6025
Oregon Department of Higher Education		66/40
McComb City College		6025
University of Louisville, Kentucky		6070
St. Louis University		6025
Indianapolis Public Schools		66/10

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

Waterloo University, Canada	Dual	6060
Cuyahoga Community College		66/10
Bologna University, Italy		6030
Nationale Education, France		6030
National Science Foundation		6040
Kent State		6040

Medical

Sisters of Mercy Hospital, Portland, Oregon		6040
South Carolina Memorial Hosp., Charleston, S.C.		66/40
State of N.Y. Medical Center, Syracuse, N.Y.		6030
Good Samaritan Hospital, Phoenix, Arizona	Dual	600
Upstate Medical Center, Syracuse, New York		6040
North Carolina Baptist, Winston-Salem, N.C.		6040
Massachusetts Blue Cross, Boston		66/60
Massachusetts Hospital Association, Boston		66/40
Michigan Blue Shield, Lansing, Michigan		6025
Hyks Hospital, Helsinki, Finland		66/20
Orange Memorial Hospital, Orlando, Florida		66/10
CPHA Health Services, Ann Arbor, Michigan		6060
Colorado Hospital Services, Denver		6040
Arizona Blue Cross, Phoenix, Arizona	Dual	66/40
Charity Hospital, New Orleans, Louisiana		6060
Bernalillo City Medical Center, Albuquerque, N.M.		6025

Communications/Services

Honeywell Datanetwork Services, Minneapolis		6080
Leggs Data Center, Atlanta		6025
G.E. Information Services, Cleveland	Dual	6080
MacMillan, Inc., Delran, New Jersey		66/40
A. C. Nielsen, Green Bay, Wisconsin		6040
Air Canada, Quebec	Dual	6080
Bell Telephone Laboratories, New Jersey	Triple	6070
Dentsu Advertising, Japan		6060
Fidelity Amer. Computer Services, Lynchburg, Va.		6060
Field Enterprises, Chicago		6060
Interstate Business Services, Akron, Ohio		66/10
Copenhagen Telephone, Denmark		66/40
GTE Data Services, Tampa		66/20
G. M. Information Services, Detroit		68/80
J. J. Johnson Enterprises, Houston		66/20
Ohio Bell Telephone, Cleveland		6050
Computer Sharing Services, Denver		66/60
Mountain Bell Telephone, Denver	Dual	6080
Northwest Computer Services, Minneapolis		6040
United Engineers, Philadelphia		66/60
Management Systems Design, Lafayette, La.		66/20
Southern Bell Telephone, Atlanta		66/60

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Manufacturing & Distribution

ATO, Willoughby, Ohio		6060
Best Products, Richmond, Virginia		6060
Bowmar, Phoenix		66/20
Canadian General Electric, Ontario		6040
Crouse-Hinds, Syracuse, New York		6030
United Engineers (Raytheon), Phila.	Dual	66/60
Peterson, Howell, and Heather, Hunt Valley, Md.		6060
A. E. Staley, Decatur, Illinois		6025
Allegheny Ludlum Steel, Pittsburgh	Dual	6060
Alcoa, Newburgh, Indiana		600
ASEA, Sweden		6060
Kugelfischer, Germany		6060
Fieldcrest Mills, Eden, North Carolina		6030
FlexiVan, Secaucus, New Jersey		6040
Ford, Dearborn, Michigan	Dual	6080
Ford, Ypsilanti, Michigan	Dual	6060
Ford AAD, Nationwide	(19)	66/20
Brockton Edison, Boston		66/10
Eckerd Drug, Charlotte, North Carolina		66/20
Greenlee Bros, Rockford, Illinois		66/10
Chrysler, Detroit		66/20
Frigiking, Dallas		6025
G. D. Searle, Chicago	Dual	6060
Daniel International, Greenville, South Carolina	Dual	600
Dow Chemical, Plaquemine, Louisiana		600
Dowell, Tulsa		6040
Eddie Bauer, Redmond, Virginia		6040
Excello, Detroit		6060
G. E. Aerospace, Utica, New York	Dual	6060
G. E. Credit, Stamford, Connecticut		6040
G. E. Aircraft Engine, Cincinnati	Dual	6060
G. E. Mexico		600
G. E. Teleprocessing, Schednectady, New York	Dual	6080
G. E. Lamp, Cleveland		600
G. E. Aircraft Engine, Lynn, Massachusetts	Triple	6060
G. E. Military, Philadelphia	Dual	6060
G. E. Ordinance, Pittsfield, Massachusetts	Dual	600
G. E. Nuclear Energy	Triple	6070
Philco-Ford, Willow Grove, Pennsylvania		6040
Philco-Ford, Colorado Springs		6060
Philco-Ford, Palo Alto, California		6060
Philco-Ford, Newport Beach, California		6040
Pillsbury, Minneapolis	Dual	6080
Premier Industrial, Cleveland		600
Rubbermaid, Wooster, Ohio		6040
Rubbermaid, Winchester, Virginia		6040
Rucker Co., Oakland, California		6025
Jones & Laughlin Steel, Pittsburgh	Dual	6060
Kerr McGee Oil, Oklahoma City		66/60
National Grocers, Ontario		6040
Purolator Services, Manhasset, New York		66/40

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Leisure Dynamics, Minneapolis		66/10
Maremont Corp., Nashville		66/60
Newport News Shipbuilding (Tenneco), Va.	Dual	6080
Globe Union, Milwaukee		6060
G. M. Parts Division, Flint, Michigan	Dual	6080
Hoffman-LaRoche, Nutley, New Jersey	Dual	6080
Hoffman Manufacturing, Dayton		66/20
Honeywell Micro Switch, Freeport, Illinois		66/20
Honeywell Corp., Minneapolis		6080
Magnetic Peripherals, Inc., Oklahoma City		600
J. C. Penney, New York City		6025
U.S. Steel, Pittsburgh	Dual	6060
W. A. Krueger, Milwaukee		600
Weyerhaeuser, Tacoma, Washington	Dual	66/60
Robert Hall, New York City		66/20
Sun Chemical, Fort Lee, New Jersey		66/10
Union Carbide, New York		66/10
S. C. Johnson, Racine, Wisconsin		6060
Smith, Hinchman, & Grylls, Detroit		600
Talley Industries, Thomaston, Connecticut		6060
Tenneco, Houston	Dual	6080
Texas Eastern, Houston	Dual	66/60
Shibaura Electric, Japan		6080
Turner, Collie, & Braden, Houston		6025

Financial

CBC Bank, Australia		6040
Credito Commerciale, Italy	Dual	6040
Bank of Verona, Italy	Dual	6030
Bisque Provincial, Canada	Dual	6080
Australia-New Zealand Bank, Australia	Dual	6080
Banco Popo Luino, Italy		66/10
Hungarian National Bank, Hungary	Dual	66/20
Credito Italiano, Italy	Dual	6070
Andresens Bank, Norway	Dual	6040
Bank Viscaya, Spain		66/60
Virginia Federal Savings Bank, Richmond		66/20
Sunbank, Orlando, Florida	Dual	66/60
First National City Bank, New York City	Dual	66/40
Merchants National Bank, Mobile, Alabama	Dual	6025
Northwest Bank, Minneapolis, Minnesota	Dual	6080
CRCAM, Rennes, France		6030
Fulton National Bank, Atlanta	Dual	6080
Financial Computer Center, Schenectady, New York	Dual	6040
Cacso Bank, Portland, Maine		6040
Seattle First National Bank, Seattle, Wash.	Dual	6080
Security Trust, Rochester, New York	Dual	6060
Fidelity National Bank, Oklahoma City	Dual	6040
Harvard Trust, Boston, Massachusetts		6040
Bancohio, Columbus, Ohio	Dual	6060
Boston Five Cent Bank, Boston		6025

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
		KOP, Finland	Dual 6060
		BFG Bank, Germany	66/60
		Goss Bank, Russia	Dual 6040
		Discount Bank, Switzerland	6025
		SKOP, Finland	Dual 6040
		Banca Sella, Italy	66/20
		Bank of New South Wales, Australia	6040
		GZB, Austria	6040
		Assubel, Belgium	6060
		Union Des Assurance, France	Dual 6040
		Garantie Muluelle Des Fonctionnaires, France	Dual 6060
		M.A.I.F., France	Dual 6040
		Le Secours, France	6050
		Met Life, New York City	Dual 66/20
		La Providence Assurance	6025
		Chegaray, France	6040
		Debeka, Germany	6040
		La Genevoise, Switzerland	6030
		Rhine Moselle, France	66/10
		Suppertal, Germany	6040
		Seguros America, Mexico	66/20
		Assurances Generale, Belgium	Dual 66/40
		A. G. Edwards, St. Louis, Missouri	Dual 6060
		Farm Bureau Insurance, Lansing, Michigan	Dual 66/40
		Blyth Eastman Dillion, New York City	6060
		Financial Computer Center, Schednectady, New York	6040
		Colonial Penn Insurance, Phila.	66/60
		Banco Antonio Padova, Italy	66/20
		UCAB, Switzerland	66/20
		Tarrasa Savings Bank, Tarrasa, Spain	66/60
		Banco Pastor, Spain	66/20
		Banco De Mexico, Mexico	66/20
		Banco Del Monte, Italy	Dual 66/20
		Zavada, Yugoslavia	6030
		Delta Lloyd, Holland	6060
		Wurtembergische Feuerversicherung, Germany	6030
		Phoenix Soleil, Italy	6030
		Swiss Life, Switzerland	Dual 66/20
		Hancock Bank, Jackson, Mississippi	6025
		Prudential Federal Savings, Salt Lake City, Utah	66/10
		Societe Generale, France	Dual 6080
		Credit Agricole, France	6025
		Cial, France	6040
		Cum, France	Dual 6040
		Banca S. Paolo, Italy	6040
		Tietote Hdas, Finland	Dual 66/20
		Pari Bas, Belgium	6030
		Tokyo Met Fed Bank, Japan	6040
		Oko Bank, Finland	66/40
		Tarrasa Savings Bank, Spain	66/10
		Hungary National Bank, Hungary	600
		UCAB, Sweden	66/20

9.3 BURROUGHS SYSTEMS THAT COMPETE WITH 1100

Series	Burroughs Competition	Performance Estimates
1100/10	B3800 B4800 PM B6800 MP	1100/11 (without overlap) should offer performance comparable to B3800 and B6707 but less than B4800 and B6811. 1100/12 will substantially outperform a B4800 and B6811 but fall short of a B4800 PM and B6821 (2 x B6811). B3800 and B4800 performance overlaps that for B6807 and B6811 (uniprocessor models). B67/6800 are designed for general purpose processing; FORTRAN capabilities are, however, weak. B38/4800 are optimized for COBOL processing. B38/4800 and B6800 series are both optimized for database/data communications processing.
1100/20	B4800 PM B6800 MP	1100/21 should offer performance comparable to B4800 and B6811. 1100/22 performance should be commensurate with that of B4800 PM and B6821 (B6811 MP).
1100/40	B4800 PM B6800 MP B7700 MP	1100/41 (all primary) should substantially outperform B4800 and B6811 but fall short of a B7755 (1X). 1100/42 should outperform B4800 PM and B6821 but fall short of a B7765 (2X).
1100/80	B6800 MP B7700 MP	1100/81 should outperform a B7755 (1X) and 3 X B6800. 1100/82 should outperform a B7765 (2X).

PM—Parallel Multiprogramming (Shared Disk) System

MP—Tightly Coupled System

The above models are marketed worldwide.

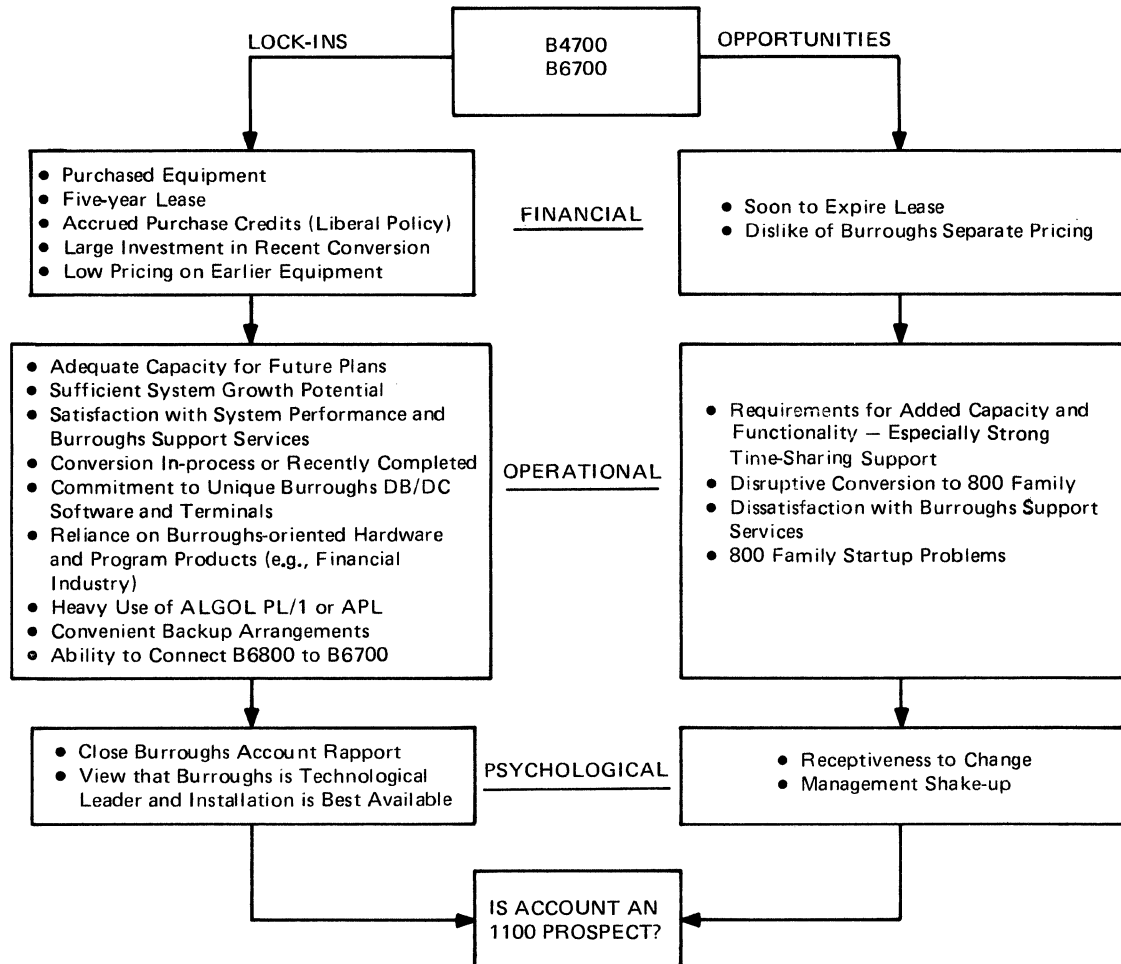
Currently Marketed Burroughs Models that Compete with 1100

Model	Description	Relative Performance		Variations/Comments
		VS IBM	VS Burroughs	
B3830	Single B3800 system	0.8 x M148	2.0 x B3700	B3831: B3830 with File Protect Memory B3832: Parallel Multiprogramming B3831
B4840	Single B4800 system	1.6 x M148	2.0 x B4700	B4841: B4840 with File Protect Memory B4842: Parallel Multiprogramming B4841
B6738	1 x 1 with removable disk for MCP residency	0.8 x M148	0.8 x B6748	Field upgradable to B6748; 2 x B6738 = 2 x 2 is lowest priced B6700 MP system
B6746	1 x 1 with earlier core (98 KB modules @ 1.2 μ sec)	0.8 x M148	—	Repackaged, price reduced earlier B6700 offered on purchase only basis.
B6748	1 x 1 with fixed disk for MCP residency	1.0 x M148	—	Fixed disk recommended but not mandatory; 2 x B6748 is legitimate and less expensive than B6750 with 2nd IOP
B6750	2 x 1	1.8 x M148	1.8 x B6748	Tightly-coupled design effects about 85% performance contribution from 2nd CPU
B6760	3 x 2	1.2 x M148-3	—	370/158-3 = 2.2 x M148; 3rd CPU adds 85%; expandable to 3 x 3
B6807	1 x 1	0.8 x M148	1.0 x B6738	Entry level B6800 model intended for new customers
B6811	1 x 1	1.8 x M148	2.2 x B6738 1.8 x B6748	Upgrade alternative for B6738 and B6748 customers
B6821	2 x 2	1.4 x M158-3	1.0 x B7755	370/158-3 = 2.2 x M148; can be expanded beyond 2 x 2
B7755	1 x 1	1.4 x M158-3	—	B7800 expected to be more than 2.5 x B7755 or about 1.2 x M168-3 = 3 x M158-3
B7765	2 x 2	2.6 x M158-3	—	Tightly-coupled design effects about 85% performance contribution from 2nd CPU
B7775	3 x 2	1.3 x M168-3	—	B7775 & B7765 are low priced MP alternatives to uniprocessor 370/168-3
B7785	4 x 2	1.7 x M168-3	—	Expandable to 4 x 4
Performance estimates are based on Burroughs claims.				

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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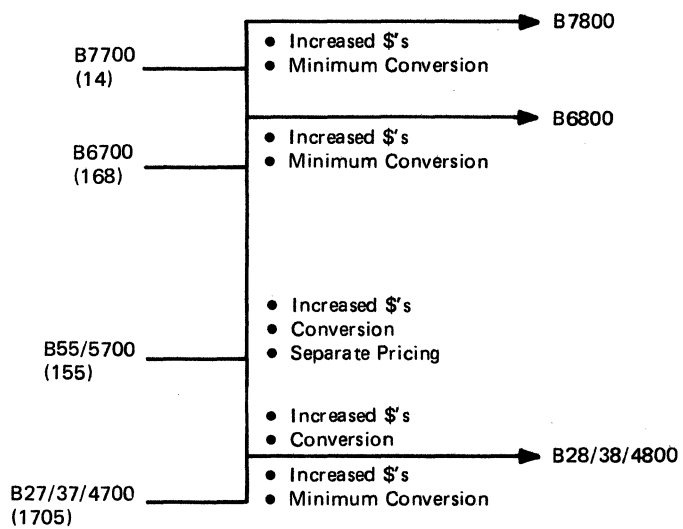
Qualifying Burroughs Accounts As 1100 Series Prospects

Burroughs Replacement Suspects



PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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700 to 800 Family Migration



() denotes estimated worldwide installations

Prospective Problems
- Delayed Deliveries - Startup Problems

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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**Why a prospect should buy an
1100/10 or 20 over a B4800**

1. Superior scientific processing performance — B4800 systems are optimized for COBOL based processing. They generally perform poorly in FORTRAN based processing, especially array manipulation. No "hard" index registers are implemented in the B4800. Arithmetic processing is decimal based.
2. Reentrant code support — no hardware reentrant support is implemented in the B4800. With the exception of selected interactive software, all B4800 software facilities are non-reentrant.
3. Tightly-coupled multiprocessing — tightly-coupled multiprocessing is not supported with B4800 systems . . . only parallel multiprogramming or shared disk multiprocessing. Parallel multiprogramming requires multiple copies of the B4800 MCP.
4. Growth potential — unlike B4800 systems, 1100 systems can be expanded to include more than one megabyte of main store and an additional processor.
5. System upgrades without conversion — B4800 systems are architecturally different than B67/68/7700 systems. The B4800 MCP is different than the B67/68/7700 MCP's. B4800 processing environments, unlike 1100 OS environments are not portable between models. B4800 to B67/68/7700 upgrades entail recompilations of application programs and installation support personnel reorientation.
6. Proven hardware & software — B4800 deliveries began six months later than scheduled. The 1st shipment occurred in August 1976. Initial installations run under MCP V.7. Native MCP support under MCP IV, originally scheduled for 3rd quarter 1976, is delayed. COBOL '74 and other selected software will not be available until 2nd quarter 1977.
7. Industry compatible 8430 type disk — Burroughs major disk products are based on 8440 type technology. Currently, Burroughs largest capacity disk (not deliverable until 2nd quarter of 1977) provides storage capacity comparable to the 8433. No 8450 counterpart is available.
8. 6250 bpi magnetic tape — no 6250 bpi magnetic tape is available. STC, however, can install 6250 bpi drives on B4800 systems on a plug-compatible basis.
9. 2000 lpm band printer — Burroughs fastest "quality print" printer is a 1500 lpm (at 48 character set) train printer. The fastest printer is an 1800 lpm drum printer, OEM from Data Products.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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10. CODASYL compatible DMS – DMSII does not comply with CODASYL standards.
11. One price service – DMSII, conversion aids, and other selected Burroughs B4800 software products are chargeable.
12. On-call maintenance option for lease customers – “standard” Burroughs policy requires 5-year lease customer to contract for maintenance coverage. The 5-year lease discount varies according to the coverage selected. No remedial maintenance service is provided during hours not covered by a contract.
13. Installation support – Burroughs support is spotty. Support problems have earned Burroughs a poor reputation in many areas of the world.
14. CTS – Burroughs advertises that MCP VI will rectify the weak time sharing support currently available with MCP V. Few details regarding this enhanced time sharing support are, however, available at this writing.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Why a prospect should buy an 1100/10, 20 or 40 over a B6700

1. Superior scientific processing performance — the internal design of the B6700 trades-off scientific performance for commercial performance. The 1100/10 should substantially outperform the B6700 in FORTRAN biased processing environments, particularly those that entail array manipulation.
2. Strong I/O Support — B6700 IOP can only sustain a 1.6-2.0 megabytes per second data rate versus, for example, 6.67 megabytes per second for the 1100/10 and 16 megabytes per second for an 1100/40 IOAU.
3. Industry compatible 8430 type disk — Burroughs major disk products are based on 8440 type technology. Currently, Burroughs largest capacity disk (not deliverable until 2nd quarter of 1977) provides storage capacity comparable to the 8433. No 8450 counterpart is available.
4. 6250 bpi magnetic tape — no 6250 bpi magnetic tape is available. STC, however, can install 6250 bpi drives on the B6700 on a plug-compatible basis.
5. 2000 lpm band printer — Burroughs fastest "quality print" printer is a 1500 lpm (at 48 character set) train printer. The fastest printer is an 1800 lpm drum printer, OEM from Data Products.
6. CTS — The B6700 time sharing implementation (CANDE) requires a large, dedicated partition, forfeits the B6700's hardware assisted reentrancy, and lacks comprehensive on-line debugging facilities.
7. CODASYL compatible DMS — DMSII does not comply with CODASYL standards.
8. One price service — DMSII, conversion aids, APL, and other selected Burroughs B6700 software products are chargeable.
9. On-call maintenance option for lease customers — "standard" Burroughs policy requires 5-year lease customer to contract for maintenance coverage. The 5-year lease discount varies according to the coverage selected. No remedial maintenance service is provided during hours not covered by a contract.
10. Installation support — Burroughs support is spotty. Support problems have earned Burroughs a poor reputation in many areas of the world.
11. Large-scale system experience — whereas Sperry Univac can boast close to a thousand large-scale 1100 installations worldwide, Burroughs has only about 200-225 B67/7700 installations.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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**Why a prospect should buy an
1100/10, 20, or 40 over a B6800**

1. Proven hardware and software — availability of many B6800 capabilities are scheduled beyond the 2nd quarter of 1977. For example:

B6807	August 1977
B6821	January 1978
B6009-13 Global Memory Interface for B6700	March 1978
New Data Comm Features	June 1977

Only the B6811 is scheduled to be available in the near future . . . January 1977. 1100 series hardware and software is installed and proven.

2. Strong I/O Support — a B6800 IOP can only sustain a 2.2 megabyte per second data rate versus, for example, 6.67 megabytes per second for the 1100/10 and 16 megabytes per second for an 1100/40 IOAU.
3. Industry compatible 8430 type disk — Burroughs major disk products are based on 8440 type technology. Currently, Burroughs largest capacity disk (not deliverable until 2nd quarter of 1977) provides storage capacity comparable to the 8433. No 8450 counterpart is available.
4. 6250 bpi magnetic tape — no 6250 bpi magnetic tape is available. STC, however, can install 6250 bpi drives on B6800 systems on a plug-compatible basis.
5. 2000 lpm band printer — Burroughs fastest "quality print" printer is a 1500 lpm (48 character set) train printer. The fastest printer is an 1800 lpm drum printer, OEM from Data Products.
6. CODASYL compatible DMS — DMSII does not comply with CODASYL standards.
7. One price service — DMSII, conversion aids, APL, and other selected Burroughs B6800 software products are chargeable.
8. On-call maintenance option for lease customers — "standard" Burroughs policy requires 5-year lease customer to contract for maintenance coverage. The 5-year lease discount varies according to the coverage selected. No remedial maintenance service is provided during hours not covered by a contract.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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9. Installation support — Burroughs support is spotty. Support problems have earned Burroughs a poor reputation in many areas of the world.
10. Large-scale system experience — whereas Sperry Univac can boast close to a thousand large-scale 1100 installations worldwide, Burroughs has only about 200-225 "large-scale" B67/7700 installations.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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**Why a prospect should buy an 1100/40
or 80 over a B7700**

1. Superior scientific processing performance — the internal design of the B7700 trades-off scientific performance for commercial performance. The 1100/80 should substantially outperform the B7700 in FORTRAN biased processing environments, particularly those that entail array manipulation.
2. Large cache capacity — The B7700 cache capacity, 6KB, appears too small despite the systems unorthodox stack based implementation.
3. Industry compatible 8430 disk — Burroughs major disk products are based on 8440 type technology. Currently, Burroughs largest capacity disk (not deliverable until 2nd quarter of 1977) provides storage capacity comparable to the 8433. No 8450 counterpart is available.
4. 6250 bpi magnetic tape — no 6250 bpi magnetic tape is available. STC, however, can install 6250 bpi drives on B7700 on a plug-compatible basis.
5. 2000 lpm band printer — Burroughs fastest "quality print" printer is a 1500 lpm (at 48 character set) train printer. The fastest printer is an 1800 lpm drum printer, OEM from Data Products.
6. CTS — The B7700 time sharing implementation (CANDE) requires a large, dedicated partition, forfeits the B7700's hardware assisted reentrancy, and lacks comprehensive on-line debugging facilities.
7. CODASYL compatible DMS — DMSII does not comply with CODASYL standards.
8. One price service — DMSII, conversion aids, APL, and other selected Burroughs B7700 software products are chargeable.
9. On-call maintenance option for lease customers — "standard" Burroughs policy requires 5-year lease customer to contract for maintenance coverage. The 5-year lease discount varies according to the coverage selected. No remedial maintenance service is provided during hours not covered by a contract.
10. Installation support — Burroughs support is spotty. Support problems have earned Burroughs a poor reputation in many areas of the world.
11. Large-scale system experience — whereas Sperry Univac can boast close to a thousand large-scale 1100 installations worldwide, Burroughs has only about 200–225 large-scale B67/7700 installation; 30–35 of these are B7700 installations.

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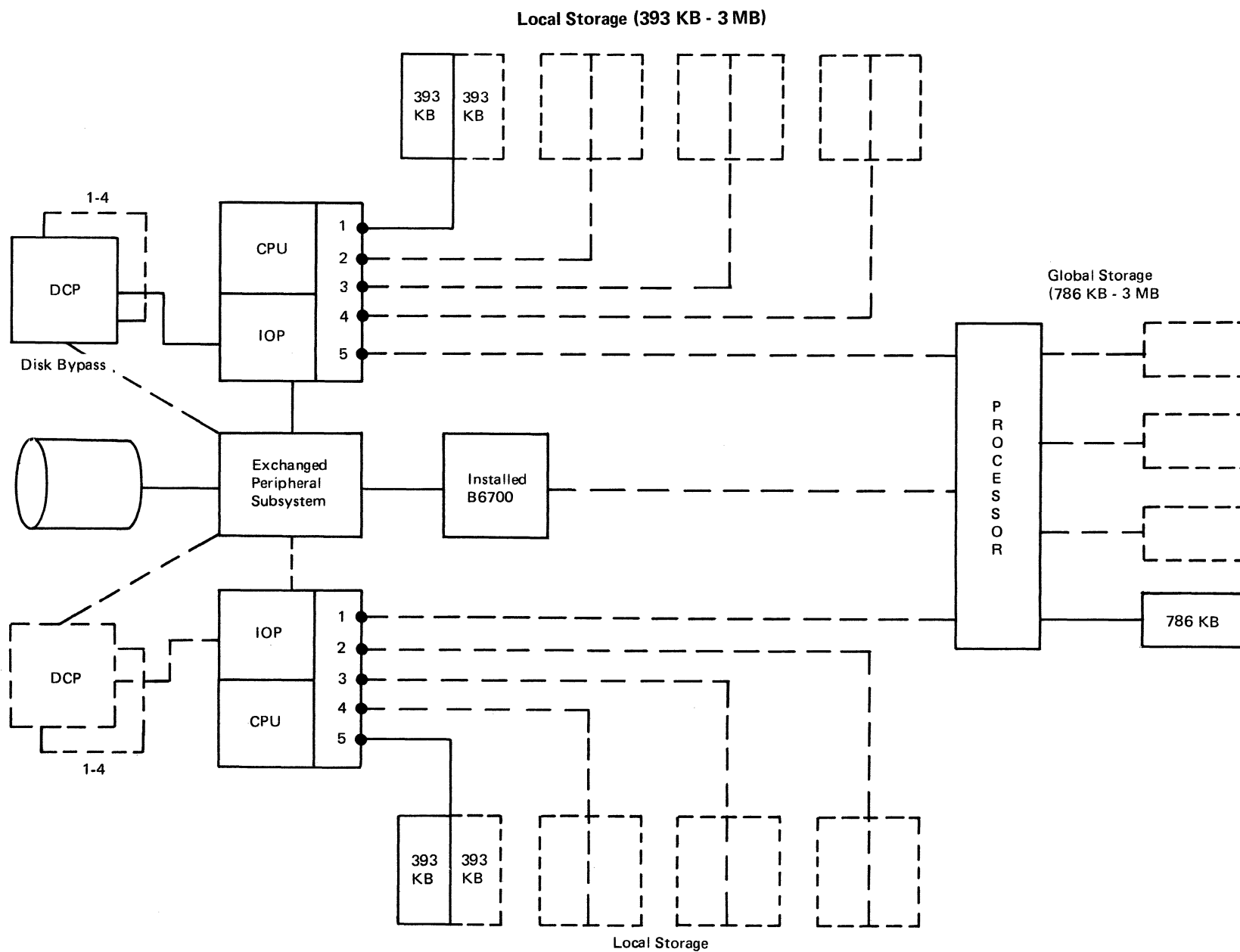
Burroughs System Specifications

	B3800/B4800	B6700	B6807/B6811	B7700
PROCESSOR				
Cycle Time	250/125 ns	200 ns (basic) 100 ns (arithmetic)	150 ns	62.5
Instructions				
Type	COBOL-optimized Variable length	ALGOL-optimized Polish notation vector operators for arrays	B6700 compatible Polish notation vector operators for arrays	Same
Number	—	—	—	—
Options	Single & double FP	None	Same	Same
Control Store				
Use	Instruction microcode	Hardware instructions No control store, per se	Instruction microcode	Some microcoded instructions; mostly hardwired
Size	—	—	—	—
Pipeline Design	No; partial stack	No; full stack	Yes; full stack	Same
Cache				
Type	Not applicable	Same	Local & Global memory hierarchy	Combination instruction cache & stack extension
Size				6 KB
Cycle Time				62.5 ns
Hit %				—
Modes of Operation	Unorthodox Virtual	Same but unlike B3800/B4800	Same	Same
MAIN STORE				
Type	MOS/Bipolar	4 Types, intermixable Most common: MOS Planar Core	Planar Core	MOS
Self-Correcting	Yes	Yes	Yes	Yes
Word Width	2-bytes	48-bits (6 bytes)	Same	Same
Read Time	500/250 ns	325 ns	1.5 μ s/450 ns	468 ns (effective)
Write Time	500/250 ns	—	—	—
Interleave	No	2-way	2-way	4-way
Min Capacity	100/200 KB	393 KB	393 KB of Local	786 KB
Max Capacity	1 MB/1 MB	6 MB	3 MB/CPU of Local 3 MB of Global	16 MB
Increments	50,100 KB	393 KB	393 KB for Local 786 KB for Global	786 KB
RELATIVE MAINFRAME PERFORMANCE (EST)	0.8/1.6 VS 370/148=1	0.8/1.0 (B6738/48) VS 370/148=1	0.8/1.75 VS 370/148=1	3.1 (B7755) VS 370/148=1
INPUT/OUTPUT				
Design	Memory Control interfaces programmed Data-Link Processors (DLP's), which attach peripherals to main store. Full records are buffered and exchanges	Free standing I/O processor (IOP) interfaces to main store via bus	Same as B6700 except IOP is integrated with instruction processor	Free standing I/O processor (IOP) interfaces to main store via bus
No. of Channels	Up to 24 DLP's; optional channel sup- port for earlier 700 Family peripherals	12 data switching (floating) channels per IOP	20 channels per IOP; 12 with 512-byte buffers & 8 with 256-byte buffers	28 channels per IOP
Aggregate Data Rate	4/8 MB/sec	About 1.8 MB/sec per IOP	2.2 MB/sec per IOP	8 MB/sec per IOP
SYSTEM CONSOLE				
Type	CRT	Dual CRT's up to 4 CRT's per CPU	Same	Same
Options	60 cps Printer Key- board instead of CRT		Same	Same

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Burroughs Multiprocessing Capabilities

Multiprocessing Capability	Support		Features
	Systems	Software	
1. Parallel Multiprogramming	B37/3800 B47/4800	MCP V & VI	2-8 systems, each with copy of MCP, arranged to share common fixed disk subsystem. File Protect Memory (FPM), a hardware device transparent to software, reconciles contention at record level. Burroughs has been successful in selling this MP approach to customers with stringent up-time requirements, e.g. banks that perform MICR processing.
2. Tightly Coupled	B6700 B7700	MCP	Up to 6 "processors" can be arranged to share common main store (and MCP) in B6700 and up to 8 in B7700. B6700 "processors" comprise CPU's, I/O Processors (IOP's) and Data Communications Processors (DCP's); B7700 "processors" comprise CPU's & IOP's. Processors can be configured in any combination. DCP's attach to IOP's in B7700. In B6700 DCP's attach to IOP's or directly to main store. Two-way partitioning is possible in both B6700 and B7700: a Configuration Control Unit (CCU) is required in B6700; a CCU is built into the B7700.
3. Multiple Processor	B6800 (B6700)	MCP	Multiple Central Processor Units (CPU's), each comprising a processor, I/O processor, common Global Storage. There is no logical limit on the number of CPU's that can be configured, only a practical limit. Installed B6700's are intermixable with B6800's. Multiple Processor Systems can operate in three different modes: (1) Multiprocessor Mode — system functions as single resource, (2) Shared Resources Mode — system partitioned into environments, and (3) Split System Mode — totally independent systems.
4. Disk Bypass	B6800 B7700	MCP	An IOP and DCP can attach to a common fixed disk subsystem enabling the host and DCP to exchange information via a "mail-box" procedure. The DCP can continue to operate in a degraded mode should the host fail. Burroughs Disk Bypass Support compares with Honeywells Delta Configuration Support for 6000 and Level 66 series systems.
5. Distributed Processing	B47/4800 B67/6800 B7700	MCP	Processing functions can be relegated to remote, satellite systems including B80, B1700, B776, S1500, etc. Burroughs Band Information System (BIS) is integrated hardware/software package exemplifying distributed processing support.

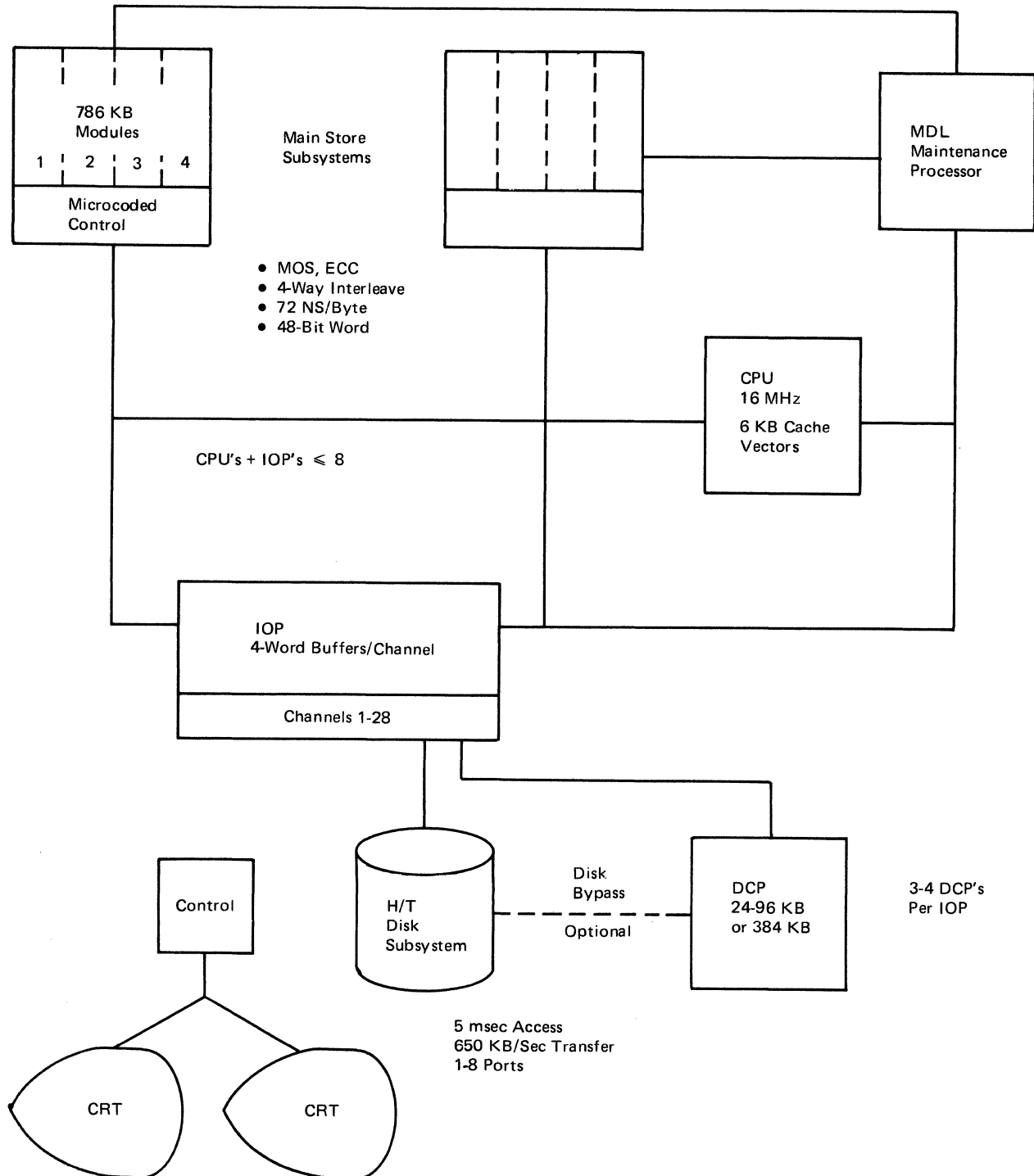


PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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B6800 Modes of Operation

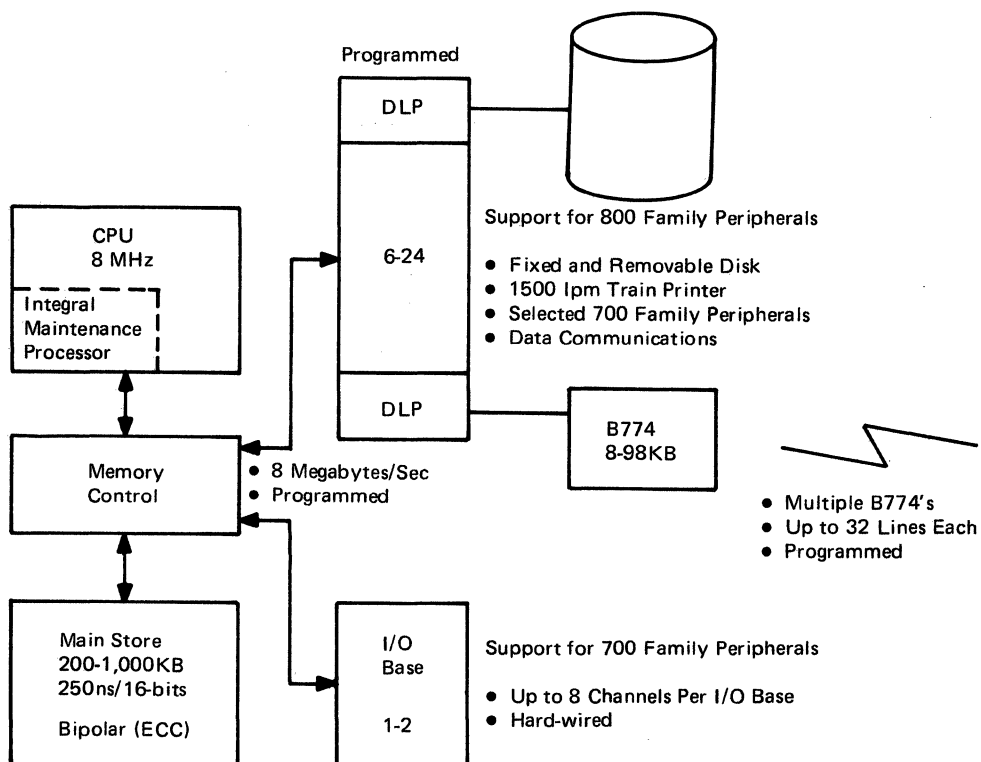
Mode	Application	Operation	Global	Local
Multiprocessor	Homogeneous Processing Environment	• System appears as one resource to programs/operators • MCP allocates resources across entire job mix • Jobs migrate across CPU's to balance load	• MCP Resource Mgt Code • MCP tables	• User Programs • Heavily accessed MCP routines
Shared Resources	Heterogeneous Processing Environment	• System partitioned into environments • Partitions individually schedule jobs and allocate resources • Environments share common data via DMS II	• DMSII Buffers • Contention resolution logic	• MCP • Programs & Data
Split System	Fail-soft	• Totally independent systems • Peripherals switchable between systems	• Not applicable	• Associated with each system

Burroughs B1700 System Architecture

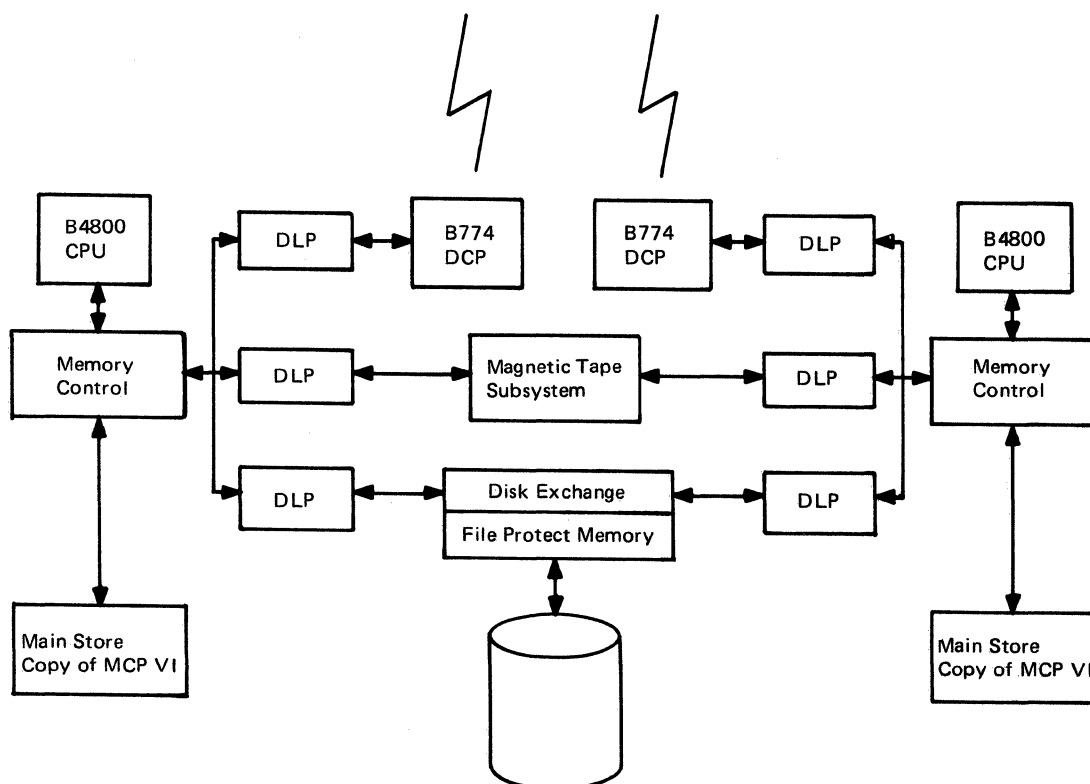


BURROUGHS B4800 SYSTEM ARCHITECTURE

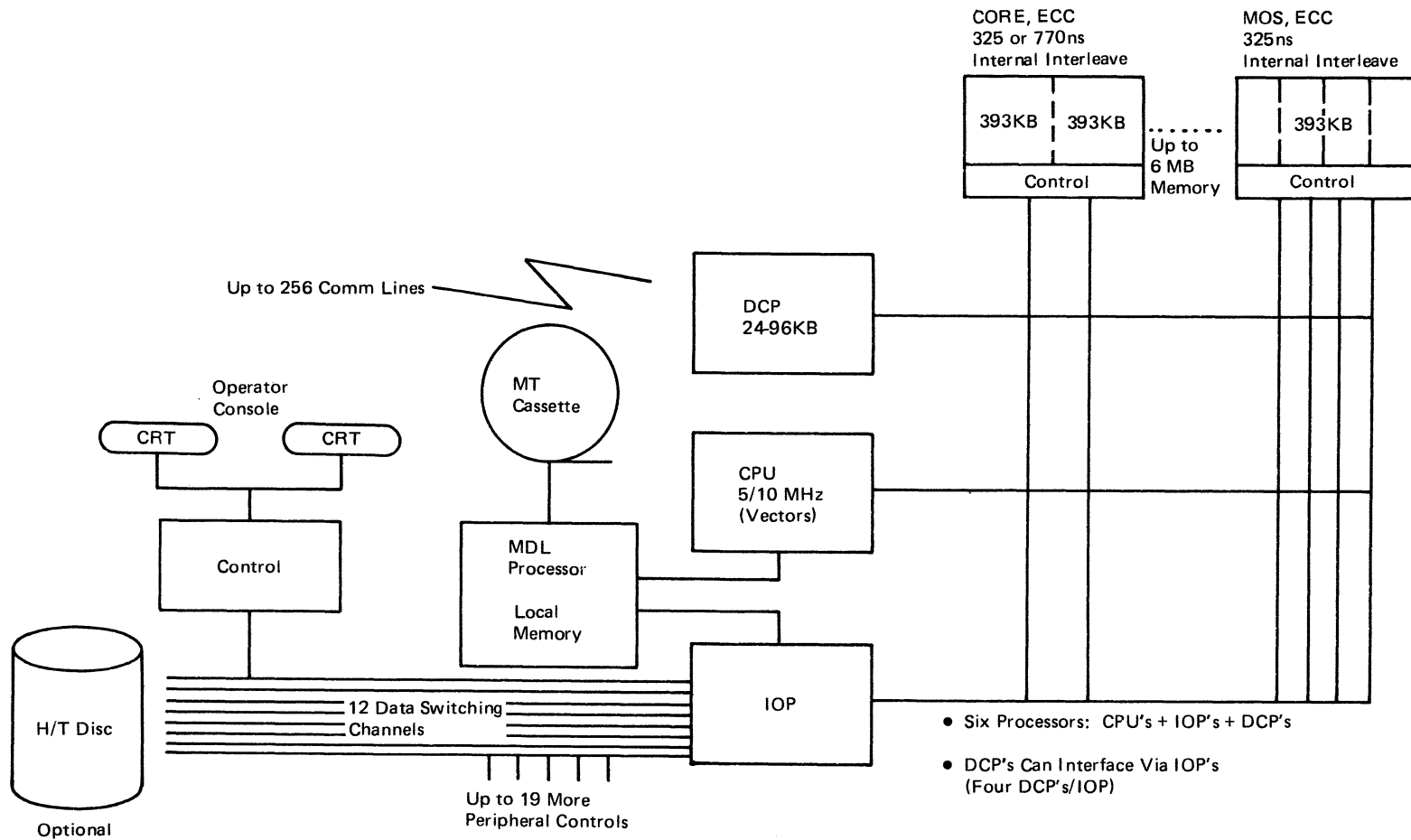
Single System



Parallel Multi-Programming System



Burroughs B6700 System Architecture



Burroughs MCP's

	Burroughs MCP V	Burroughs MCP VI	Burroughs MCP
GENERAL			
Systems	B27/37/4700 B28/38/4800	B28/38/4800	B6700, B7700
Minimum Viable System	90 KB	100 KB	393 KB
Status	Installed; release 7 due 1st Q'76 will be interim to MCP VI and include some MCP VI functions	Initial release scheduled for 3rd Q'76 will probably be delayed	Installed; MARK II.6 and II.7 are current releases
DESIGN			
Orientation	Multiprogrammed batch	Data Base/Datacomm	Data Base/Datacomm
Implementation	Unorthodox virtual (similar to OS/3)	Same as MCP V	Unorthodox virtual (similar to OS 1100)
Program Control	Hardware-assisted dynamic overlay using variable size segments	Same as MCP V	Hardware stack-assisted dynamic overlay using variable size segments
Program Relocatability	Yes	Yes	Yes
Memory Management	Job allocated contiguous area = requirements of resident segments + largest overlay	Same as MCP V	Jobs allocated noncontiguous areas
Language Used	B25/3500 Assembler (COBOL-like) and B27/37/4700 Burroughs Programming Language BPL (ALGOL-like)	BPL	ESPOL-Executive System Programming Oriented Language (ALGOL-based)
FUNCTION			
Batch Multiprogramming	1-80 jobs	1-256 jobs	1-256 jobs
Spooling	Integral; up to 80 pseudo readers; no limit on printer/punch back-up	Integral	Integral
Multiprocessing	Shared disk (parallel multiprogramming)	Same as MCP V	Tightly coupled (up to 4 x 2)
Remote Batch	Requires Burroughs-supplied or user-written MCS	Same as MCPV	Comparable to MCP VI
Transaction Processing	Supported via NDL, MCS, Disk FORTE/2, and other adjuncts to MCP; datacomm constructs are in COBOL and Assembler (no DMS II support)	Same as MCP V; DMS II, however, is integral to MCP VI	Comparable to MCP VI

Burroughs MCP's

	Burroughs MCP V	Burroughs MCP VI	Burroughs MCP
FUNCTION (continued)			
Conversational: Support	Separate T/S system (Command And Edit Language - CANDE)	Full capabilities: T/S Module, Editor and Remote Compilation System	Separate T/S System with full capabilities; CANDE
Concurrent Users	1-20	More than 20	Large number
Problem Solving	BASIC only (incremental)	All compilers available (APL under development)	All compilers available; APL available as separate subsystem (doesn't run under T/S control)
Program Preparation	Limited support	Improved support	Yes; syntax checking and debugging facilities are weak
CRJE	Yes (no listings to terminal)	Yes	Yes
ADJUNCTS			
Conversion Aids: Competitive	Numerous soft conversion aids for IBM, HIS, and UNIVAC Series 70 (no emulators)	Same as MCP V	Same as MCP VI
Inter-system	—	Programs that run under MCP V will run under MCP VI at object level; COBOL '68 must be modified and recompiled to capitalize on COBOL '74; Disk FORTE/2 support is optional	Programs that run under MCP V must be filtered and recompiled to run under B67/7700 MCP; Disk FORTE/2 support is optional; B67/7700 NDL must be used to create new operating system for DCP
Job Accounting	Full support; Time Accounting and Billing System (TABS)	Full support; enhances version of TABS called TABS VI	Full support; Log Analysis Facility
Performance Monitors and Aids	MONITR (monitors individual programs enabling tuning); TABS provides information for system tuning	Same as MCP V	SPARK (system performance analysis and review kit) — \$560/month; optional use of log facilities

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Burroughs Data Management Systems (Part 1 of 3)

	Disk File ORGANIZATION TECHNIQUES (Disk FORTE/2)	Data Management System DMSII
Support	All MCP's available with B1700-B7700, including B28/38/4800 65 KB B170.0 and minimum B2700-B7700 systems.	MCP II (B1700); MCP VI (B28/38/4800); MCP (B67/7700) B1700 (64 KB) and minimum B2800-7700 systems.
General Description	Disk FORTE/2 is a COBOL-based development aid that provides the ability to declare, create, access, and maintain a structured data base on Burroughs head-per-track disk, disk-pack, and disk cartridge drives. Disk FORTE/2 supports: • Two data associations: Link and Chain • List structures • Six data retrieval methods: Index-random, Random, Index-sequential, Index-sequential-grouped, Ordered, and Unordered Disk FORTE/2, announced in January 1974, is an enhanced version of Disk FORTE, which first became available in 1968. When announced, there were over 400 Burroughs customers using Disk FORTE. Disk FORTE/2 has the following features: • Modularity and data independence • Batch and/or on-line (NDL interface) mode usage • File sharing between multiple programs (with or without FPM) • Redundant data elimination • File access via more than one retrieval method • Optimized use of disk-pack and cartridge disk • Generalized file search feature • Easy file restructuring (REMAP) • Audit and recovery	A full-featured data base management facility, which is integrated into MCP II, MCP VI, and the B67/7700 MCP. Major features include: • Elaborate audit/recovery capabilities • Multiple keys of ordering* • Variable record size • Data reconstruction • Bit vectors • Automatic sets and subsets* • Group moves and move corresponding* • Record-level lock-out in shared file use • Boolean manipulation of sets* • Archival storage and cataloging* • Partitional files • Data base security • Data compaction • Dynamic data base definition* *These items are not available in Disk FORTE/2. The remaining items are available with Disk FORTE/2, but generally have less functionality. DMSII was released in October 1974. Burroughs will attempt to migrate all 700 Family customers from Disk FORTE to DMSII when they upgrade to 800 Family models. At this writing, there are some 75-80 users of DMSII on B67/7700 systems.
Design	Disk FORTE/2 systems are generated. A user inputs free-form, keyword specifications defining the data files, data associations, and access methods. The Disk FORTE/2 Definition program edits the specifications and creates a control directory for use by the Generator program. The program reads the directory and generates the ANS COBOL '68 statements required to access and maintain the user's data base. A cross-reference file of the COBOL statement is created to expedite the merge process. Every user COBOL program that accesses the data base is processed through the Merge program. The Disk FORTE/2 Merge program scans the user's COBOL program for routines performed. All required file	DMSII is structured similar to CODASYL specifications, but doesn't comply with these specifications completely. It provides a data and structure definition language and user interfaces via COBOL, ALGOL, and PL/1. DMSII is sysgened into MCP II, MCP VI, and the B67/7700 MCP. Its facilities are invoked and managed by the MCP's as reentrant transients (what Burroughs call intrinsics). Unlike Disk FORTE/2, DMSII code is not integrated in user programs. This integral support is designed to offer high performance.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Burroughs Data Management Systems (Part 2 of 3)

	Disk File Organization Techniques (Disk FORTE/2)	Data Management System DMSII																								
Design (Cont.)	descriptions and data descriptions, as well as specific routines requested by the program, are merged into the user program. The output of the merge is ready-to-compile COBOL Source program that may be stored on disk or tape.	DMSII includes many recovery facilities that are implemented at the VS/9 level instead of the DMS/90 level in 90/80 systems.																								
Installation Requirements	Burroughs claims Disk FORTE/2 is easy to use and implement. FORTE/2 system generations occur infrequently. FORTE/2 facilities can be readily tailored for efficiency. FORTE/2 data bases can be easily ported across systems.	Installations must designate a data base administrator. Burroughs claims DMSII is easy to use, install, and maintain. Formal education is available at a charge.																								
Pricing	All systems: \$11,000 paid-up license with \$275 annual maintenance charge of \$264 per month under five-year license. ANS COBOL '68 is separately priced for B1700 only (\$50 per month).	<table><tr><th></th><th>Paid-up License</th><th colspan="2">Monthly License</th></tr><tr><th></th><th></th><th>Annual</th><th></th></tr><tr><th></th><th>Price</th><th>Maintenance</th><th>5-Years</th></tr><tr><td>B1700</td><td>\$12,000</td><td>\$1,200</td><td>\$288</td></tr><tr><td>B28/38/4800</td><td>11,700</td><td>1,170</td><td>374</td></tr><tr><td>B67/7700</td><td>24,000</td><td>2,400</td><td>768</td></tr></table> The B67/7700 is an inclusive super-set of the B28/38/4800 implementation and the latter a superset of the B1700 implementation. B1700 ANS COBOL '68 is \$50 per month; B28/38/4800 ANS COBOL '74 is \$50 per month; B67/7700 compilers are not separately priced.		Paid-up License	Monthly License				Annual			Price	Maintenance	5-Years	B1700	\$12,000	\$1,200	\$288	B28/38/4800	11,700	1,170	374	B67/7700	24,000	2,400	768
	Paid-up License	Monthly License																								
		Annual																								
	Price	Maintenance	5-Years																							
B1700	\$12,000	\$1,200	\$288																							
B28/38/4800	11,700	1,170	374																							
B67/7700	24,000	2,400	768																							
Sizing	Disk FORTE/2 requires a minimum of 32 KB on B27/37/4700 and B28/38/4800 systems, 24 KB on B1700 systems, and 90 KB on B67/7700 systems, exclusive of MCP requirements.	DMSII requires about 30 KB and 90-120 KB for buffers, under the B67/7700 MCP. MCP and application program requirements are additional. DMSII is supported on a 65 KB B1700. 49 KB of the 65 KB are used for DMSII requirements, MCP and interpreters. 16 KB are available for user application(s). Sizing data are not yet available for MCPVI.																								
Optional Features	- Pre-evaluator (no charge): enables files, tables, synonyms dead areas, etc., to be evaluated prior to implementation of a Disk FORTE/2 system. - Network Definition Language — NDL (\$50/month for B1700, \$125/month for B27/37/4700 and B28/38/4800; and no charge for B67/7700): generator that facilitates implementation of network interface to Disk FORTE/2 applications.	- Informal Pre-evaluators (no charge) - REPORTER, POLGEN, and NDL (see Disk FORTE/2) - Data Management Inquiry (B67/7700 only — \$525 per month): query language facility																								

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Burroughs Data Management Systems (Part 3 of 3)

	Disk File ORganization TEchniques (Disk FORTE/2)	Data Management System DMSII
Optional Features (Cont.)	- Reporter Writer-REPORTER (\$72/month for B1700-B4800 and \$135/month for B67/7700): generative facility that simplifies report production from Disk FORTE/2 data base batch and on-line use. - Problem-Oriented Language Generator-POLGEN (\$120/month for B1700-B7700): generative facility to design and implement a free-form man-machine communication link for easy use of a FORTE/2 data base by nonprofessional; batch and on-line use.	
Compatibility	Filter programs are available to facilitate Disk FORTE to FORTE/2 conversions. Conversion to DMSII entails program rewrites and data base restructuring.	Incompatibilities exist between BDMS (predecessor to DMSII) and DMSII, requiring program rewrites and data base reorganizations. DMSII files are portable between B1700-B7700 systems. Disk FORTE/2 files are incompatible with DMSII files. Series 70 ISAM support facilities are available for converting Series 70 customers to Burroughs systems.

Burroughs Software Support for Transaction Processing

- Data Management System II

(Generated as extension to MCP using Data and Structure Definition Language – DASDL)

User responsibility

Written in COBOL and ALGOL (for B67/7700) and UPL (for B28/38/4800)
Facilities invoked as transients (intrinsic)

- Message Control System

(Generated using MCS generator or written in DCALGOL or UPL)

Optional

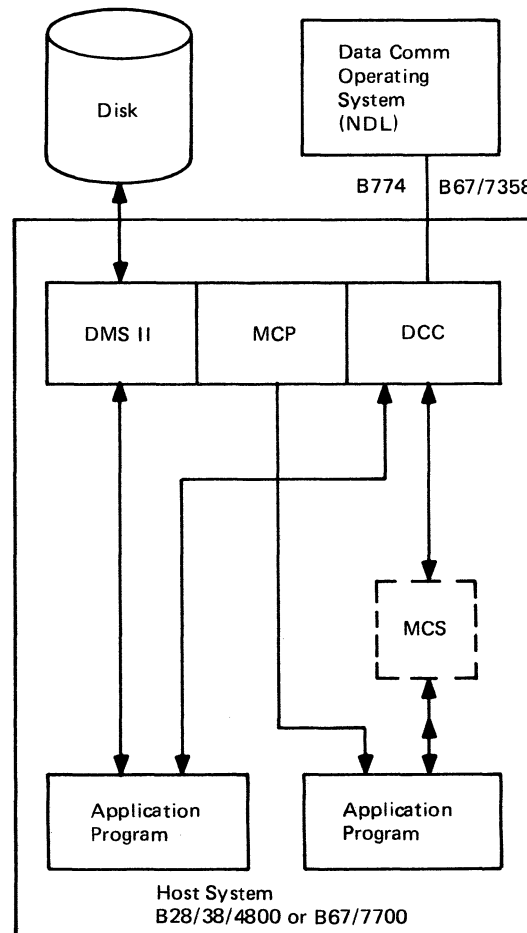
Burroughs provided or user responsibility
Creates, retrieves, transmits, switches, and destroys messages; maintains security on the message flow and file use and handles exceptional conditions

- Network Definition Language

(DataComm operating system generated using NDL compiler)

User responsibility

NDL is user-oriented, parameter-driven, descriptive language
DC operating system performs network control, message assembly, disassembly and buffering, and error control



- Data Communications Controller (Generated as extension to MCP)
Burroughs provided
Written in ESPOL for B67/7700 and in UPL for B28/38/4800
One DCC per DCP
Central decision maker; coordinates all DC I/O; initiates polling, selecting, data tx, and data reception via Request Queues; provides feedback via Result Queues

- Application Programs

(Written in COBOL, PL1, ALGOL, etc.)

User responsibility

Treat terminals in same manner as peripheral I/O
High-level constructs in compilers to link to DCC, MCS, and DMS II
Data Manipulation Language (DML) for links to DMS II

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

Burroughs Product Strategy

Product differentiation via unorthodox system designs

700 Family Systems

- Compiler optimized hardware
- Stack implementations

800 Family Systems

- Database/data communications optimized systems
- Product line unification
- New generation of peripherals
- Application software emphasis

700/800 Family compatibility to facilitate migration

Burroughs Market StrategyAggressiveness

- Anxious to expand market share
- Willing to discount

Target marketing

- Financial and GEM (S & L Govt, Education and Medical)
- Full hardware and software solutions
- Expanding line of application software

Many system alternatives

- Multiple versions of single system
- Repriced, recycled used systems

Low balling — MCP is virtualEmphasis on strengths

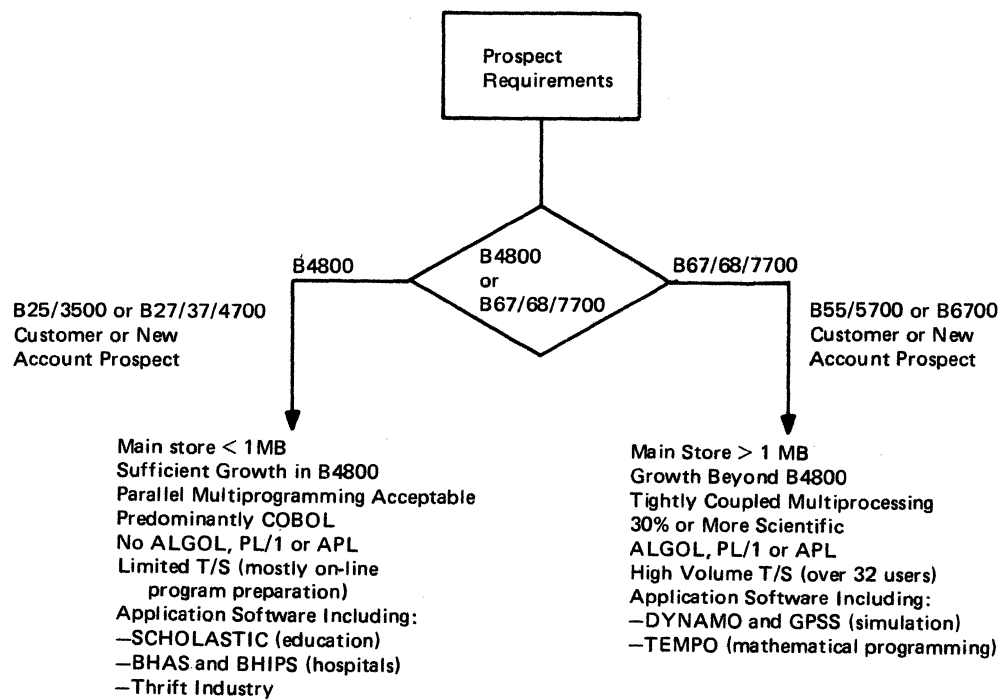
- Unorthodox hardware/software
- DMSII function and performance
- Failsoft (B7700)
- Data Comm (substantial support)
- low priced double density 8440 disk (priced to compete with IBM 3350)
- Compile performance in lieu of execute performance (systems are compiler optimized)

MAJOR PROBLEMS

- Small large-scale EDP sales staff (most salesmen sell small computers)
- Limited technical expertise (many salesmen are A/M oriented)
- Restricted SA/FE support
- High turnover (compensation is meager by industry standards)
- Lots to sell but little to install (800 Family product delays)

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Determinants of What Burroughs Will Bid



DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Capitalizing on Mis-Pricing

	2 x B6738	2 x B6748	B6750
Orientation	Disk Based	Drum Based	Drum Based
CPU's	2	2	2
IOP's	2	2	1
I/O Chan	16	24	12
MDL's	2	2	1
Consoles	2	2	1
Copies of MCP	1	1	1
1-Yr Lease	\$14,560	\$18,564	\$21,690
Purchase	669,760	853,940	1,004,230

2 x B6738's & 2 x B6748's
are being bid in lieu of
B6750's. These alternatives
provide same general
capabilities and are lower
priced.

B6750	\$15,944	\$ 710,425
2nd IOP	2,860	131,560
2nd MDL	2,600	124,800
2nd Console	786	37,445
	<u>\$21,690</u>	<u>\$1,004,230</u>

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

Burroughs Discount Determinants

- Incumbent Vendor
- Conversion Requirements
- Potential For Add-On Business
- Terminal Requirements (Terminals Are Very Profitable)
- Changes Of Success
- Product Fit – Hardware & Software
- Experience Value
- Availability Of Support Resources
- Branch Record
- Product Cycle
- Unbundled Charges
- Purchase Vs. Lease

Burroughs Major Hardware Contracts for B3800 – B7700

- 1,3 and 5-year leases

Lease	Maint. Coverage		Discount from 1-year gross rate		
	Hours	Days	B38/4800	B67,6800	B7700
1-year	8	5	0%	0%	0%
3-year	8	5	7	5	3
5-year	8	5	11	10	8
	16	7	8	6	4
	24	7	7	5	3

- Unlimited use
- Hardware price protection only. Maintenance charges, bundled into lease rates but to maintenance under purchase, can be increased once a year after first year.
- Two year extensions at same rates.
- Full hardware price protection.
- One time replacement charges for all system and component replacements.
- Purchase option accruals.

Customer	Months	Accrual % of Gross Monthly Payment
Commercial	1–36	50%
S & L Govt.	1–6	70
	7–36	50

- Ramp plan for B6700 and B7700

Months	Payment
1–2	30% of 5-year rate
3–4	40% of 5-year rate
5–8	60% of 5-year rate
9–18	80% of 5-year rate
19–78	Full 5-year rate

- Education discounts: 20% on purchase; additional discounts off 5-year leases: 9% for B38/4800 and 10% for B67/6800 and B7700.
- S & L Govt. installment purchase plan.
 - 7-year term
 - No discount
 - Early termination without penalty if funds not appropriated
 - Ownership after last payment
 - Interest charge varies based on prime rate
- No non-chargeable maintenance coverage on purchase.
- Investment tax credit available on 5-year lease as well as purchase.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Burroughs B4800 Configuration

Model	Description	Qty	1-Yr Gross Lease	Purchase	Maint
B4840	CPU & 200 KB	1	\$ 9,290	\$ 445,920	\$ 515
B4099-8	Floating Point	1	150	6,000	190
B4050-8	Addit 300 KB	1	1,260	58,210	90
B9348-3	Console CRT	1	170	7,900	26
B4351-81	DLP-4 for Console	1	95	3,800	18
B9470-1	Fixed Disk -5.5 MB	1	850	34,000	63
B9470-11	Fixed Disk -5.5 MB	1	700	28,000	61
B9471-6	Electronics Unit	1	250	10,000	38
B4373-81	DLP-4 for FD	1	350	14,400	17
			<u>\$13,115</u>	<u>\$ 606,230</u>	<u>\$1,018</u>
B9383-18	2 X 10 Disk Subsys (1744 MB usable)	1	\$ 6,245	\$ 305,200	\$1,211
B4304-8	DLP-4 for Disk	2	300	8,000	32
B9495-5	MT (320 KB, PE)	6	4,098	139,200	60
B4395-82	DLP-3 for MT	2	1,000	34,000	120
B9499-12	2 X 8 Exchange	1	435	16,650	48
			<u>\$12,078</u>	<u>\$ 503,050</u>	<u>\$1,471</u>
B9117	CR (800 cpm)	1	\$ 274	\$ 9,875	\$ 11
B4110-8	DLP-3 for CR	1	60	2,400	18
B9247-15	LP (1500 lpm, Train)	1	1,450	52,200	435
B4247-82	DLP-3 for LP	1	400	14,400	18
			<u>\$ 2,184</u>	<u>\$ 78,875</u>	<u>\$ 482</u>
B0774-1	DCP (12 KB)	1	\$ 684	\$ 29,900	\$ 105
B0551-5	Asynch Line -1880 bps	12	420	17,480	41
B4303-8	DLP-4 for DCP	1	150	6,000	16
			<u>\$ 1,254</u>	<u>\$ 53,380</u>	<u>\$ 162</u>
			<u>\$28,631</u>	<u>\$1,241,535</u>	<u>\$3,133</u>
5-Year Lease incl. prime maint \$25,482 (11% discount) Software charges: DMS II \$374 TABS VI billing system 35 ANS '74 COBOL 50 <u>\$459/month</u>					

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Burroughs B6738

Model	Description	Qty	1-Yr Gross	Purchase
B6738	1 X 1, Console	1	\$ 7,280	\$ 334,880
B6005-4	393 KB	1	2,742	124,200
B6005-5	393 KB	1	2,290	103,500
			<u>\$12,312</u>	<u>\$ 562,580</u>
B9383-8	2 X 10 Disk	1	\$ 6,680	\$ 281,780
B6304-1	872 MB <u>Usable</u> Disk Ctrl	2	312	8,320
			<u>\$ 6,992</u>	<u>\$ 290,100</u>
B9495-3	MT (120/200 KB)	6	\$ 3,354	\$ 111,940
B6395-2	Ctrl (PE/NRZ)	2	1,072	34,500
B9499-12	2 X 8 Exchange	1	435	16,650
			<u>\$ 4,861</u>	<u>\$ 163,090</u>
B9117	CR-800 cpm	1	\$ 274	\$ 9,875
B6110-5	Ctrl	1	104	4,370
B9213	CP-300 cpm	1	582	27,905
B6212	Ctrl	1	104	4,370
B9247-14	LP-1100 lpm, Train	1	1,150	43,550
B6247-4	Ctrl	1	208	9,985
			<u>\$ 2,422</u>	<u>\$ 100,065</u>
B6358	DCP (12 KB)	1	\$ 1,018	\$ 46,000
B6650-3	Line Adapter-2400 bps	4	244	11,520
			<u>\$ 1,262</u>	<u>\$ 57,520</u>
			<u>\$27,849</u>	<u>\$1,163,355</u>
5-Year lease with Prime Maint \$25,064/month				
5-Year lease with Full Maint 26,457/month				
Software License for DMS II:				
\$24,000 Paid-up License				
+ 2,400 Annual Maintenance				
\$768/month — gross 5-year lease				

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Burroughs B6746 Configuration

Model	Description	Qty	Purchase	Maint
B6746	1 X 1 incl console	1	\$225,000	\$ 937
B6004-3	295 KB of core 1.2 μ s/48-bits	3	150,000 <u>375,000</u>	1,143 <u>2,080</u>
B9900-37	Peripheral Power Pack 60 MB of 23 ms H/T Disk 1100 lpm drum printer 1400 cpm CR 300 cpm CP 2 MT's @ 144 KB (PE)	1	\$180,000	\$1,241
B9383-6	1 X 2 Disk (8440 Type) (174 MB usable storage)	1	\$ 77,575	
B9486-4	Dual Drive Increments	1	36,250	
B6304-1	Disk Control	1	4,160 <u>297,985</u>	
B6358	DCP (12 KB)	1	\$ 46,000	
B6350-1	Adapter Cluster	1	9,600	
B6650-3	Adapter — 2400 bps	10	28,800 <u>84,400</u> <u>757,385</u>	
1. B6746, B6004-3 and B9900-37 are used equipment. 2. B6746 and B6004-3 can be purchased and peripherals leased. 3. Installment purchase plans are available. 10% down-payment is desirable but not necessary. 4. System is object code compatible with newer B6700 and B6800 systems. 5. DMS II and all other B6700 software products can be used.				

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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BURROUGHS B6748

Model	Description	Qty	Gross 1-Yr	Purchase
B6748	CPU, IOP, Dual CRT's	1	\$ 9,282	\$ 426,970
B6006-1	393KB Planar	1	4,056	188,860
B6006-2	393KB Planar	1	3,328	153,920
B9950	Sys. Console Desk	1	158	7,490
			<u>\$16,824</u>	<u>\$ 777,240</u>
B9470	5.9 MB H/T Disk	1	\$ 850	\$ 34,000
B9470-12	5.9 MB H/T Disk	1	700	28,000
B6377-1	Control	1	580	23,200
B9471-6	DEU	1	250	10,000
B9383-8	2 x 10 Disk (872 MB)	1	6,680	281,780
B9486-4	0 x 2 Disk (174 MB)	1	968	36,250
B6304-1	Disk Control	2	312	8,320
B9495-3	MT (200KB, PE)	6	3,354	113,940
B9499-12	2 x 8 Exchange	1	435	16,650
B6395-2	MT Control	2	1,072	34,500
B9112	CR (1400 cpm)	1	532	24,145
B6110	CR Control	1	104	4,370
B9247-14	LP (1100 lpm)	1	1,150	43,550
B6247-4	LP Control	1	208	9,985
			<u>\$17,195</u>	<u>\$ 668,690</u>
B6358	DCP (12KB)	1	\$ 1,018	\$ 46,000
B6358-5	12 KB	2	704	32,200
B6350-1	Adapter Cluster	1	203	9,600
B6650-3	Line Adapter	10	610	28,800
			<u>\$ 2,535</u>	<u>\$ 116,600</u>
				<u>\$1,562,530</u>
1-YR LEASE (PRIME SHFT MAINT)..... \$36,554				
5-YR LEASE (PRME SHIFT MAINT)..... \$32,899				
" " (24-HR MAINT) \$34,227				
<u>SOFTWARE CHARGES</u>				
			<u>Monthly Fee</u>	
	MCP		\$ 0	
	DMS II		768	
	ANS COBOL		0	
	NDL		0	

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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BURROUGHS B6760

Model	Description	Qty	Gross 1-Yr	Purchase
B6060	3 x 2, Console	1	\$24,024	\$1,105,105
B6005-6	393KB IC	1	4,037	184,400
B6006-1	393KB Planar	2	8,112	377,720
B6006-2	393KB Planar	2	6,656	307,840
			<u>\$42,829</u>	<u>\$1,975,065</u>
B9470-2	Fixed Disk - 5.9MB	2	\$ 1,700	\$ 68,000
B9470-12	Fixed Disk - 5.9MB	2	1,400	56,000
B9471-6	DEU	2	500	20,000
B6377-1	Disk Control	2	1,160	46,400
B6377-6	4 x 4 Exchange	1	210	8,400
B6377-31	Control Adapter	2	60	2,400
B6377-32	EU Adapter	2	60	2,400
B9383-18	2 x 10 Disk (1744MB)	1	1,245	305,200
B9484-8	0 x 2 Disk (348MB)	1	840	33,700
B6304-3	Disk Control	2	770	18,000
B9494-6	MT (400KB, PE)	8	6,248	236,288
B9499-12	2 x 8 Exchange	2	870	33,200
B6395-7	MT Control	4	2,144	69,000
B9247-14	LP (1100 lpm)	2	2,300	87,100
B9246-2	LP (1800 lpm)	1	1,621	67,275
B6247-4	LP Control	2	416	19,970
B6240	LP Control	1	156	7,490
B9112	CR (1400 cpm)	1	532	24,145
B6110	CR Control	1	104	4,370
B6113	CP (300 cpm)	1	582	27,905
B6212	CP Control	1	104	4,370
			<u>\$28,022</u>	<u>\$1,141,613</u>
B6358	DCP (12KB)	1	\$ 1,018	\$ 46,000
B6358-5	12KB	4	1,408	64,400
B6350-1	Adapter Cluster	2	406	19,200
B6650-5	LA - 9600 bps	4	608	28,800
B6650-3	LA - 2400 bps	20	1,220	57,600
			<u>\$ 4,660</u>	<u>\$ 216,000</u>
			<u>\$75,511</u>	<u>\$3,332,678</u>
1-YR LEASE (PRIME SHIFT MAINT) \$75,511				
5-YR LEASE (PRIME SHIFT MAINT) \$67,960				
" " (24-HR MAINT) \$71,736				
<u>SOFTWARE CHARGES</u>				
			<u>Monthly Fee</u>	
MCP			\$ 0	
DMSII			768	
ANS COBOL			0	
NDL			0	

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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BURROUGHS B6807 CONFIGURATION

Model	Description	Qty	1-Yr Gross Lease	Purchase	Maint
B6807	1 x 1 with Console, 1.5 access to main store; & to IOP with 20 channels	1	\$ 5,900	\$ 227,000	\$ 884
B6009-5	393KB	2	<u>5,600</u> \$11,500	<u>168,000</u> \$ 395,000	<u>700</u> \$1,584
B9383-18	2 x 10 Disk Subsystem (1744 MB usable storage)	1	\$ 6,245	\$ 305,200	
B6304-3	Disk Control	2	770	18,000	
B9495-6	MT (PE, 320KB)	6	4,096	139,200	
B6395-7	MT Control	2	1,072	34,500	
B9499-12	2 x 8 Exchange	1	<u>435</u> \$12,618	<u>16,650</u> \$ 513,550	
B9112	CR (1400 cpm)	1	\$ 532	\$ 24,145	
B6110	CR Control	1	104	4,370	
B9247-17	LP (1100 lpm, train)	1	1,150	43,550	
B6247-4	LP Control	1	<u>208</u> \$ 1,994	<u>9,985</u> \$ 82,050	
B6359	DCP	1	\$ 800	\$ 38,400	\$ 190
B6359-1	12 KB of memory	1	200	9,600	29
B6353-8	Adapter Cluster III	2	440	21,120	64
B6353-11	AC II Adapter - (9600 bps)	12	<u>540</u> \$ 1,980	<u>25,920</u> \$1, 95,040	<u>84</u> \$ 367
5-Year Lease with Prime Maintenance \$25,283 (10% discount)					
Major software charge is for DMS II - \$768 per month (gross 5-yr license)					

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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BURROUGHS B6811 CONFIGURATION

Model	Description	Qty	1-Yr Gross Lease	Purchase	Maint
B6811	1 x 1 with Console, 450 ns access to main store, & IOP with 20 channels	1	\$ 9,900	\$ 480,000	\$1,050
B6009-5	393KB of main store	5	14,000	420,000	1,750
B9470-2	Fixed Disk - 5.9 MB	1	850	34,000	
B9470-12	Fixed Disk - 5.9 MB	1	700	28,000	
B9471-6	Electronics Unit	1	250	10,000	
B6377-1	Control (1 x 1)	1	580	23,200	
			<u>\$26,280</u>	<u>\$ 995,200</u>	
B9383-18	2 x 10 Disk Subsystem (1744 MB usable storage)	1	\$ 6,245	\$ 305,200	
B9484-8	Dual Drive Increment (345 MB usable storage)	1	840	33,700	
B6304-3	Disk Control	2	770	18,000	
B9495-5	MT (PE, 320KB)	6	4,098	139,200	
B6395-7	MT Control	2	1,072	34,500	
B9499-12	2 x 8 Exchange	1	435	16,650	
			<u>\$13,460</u>	<u>\$ 547,250</u>	
B9112	CR (1400 cpm)	1	\$ 532	\$ 24,145	
B6110	CR Control	1	104	4,307	
B9247-14	LP (1100 lpm, Train)	2	2,300	87,100	
B6247-4	LP (Control)	2	416	19,970	
			<u>\$ 3,352</u>	<u>\$ 135,522</u>	
B6359	DCP	1	\$ 1,600	\$ 76,800	\$ 380
B6359-1	12KB of local memory	2	400	19,200	58
B6353-8	Adapter Cluster	3	660	31,680	102
B6353-11	AC II Adapter - 9600 bps	24	1,080	51,840	168
			<u>\$ 3,740</u>	<u>\$ 179,520</u>	<u>\$ 708</u>
			<u>\$46,832</u>	<u>\$1,857,492</u>	
5-Year Lease with prime maint \$42, 149 (10% discount)					
Major software charge is for DMS II - \$768 per month (gross 5-yr license)					

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Burroughs B6821 Configuration

Model	Description	Qty	1-Yr Gross Lease	Purchase	Maint
B6821	2 X 2 with 2 consoles and 786 KB of Global Memory	1	\$25,800	\$1,248,000	\$2,800
B6009-5	393 KB Local Memory	6	16,800	504,000	2,100
B9470-2	Fixed Disk - 5.9 MB	2	1,700	68,000	
B9471-6	Electronics Unit	2	500	20,000	
B6377-1	Control (1 X 1)	2	1,160	46,400	
B6377-6	4 X 4 Exchange	1	210	8,400	
B6377-32	EU Adapter	2	60	2,400	
B6377-31	Ctrl Adapter	2	60	2,400	
			<u>\$46,290</u>	<u>\$1,899,600</u>	
B9383-18	2 X 10 Disk Subsystem (3488 MB usable storage)	2	\$12,490	\$ 610,400	
B6304-3	Disk Control	4	1,540	36,000	
B9495-6	MT (PE, 400 KB)	10	7,810	295,360	
B9499-14	4 X 16 Exchange	1	900	34,560	
B6395-7	MT Control	4	2,144	69,000	
			<u>\$24,884</u>	<u>\$1,045,320</u>	
B9112	CR (1400 cpm)	2	\$ 1,064	\$ 48,290	
B6110	CR Control	2	208	8,614	
B9246-2	LP (1800 lpm drum)	2	3,242	134,550	
B6240	Printer Control	2	312	14,960	
			<u>\$ 4,826</u>	<u>\$ 206,414</u>	
B6359	DCP	2	\$ 1,600	\$ 76,800	\$ 380
B6359-1	12 KB Local Memory	4	800	38,400	116
B6353-8	Adapter Cluster	4	880	42,240	136
B6353-11	AC II Adapter — 9600 bps	40	1,800	86,400	280
			<u>\$ 5,080</u>	<u>\$ 243,840</u>	<u>\$ 912</u>
			<u>\$81,080</u>	<u>\$3,395,174</u>	
5-Year Lease with prime maint <u>\$72,972</u>					
Major software charge is for DMS II — \$768 per month (gross 5-yr license)					

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Burroughs B7700 Configuration

Model	Description	Qty	1-Yr Gross Lease	Purchase	Maint
B7755	1 X 1 with Console	1	\$29,000	\$1,392,000	\$1,839
B7003	Memory Controls	1	5,600	268,800	1,450
B7002	786 KB (MOS, ECC)	4	12,800	614,400	1,000
B9470-2	Fixed Disk - 5.9 MB	1	850	34,000	63
B9470-12	Fixed Disk - 5.9 MB	1	700	28,000	61
B9471-6	Electronics Unit	1	250	10,000	38
B7377-1	Control Unit (1 X 1)	1	780	31,200	87
			<u>\$49,980</u>	<u>\$2,378,400</u>	<u>\$4,538</u>
B9383-18	2 X 10 Disk Subsystem (1744 MB usable storage)	2	\$12,490	\$ 610,400	
B7304-3	Disk Control	4	1,540	36,000	
B9495-6	MT (400 KB, PE)	8	6,248	236,288	
B7395-7	MT Control	2	1,072	34,500	
B9499-12	2 X 8 Exchange	1	435	16,650	
			<u>\$21,785</u>	<u>\$ 933,838</u>	
B9112	CR (1400 cpm)	1	\$ 532	\$ 24,145	
B7110	CR Control	1	104	4,370	
B9213	CP (300 cpm)	1	582	27,905	
B7212	CP Control	1	104	4,370	
B9247-14	LP (1100 lpm Train)	3	3,450	130,650	
B7247-4	LP Control	3	624	29,955	
			<u>\$ 5,396</u>	<u>\$ 221,395</u>	
B7350	DCP	1	\$ 916	\$ 43,200	
B7350-5	Local Mem - 24 KB	3	3,387	162,000	
B7350-1	Adapter Cluster	3	609	28,800	
B7353-8	Adapter Cluster III - 8 lines	1	220	10,560	
B7353-9	Line Adapter - 9,600 bps	8	360	17,280	
B7650-3	Line Adapter - 2,400 bps	40	2,440	115,200	
			<u>\$ 7,932</u>	<u>\$ 377,040</u>	
			<u>\$85,093</u>	<u>\$3,910,673</u>	
5-Year Lease with prime maint \$78,286 (8% discount)					
Major software charge is for DMS II — \$768 per month (gross 5-yr license)					

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Partial List of B6700 Customers

Banking and Finance

World Bank, Washington
 1st National Bank, Memphis
 Harris Trust Co., Chicago
 Banco National de Mexico, Mexico City
 Federal Reserve Bank, Boston
 Maryland National Bank, Baltimore
 First Computer Corp., St. Paul, Minn.
 International Monetary Fund, Washington
 National State Bank, Linden, N.J.
 International Bank, Washington
 Dime Savings Bank, N.Y.
 Florida Informanagement Service, Orlando, Fla.
 N.Y. Clearing House Association, N.Y. (2)
 Bankers Data Processing, Boston
 National Postal Savings Bank of Argentina
 Midland Bank, London (3)
 Colonial Mutual Life, Victoria, Australia
 Banco Mercantel de Sao Paulo (Brazil)
 Data Resources In., Lexington, Mass.
 William O'Neil & Co., Los Angeles
 Federal Reserve Bank — New York
 Banco National de Mexico, Mexico City
 Chase Manhattan Bank, N.Y. (2)
 International Group Information Corp., N.Y.
 Taiyo Insurance, Japan

Government — State and Local

Penna. Dept. of Transportation, Harrisburg
 City of Cincinnati
 City of Salt Lake City
 N.Y. Criminal Justice Services, Albany
 N.Y. State Equality & Assmt., Albany
 City of Jacksonville (Florida)
 Unemployment Insurance Commission, Ontario
 State of Michigan, Lansing, Mich.
 Florida Dept. of Hw. Safety, Tallahassee
 City of Detroit (2)
 City of Charlotte (N.C.)
 New Zealand University (5)
 Metropolitan Toronto Police Force
 N.Y. State Dept. of Health

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Federal Government

Defense Logistics Service Center, Battle Creek, Mich.
U.S. Treasury Dept., Washington
U.S. A.F. Military Personnel, San Antonio, Texas
U.S. Defense Dept. Fort Meade, Md.
Gov't of USSR, Moscow (Ministry of Petroleum)
U.S. Bureau of Mines
Ames Research Center, Mountain View, Calif.
Argentine Air Force
U.S. A.F., Electronics Systems Division (3 x 2)
U.S. A.F. (Recruitment)

Education

Seneca College, Ontario
Air Force Academy
U. of California, La Jolla, Calif.
U. of California, Davis
Queens Univ., Ontario
U. of Washington, Seattle
U. of Delaware, Newark, Del.
U. of Denver (Colorado)
Utah State Univ. Salt Lake City
U. of the Pacific, Stockton, Calif.
Eindhoven U. of Technology, Netherlands
U. of Mexico, Mexico City
Western Institute for Science & Industry, Waco, Texas
U. of Sao Paulo (Brazil)
Brazilian Institute of Space Research

Manufacturing — Production & R & D

Ford Motor Company, Detroit
Chrysler Corp., Detroit
Spillers Ltd., England
Koch Industries, Wichita, Kansas
American Microsystems, Santa Clara, Calif.
Philco Ford, FT. Washington, Pa.
General Mills, Minneapolis (2)
Marathon Oil, Littleton, Colorado
Westinghouse, Sunnyvale, Calif.
Canadian Industries, Montreal
American Hospital Supply, Evanston, Ill.
Inmont Corp., New York
Libby McNeil, Chicago
Petro-Tex Chemical Corp., Houston, Texas
Gould Inc., Cleveland
Gleason Works, Rochester, N.Y.
Koppers, Pittsburgh
National Starch & Chemical, Bridgewater, N.J.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Manufacturing — Production & R & D (Cont.)

Isuzu Motors, Kawasaki, Japan
Volvo, Sweden
Kaiser Industries, San Francisco
Spartan Mills (North Carolina?)
Cone Mills (South Carolina)
Mitsubishi Oil, Japan
Yokogawa Bridge Works, Japan
Damon Creations, N.Y.
Rauchem Corp., Menlo Park, Calif.

Utilities

Michigan Bell Telephone
Northern Illinois Gas Co., Aurora, Ill.
Northern Natural Gas, Omaha, Nebraska
Pacific Bell Telephone, San Francisco
Colonial Pipeline Co., Atlanta
Gas & Fuel Corp. of Australia
Philadelphia Electric Co. (3 x 3)
Bell Telephone Labs, New Brunswick, N.J.

Engineering Consulting & Services

C. F. Braun, Alhambra, Calif.
Stanford Research Institute, Menlo Park, Calif.
People Machine Interface, N.Y.
Remote Computing Corp., Palo Alto, Calif. (2)
United Technology Center, Sunnyvale, Calif.
EBASCO Service (Div. Boise Cascade), N.Y.
Time Sharing Systems, Inc., Milwaukee
Data Communications Corp., Memphis
Lomas & Nettelton, Houston, Texas
Joseph Firsch Consulting, Port Washington, N.Y.
Japan Info. Processing Service Co., Tokyo
Southeast Data Processing Inc., Miami
I.P. Sharp Associates (Toronto)

Other

Young & Rubicam, N.Y.
C & O, B & O, Baltimore (3 x 3)
Gift America Corp., N.Y.
I.N.F.O.N.A.V.I.T., Mexico City
Gifford — Hill & Co., Dallas
Japan Information Processing, Japan
Iwai Keisan Center, Japan
Royal Dutch Meteorological Institute
Organization of Economic Cooperation & Dev. (OECD), Paris
Consumers Distributing Co. (Toronto)
Lojas Americanas (Brazil)
Douglas Dunhill, Inc. (Chicago) — Advertising
NKL (Norway) — Retail

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Partial List of B7700 Customers

Brazilian Social Security Administration (Rio De Janeiro)

U.S. Customs Service (San Diego)

Federal Home Loan Bank of Chicago

Pacific Telephone & Telegraph (San Francisco) – 3

Michigan Bell Telephone Company (Detroit) – 2

NASA

Data Resources Inc. (Lexington, Mass.)

American Hospital Supply (Chicago)

N.Y. Federal Reserve Bank

1st National Bank of Memphis (Tenn)

Australian Public Service Board (Canberra)

Midland Bank (London) – 2

Victorian Government (Australia)

So. Australian T.A.B.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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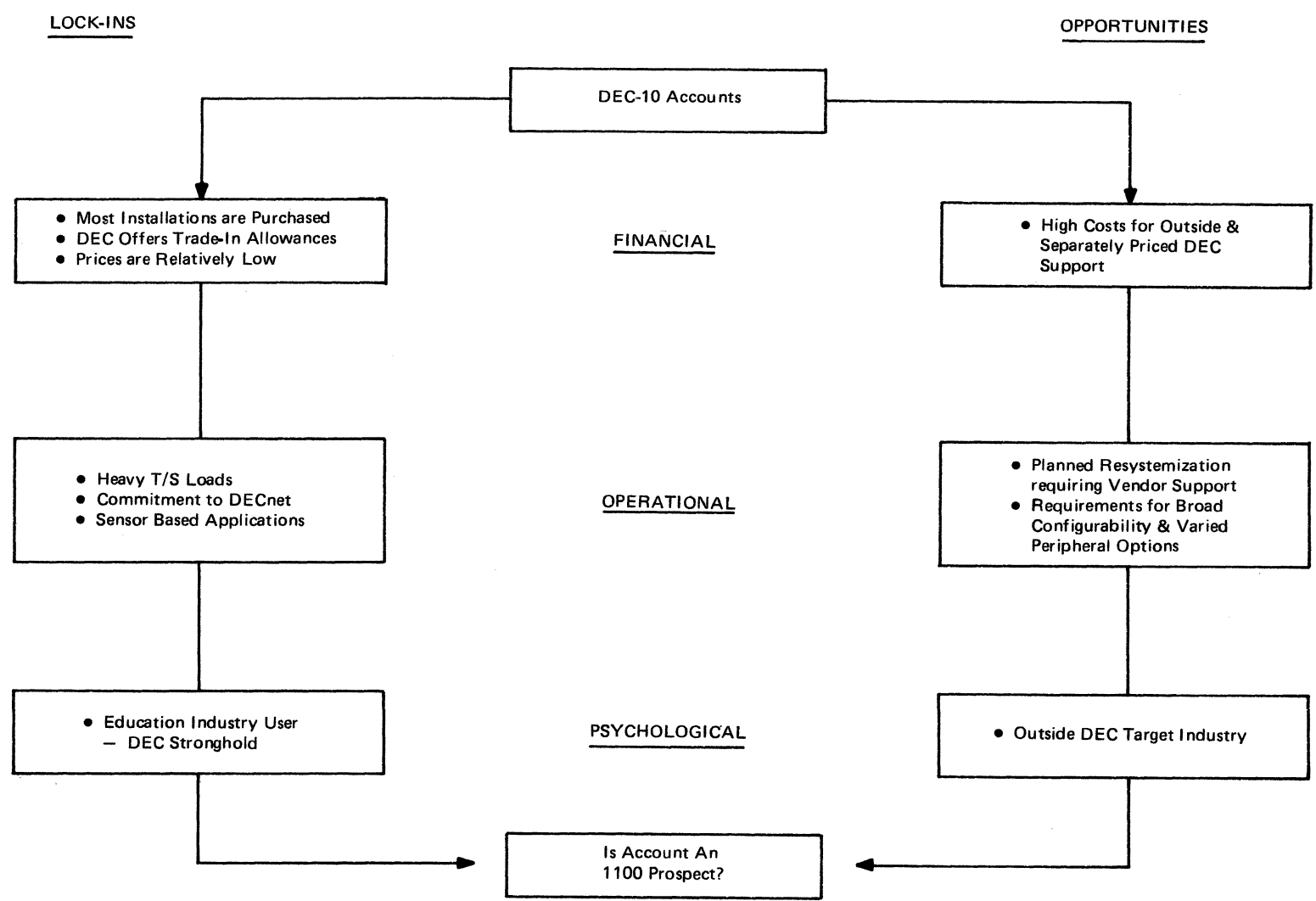
9.4 DEC SYSTEMS THAT COMPETE WITH 1100

Series	DEC Competition	Performance Estimates
1100/10	2040 1060-F,X 1066-F,X 1080-F,X	1100/11 (without overlap) should outperform a 2040 by 10-20% and provide performance commensurate with that of a 1060 (about 20% faster than 2040) in a mixed batch and time sharing environment. 1100/12 should substantially outperform a 1066 due to overlap and superior multiprocessor design but fall short of the 1080.
1100/20	1066-F,X 1080-F,X 1088-F,X	1100/21 should fall short of a 1066 and 1080. The 1100/22 should substantially outperform a 1080.
1100/40	1080-F,X 1088-F,X	1100/41 should provide performance commensurate with a 1080. The 1100/42 should outperform a 1088.
1100/80	1088-F,X	1100/81 should substantially outperform a 1088.

1. 2040 is first model in DEC-20 series. It uses KL20 processor; which is same as KL10 processor used in 1080 less cache. New DEC-20 models are expected to replace DEC-10 models (1060 and 1080) in future.
2. 1066 and 1088 are dual processor models. Processors operate in a master-slave relationship. No MP support is currently available for 2040.
3. "F" models are packaged with DF10 data channel for TU10 tape subsystem and "X" models include data channel for TU70 tape subsystem.
4. 1060 system is not in new production but still actively marketed on a refurbished basis (until DEC-20 replacement is introduced).
5. DEC-10 and DEC-20 systems are optimized for time sharing. They perform well in time sharing and teleprocessing environments but perform poorly in commercial batch.

The above DEC-10 and -20 models are marketed worldwide.

Qualifying DEC Accounts as 1100 Series Prospects



DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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**Why a prospect should buy an
1100/10 over a DEC-20**

1. 1100/10 Configurability

The configurability of DEC-20 is limited: 256K 36-bit words (max); 8 tapes (max), 8 disks (max) and 64-lines (max). No dual control support for tape and disk subsystems.

2. 1100/10 Range of Peripherals

DEC-20 supports only two types of disk (8430 & 8433); one tape model (60/120KB NRZ/PE); two printers (300 & 1200lpm) etc

3. 1100/10 CRT Console

DEC-20 uses LA36 Keyboard-Printer (30cps) as operator console.

4. 1100/10 Communications

DEC-20 currently supports only asynchronous communications.

5. 1100/10 Multiprocessing

DEC-20 cannot be configured as a multiprocessor System. 1100/10 multiprocessing offers option for increased performance (without mainframe swap-out) and option for on-site backup (a desirable capability for many real-time installations).

6. 1100 OS Batch Performance

TOPS-20 is optimized for T/S. DEC-20 may perform poorly in COBOL batch environment.

7. 1100 Series Installation Diversity

DEC-10 installations are concentrated in selected, target industries e.g. education service bureaus, etc. DEC's experience and support is limited outside these industries.

8. Sperry Univac Support

DEC's capacity to support installations that are not self-sufficient is limited.

9. Sperry Univac One-Price Posture

DEC-20 customers confront a multitude of separate charges for support software maintenance, training, etc.

10. Sperry Univac Lease Financing

DEC writes very few leases. Viability of DEC depends on outright sales. Leases are arranged via 3rd party leasing firms.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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**Why a prospect should buy an
1100/20 over a DEC-10 (K110) System**

1. 1100/20 is in Production

KI10 CPU used in 1060/66 is available only on refurbished basis. DEC could, however, bid a KL10 system.

2. 1100/20 Main Store

DEC-10 main store is core (old technology) and does not provide self-correction feature.

3. 1100/20 Range of Peripherals

DEC-10 does not support U32 tape drives. No band printers (quality print) are available 1,250 lpm drum printer is fastest.

4. 8405 Fixed Disk

RHSO4 swapping disk has low capacity (256K 36-bit words) and must be configured as free-standing subsystem. No SPI nor dual channel support.

5. 1100/22 Multiprocessing Support

1066 imposes master-slave dependency between KI10 CPU's. 1100/22 offers both performance (greater performance contribution from 2nd CPU) and availability benefits.

6. 1100 OS Batch Performance

TOPS-10 is optimized for T/S. While Galaxy Batch facility (introduced March 1976) may offer better batch performance than previously, 1100 OS should outperform TOPS-10 in COBOL batch environment.

7. 1100 Series Installation Diversity

DEC-10 installations are concentrated in selected, target industries e.g. education service bureaus, etc. DEC's experience and support is limited outside these industries.

8. Sperry Univac Support

DEC's capacity to support installations that are not self-sufficient is limited.

9. Sperry Univac One-Price Posture

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PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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DEC-10 and -20 System Specifications

PROCESSOR	1040	1060	1080	2040
	KA10	KI10	KL10	KL20
Cycle Time	—	—	125 ns	—
Instructions				
Type	General Purpose	Same	Same	Same
Number	Fixed Length (36-bits)	Same	Same	Same
Options	366	378	386	386
Control Memory				
Use	Not Applicable (Hardware Instructions)	Same	Instruction Microcode	Same
Size	Not Applicable	Same	2K 80-bit words	Same
Pipeline Design	No	Same	Same	Same
Cache				
Type	Not Applicable	Same	Non-Store-Through	Not Applicable
Size			2048 words	
Cycle Time			125 ns	
Hit %			90-95%	
Modes of Operation	Real	Virtual or Real	Virtual-std; Real-optional	Virtual
MAIN STORE				
Type	Core	Same	Same	Same
Self-Correcting	No (Parity only)	Same	Same	Same
World Width	36-bits + 1 Parity	Same	Same	
Read Time	} 1 μ sec cycle	Same	Same	} 1.28 μ sec cycle
Write Time				
Interleave	2 or 4-way	Same	Same	Same
Min. Capacity	64 KW	Same	128 KW	64 KW
Max. Capacity	256 KW	4,096 KW	Same	256 KW
Increments	32 and 64 KW	32 and 128 KW	Same	32 KW
RELATIVE MAIN-FRAME PERFORMANCE (EST)	1.0	1.8	3.9	1.5
INPUT/OUTPUT				
Design	Data comm and unit record I/O multiplexed through CPU; disk and tape I/O multiplexed directly to main store	Same	Same	Data comm and unit record I/O multiplexed through separate PDP-11 CPU; disk and tape I/O multiplexed directly to main store through programmed microprocessors
No. of Channels	2-8 per memory port mpxr; 1-2 mpxrs per system (disk and tape)	Same	Same	Not Applicable
Channel Data Rates	—		—	—
Aggregate Data Rate	1 MW/sec	Same	Same	1.8 MW/sec
SYSTEM CONSOLE				
Type	10 cps teleprinter	Same	PDP-11/40 Console Diagnostic Computer used to load microcode; support 30 cps DECwriter	PDP-11/40 arranged as C/SP supports 30 cps DECwriter
Options	CRT	Same	Same	Same
Data store internally in 7-level ASCII code, 5-characters per 36-bit word				

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

DEC Multiprocessing Capabilities

Multiprocessing Capability	Support		Features
	Systems	Software	
Master-Slave	1066 1088	TOPS-10	Only designated master CPU can operate in control mode. This constraint limits performance contribution from 2nd CPU to 40-50% (vs 70-80% for tightly coupled) and ability to quickly recover shout master CPU fail.
Networking	PDP-11 DEC-10 DEC-20 PDP-8 PDP-15	DECnet	Multiple systems arranged in communications network are supported by standard DECnet software. DECnet comprises a common set of commands that enables DEC Systems to inter-communicate. It is DEC's answer to IBM's SNA. Systems can be arranged in hierarchical networks, distributed processing networks, resource sharing networks, etc. DECnet enables DEC to unify product line, i.e., minis with larger-scale DEC-10 and DEC-20. Networks of small-scale systems can serve as alternatives to large-scale host systems in selected applications.
Communications/ Symbiont Processing	DEC-20	TOPS-20	PDP-11/45 serves as C/SP in 2040 system design.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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**Why a prospect should buy an 1100/40
over a DEC-10 (KL10) system**

1. 1100/40 Expansion Potential

1088 (2X) is largest KL 10 system. 1100/42 (and 1100/81) should outperform 1088. 1100/42 can yet be upgraded to 1100/43, etc.

2. 1100/40 Main Store

DEC-10 main store is old technology.

3. 1100/40 Range of Peripheral

DEC-10 does not support U32 tape drives. No band printers (quality print) are available 1,250 lpm drum printer is fastest.

4. 8405 Fixed Disk

RHSO4 swapping disk has low capacity (256K 36-bit words) and must be configured as free-standing subsystem. No SPI no dual channel support.

5. 1100/42 Multiprocessing Support

1088 imposes master-slave dependency between KL10 CPU's 1100/42 offers both performance (greater performance contribution from 2nd CPU) and availability benefits.

6. 1100 OS Batch Performance

TOPS-10 is optimized for T/S. While Galaxy Batch facility (introduced March 1976) may offer better batch performance than previously, 1100 OS should outperform TOPS-10 in COBOL batch environment.

7. 1100 Series Installation Diversity

DEC-10 installations are concentrated in selected, target industries e.g. education service bureaus, etc. DEC's experience and support is limited outside these industries.

8. Sperry Univac Support

DEC's capacity to support installations that are not self-sufficient is limited.

9. Sperry Univac One-Price Posture

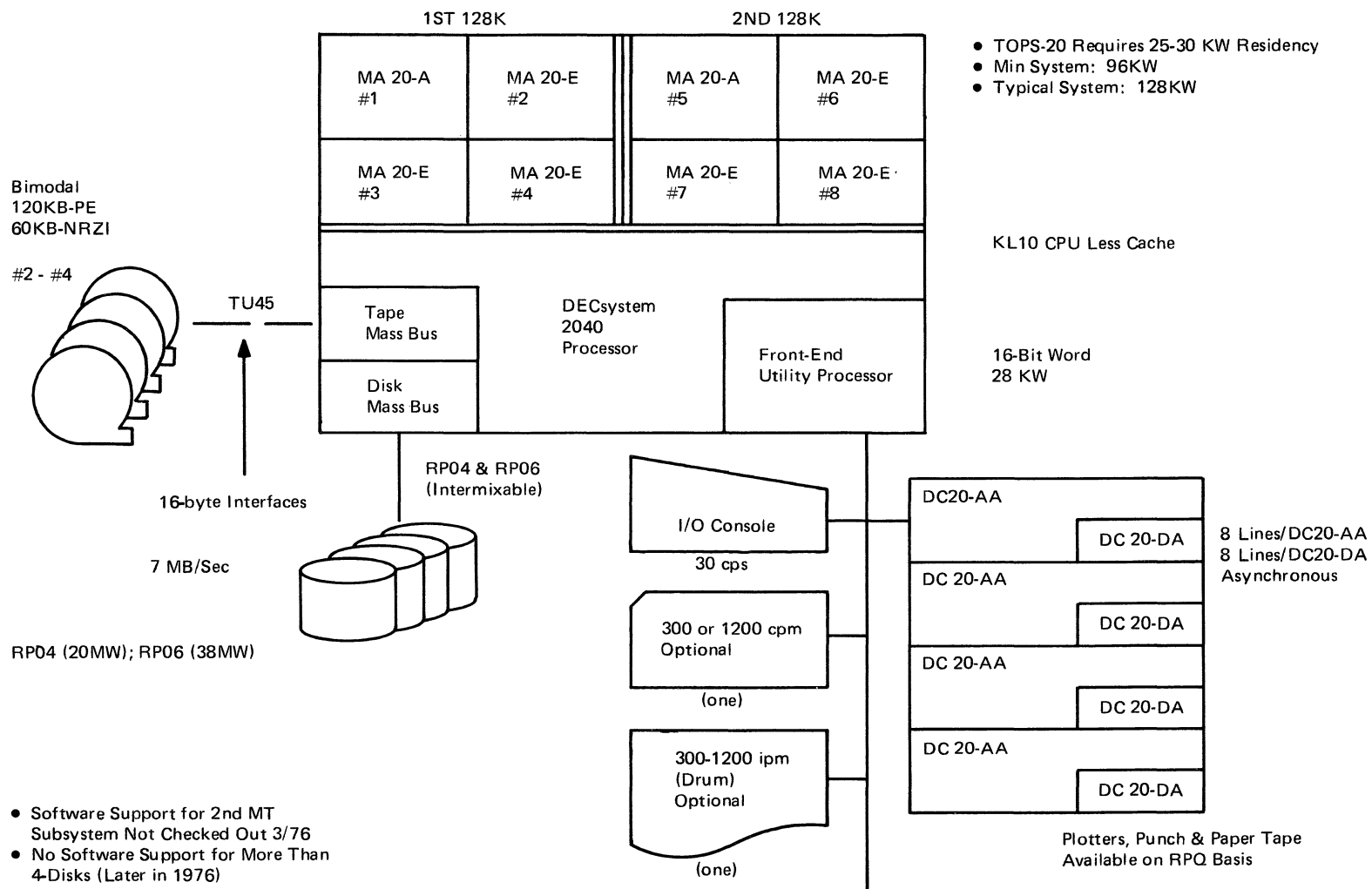
DEC-20 customers confront a multitude of separate charges for support software maintenance, training, etc.

10. Sperry Univac Lease Financing

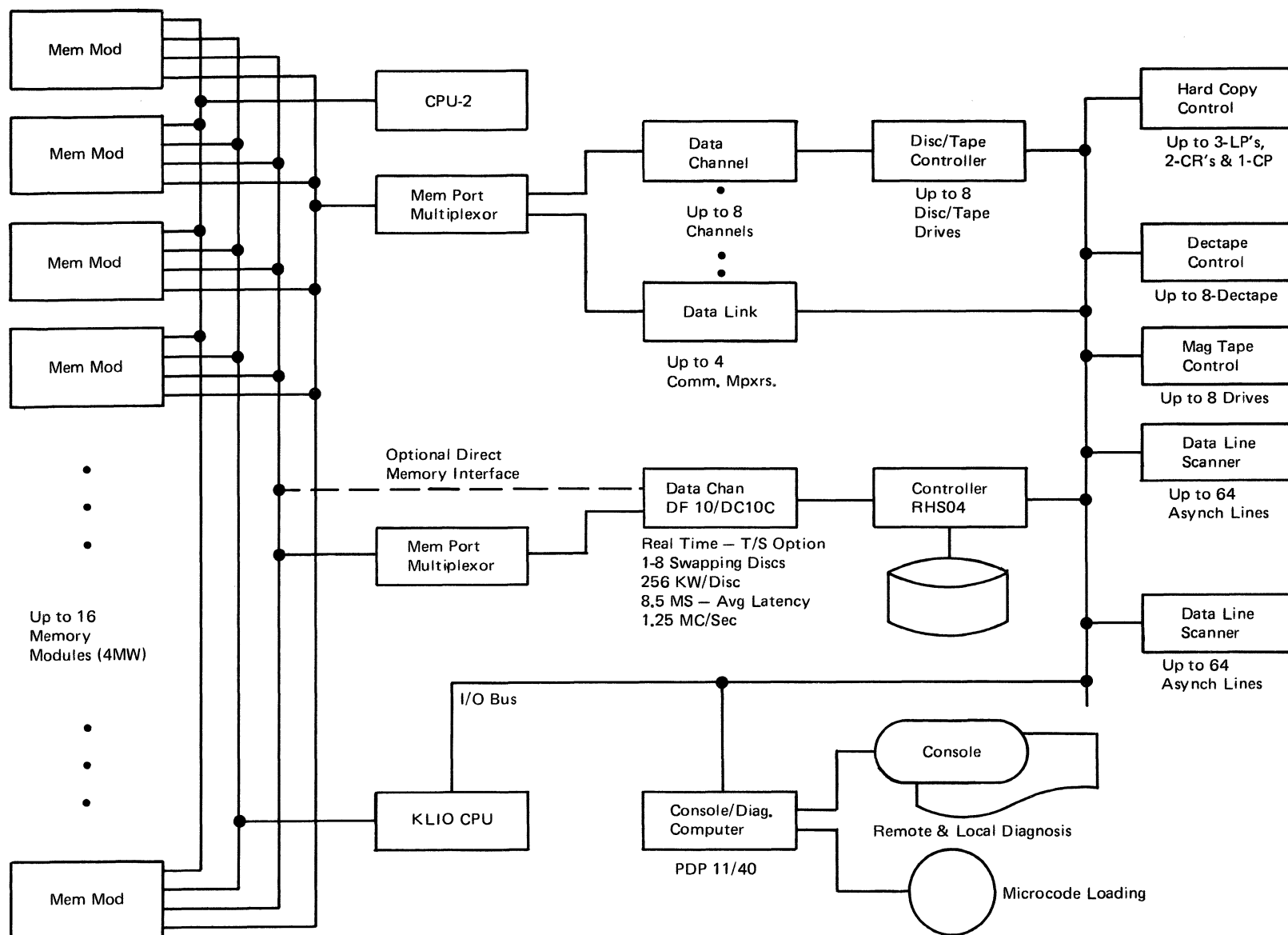
DEC writes very few leases. Viability of DEC depends on outright sales. Leases are arranged via 3rd party leasing firms.

DECsystem-20 CONFIGURATOR

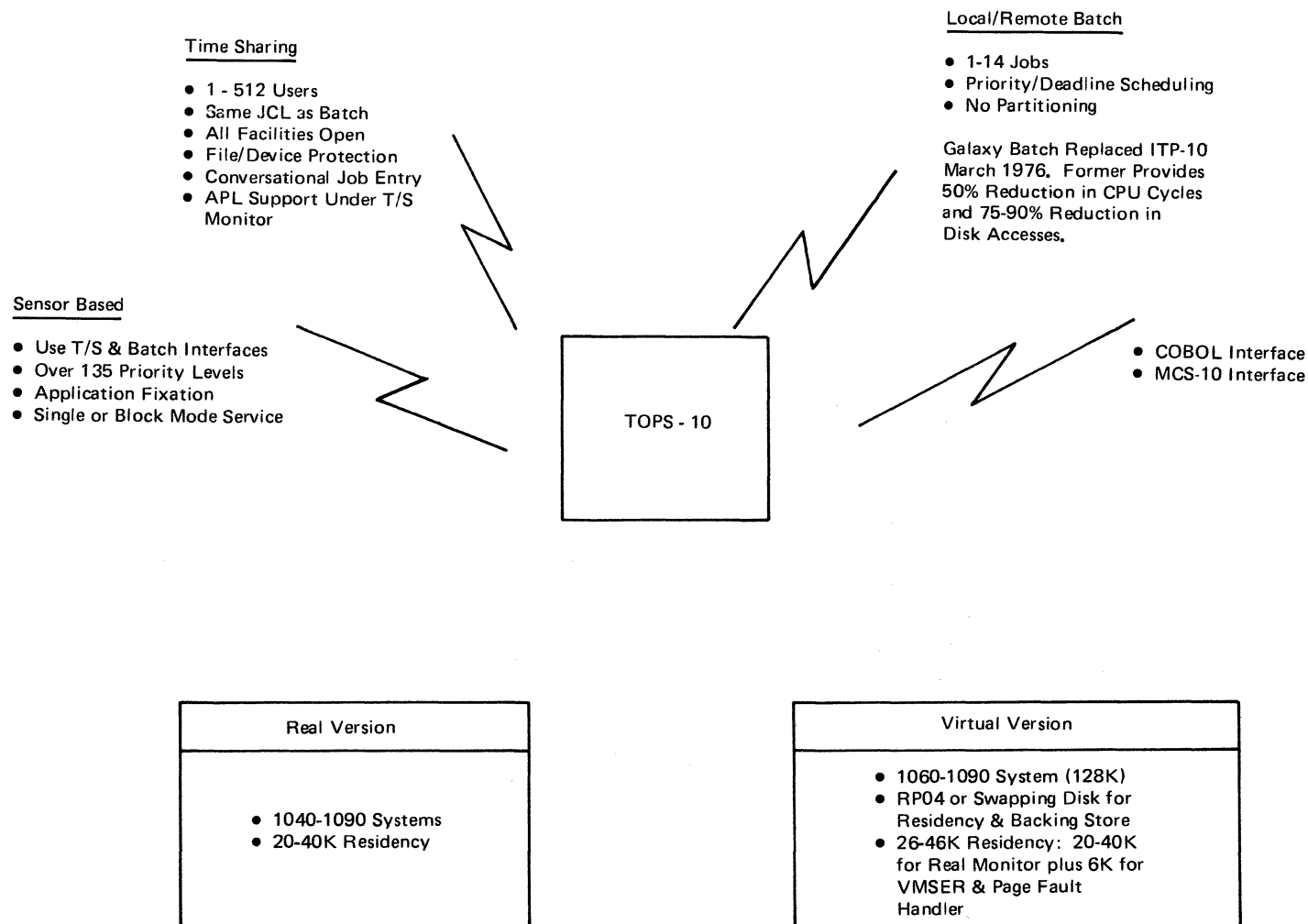
Core Memory: 36-Bit Word (5-7 bit bytes & parity)
 32K Per MA20
 1 μ sec
 2- & 4-Way Interleave



DECsystem-10 (KL10) ARCHITECTURE



TOPS-10



DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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DECsystem-10 Compilers

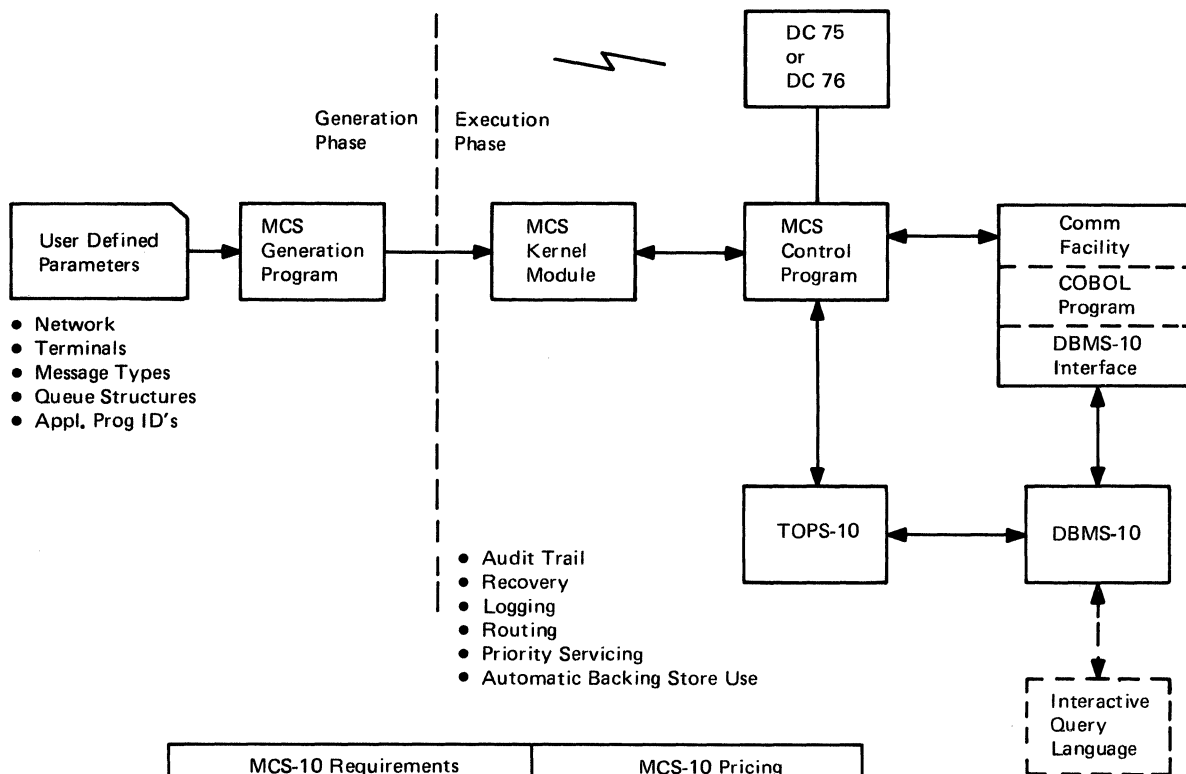
<u>COMPILER</u>	<u>FEATURES</u>	<u>REAL STORE REQ'T'S</u>
MACRO-10	2-Pass Macro Assembler Ostensible	7K + 1K/user (Reentrant)
COBOL-74	Intrinsic ISAM Communications Facility On-line Debug Pkg 2,000-6,000 Statements/Min	7K + 10K/user (Reentrant)
FORTRAN IV	Extended Version Library of 110 Functions	10K + 2K/user (Reentrant)
FORTRAN-10	Global & Local Optimization Faster than FORTRAN IV 40% Faster Object Programs FORDDT-Interactive Debug Facility	19K + 4K/user (Reentrant)
ALGOL-60	1-Pass, Single Phase 5,000 Lines/Minute	13K + 2K/user (Reentrant)
BASIC	Extended Intrinsic Editor	12K + 2K/user (Reentrant)
AID	Algebraic Interpretive Dialogue DEC Version of RAND's JOSS BASIC Alternative	9K + 2K/user (Reentrant)
APL-10	3 Versions: Basic Extended Double Precision Extended Function Editing Dynamic User Workspace Runs under T/S Monitor	20K + 1.5K/user + 5 or 6K for workspace 24K + 1.5K/user +5 or 6K/for workspace (Reentrant)

DBMS-10

- CODASYL COMPATIBLE
- HOST LANGUAGES: COBOL & FORTRAN
- SECURITY FEATURES: PRIVACY LOCKS UP TO 30 CHAR
- RECOVERY
- UTILITIES
 - INITIALIZATION
 - PRINT
 - SCHEMA UPDATE
 - STATISTICS LOGGING

REQUIREMENTS	PRICE
• 5K + 2K/USER (REENTRANT) • COBOL OR FORTRAN	• \$25,000 + \$2,500/YR

DECsystem-10 MESSAGE CONTROL SYSTEM (MCS-10)



MCS-10 Requirements	MCS-10 Pricing
• Virtual Version of TOPS-10 • DC75 or/and DC76 • 8K + 10K/User (Buffers & Tables) • COBOL	• \$50,000 Paid-Up License • \$5,000 Annual Maintenance

**DEC-10 & DEC-20
Product Strategy**

- DEC-10 and DEC-20 systems are constructed from mass produced mini-computers. This constrains costs, enabling DEC to offer DEC-10 and DEC-20 systems at low prices.
- DEC-10 and DEC-20 systems are optimized for interactive processing.
- Most of DEC's system and application software has been developed in conjunction with DEC-10 customers. For example, DEC 1088 software was developed in conjunction with General Dynamics, San Diego. TOPS-20 communications support is based on TENEX installed in the ARPA network.
- DECnet will undergo extensive enhancement. DEC claims DECnet is currently or being installed at over 100 sites.
- DEC's core memory manufacturing facilities were acquired from RCA.
- Many of DEC's peripherals are acquired on an OEM basis, e.g. 8430/33 type disk from Memorex (original 8430 was acquired from ISS); TU70 (U20 comparable) magnetic tape from STC; etc.
- A full range of DEC-20, DEC-40, etc. systems will eventually be evolved to replace DEC-10. Replacements will provide transaction processing and batch support.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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DEC-20 Market Strategy

- DEC offers inexpensive, high performance systems as alternatives to IBM and other vendors.
- DEC target markets to specific industries. About one-third of the 450 DEC-10's installed as of 1/1/76 are in education. The balance are installed primarily in time sharing environments, in-house and service bureaus. DEC will probably add to its target markets with the DEC-20. Utilities and S & L Government appear to be prime candidates.
- DEC sells installation coexistence with incumbent competitors and, if successful, total replacement in future.
- DEC can offer a network of minicomputers as an alternative to a large-scale system installation. DEC is in the forefront of distributed processing.
- DEC restricts its marketing to self-sufficient accounts. The company doesn't have the resources to provide extensive support.
- DEC sells systems outright or, alternatively, arranges lease financing via 3rd party firms. It appears that the company is not able to sustain a lease base.
- DEC develops much of its software in conjunction with customers. Customers are afforded price concessions.
- DEC avoids unprofitable support commitments by separate pricing of all support.

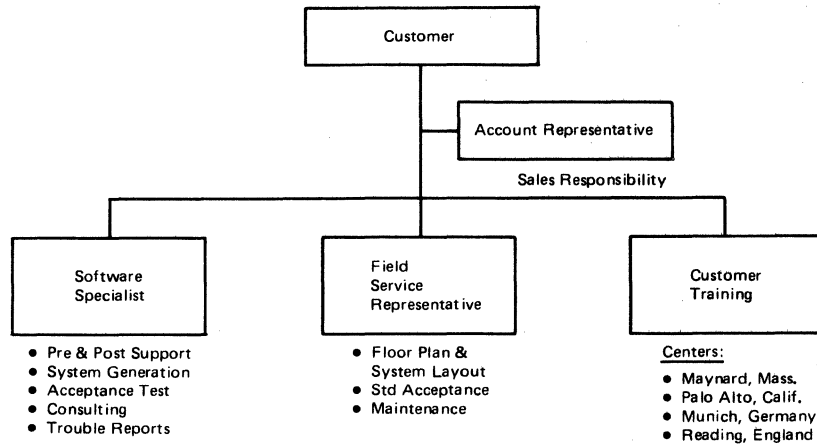
PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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DEC CONTRACTS

- Outright purchase is encouraged. DEC appears to need cash to sustain growth.
- Leases are available. DEC writes a few operating leases each year to acquire experience. Vast majority of leases are five year financing leases, with no residuals. These are generally arranged via 3rd party leasing firms. Some are arranged via DEC's leasing firms. Some are arranged via DEC's leasing subsidiary, associated with the 1st National Bank of Boston. Some DEC leases provide for a 10% purchase option or \$1.00 buyout at the end of term.
- DEC will write a 7-year installment purchase contract for State & Local Governments and provide the non-appropriation of funds termination privilege.
- DEC will negotiate trade-in allowances (based on fair market value) for upgrades.
- DEC offers 10–20% education discounts on hardware and software to secondary schools, junior colleges and universities.
- DEC may charge for difficult acceptance tests. In one case, DEC charged 1½% of the purchase value of a DEC-10.
- Maintenance is separately provided (like Sperry Univac). 8, 12, and 24-hour, 5-day per week plans are standard.
- System software is bundled. Compilers and application packages are separately priced and are available under paid-up licenses. Education discounts are available.
- SA support and training are separately priced. A limited number of training credits are bundled into the hardware pricing.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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DEC CUSTOMER SUPPORT



	System	Software	Field Engineering	Training
Free	DEC-10	• DEC software installation (Class A Only) • On-Year of Remedial Maintenance on Class A Software	• Floor Plan & Layout • Standard Acceptance Tests	• 13 Man Weeks
	DEC-20	• DEC Software Installation	• Same as DEC-10	• 10 Man Weeks
Chargeable	DEC-10	• Software Updates (Distribution, Maintenance & Notebook Update Charges) • Consultation —Per Call: \$45/Hr (\$75 Min) —Monthly: \$6,000 (160 Hrs) —Resident: 6 Months @ \$4,800/MO 12 Months @ \$4,300/Mo	• On-Call —12 & 24-Hour, 5-Day Service is Standard • On-Site —Negotiated Rates • Hourly —Charges for Time, Parts Service & Travel	• All Training in Excess of Above
	DEC-20	• Same as DEC-10	• On-Call —8 & 12-Hour, 5-Day Service is Std • On-Site & Hourly as for DEC-10	• All Training in excess of above • 5 Day On-Site Orientation Service: \$1,600

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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DEC 1080

Model	Description	Qty	Purchase Price	Maint/Mo (12-Hrs)
1080X	Basic System • KL10 CPU • 256K • RHP04 Disk (20MW) • DL10 Comm Interface • Data Chan	1	\$ 660,000	\$2,884
RP06B	Disk + Pack (38MW)	3	119,400	711
TU70D	MT (320KB) & Ctrl.	1	73,000	407
TU70A	MT (320KB)	3	81,000	498
CR10E	CR (1200 cpm)	1	18,000	112
LP10F	LP (1250 lpm)	1	47,500	192
DC76D	Front-End Processor	1	33,400	209
	16-line Group			
DC76E	16-line Extension	1	6,200	51
DC76FC	8-line Modem Interface	4	6,880	100
			<u>1,045,380</u>	<u>\$5,164</u>
TOP-10, VMSE, GALAXY, Assembler, and compilers (FORTRAN, ALGOL, BASIC and COBOL) are provided without additional charges.				
Type	Description	One-Time License Fee	Annual Maint Fee	
QH040	IQL Interactive Query Lang	\$12,000	\$1,200	
QH100	MCS-10 Message Ctrl Sys	50,000	5,000	
QH101	DBMS-10	25,000	2,500	
		<u>\$87,000</u>	<u>\$8,700</u>	
90-days of remedial software maintenance service is provided without charge.				
Thirteen man weeks of training are provided without charge. Additional training is chargeable.				
All system support other than initial software installation and initial maintenance installation and initial maintenance service as above is chargeable.				

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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DEC 2040

Model	Description	Qty	Purchase Price	Monthly Maint
2040	Basic System: • KL20/pdp-11 Processor Pair • 64KW • 1-TU45B MT & Control • 1-RP04B Disk & Control • 1-DC20AA (8-lines) • LA36-C Console	1	\$250,000	\$1,603
M20E	Storage - 32KW	2	20,000	200
PR04-A	Disk Drive - 100MB (Includes pack)	1	25,900	190
TU45	MT-120/60KB	3	42,000	360
CD20-B	CR-1200 cpm	1	15,900	100
LP20-F	LP-1200 lpm	1	44,000	200
			<u>\$397,800</u>	<u>\$2,653</u>

TOPS-20, RSX20-F and Assemblers are provided without additional charge.

Type	Description	Single Use License	Annual Update
QT001	ANS FORTRAN	\$ 7,500	\$ 750
QT003	ANS COBOL	7,500	750
QT004	BASIC	5,000	NA
QT007	SORT	2,500	250
QT008	DBMS	<u>25,000</u>	<u>2,500</u>
		<u>\$47,500</u>	<u>\$4,300</u>

Annual Update Fees are waived for 1st year.

10 man weeks of training are provided without charge. Additional training is chargeable.

All system support other than initial software installation is chargeable.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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DEC-10 Customers

Bowdoin College, Me.	U. of Calif. — L.A.
CalTech	U. of Heidelberg, Germany
Carnegie-Mellion	U. of Kiel, Germany
Case Western Reserve	U. of Manchester, U.K.
Catholic Univ. of America	U. of Maryland
Colorado	U. of Michigan
Cornell	U. of Munich, Germany
Emory	U. of Oregon
Essex Univ., England	U. of Pittsburgh
Faculte de Medicine de Paris	U. of Queensland, Australia
Harvard	U. of Utah
Hatfield Polytechnic, England	U. of Washington
James Cook Univ., Australia	U. of Western Ontario, Canada
Louisiana State Univ.	Western Michigan
Penn State	Yale
M.I.T.	Yavapai College
Ohio State	U. of Pa. (3)
Oxford, England	Watford College of Tech
Princeton	Claremont, Calif.
Southern Methodist	U. of Compinas, Brazil
Stanford	Tufts Univ.
Stanford Research Institute	Brigham Young
Stevens Institute of Tech.	U. of Furtwangen, Germany
Syracuse	National Caio Tung U., Taiwan
Tech. College of Aachen, Germany	U. of Arizona
Tech. U. of Berlin, Germany	U. of Texas
U. of Bochum, Germany	LaSalle, Phila.
U. of Bonn, Germany	Wageningen U. Holland
U. of Calif. — Irvine	Algonquin College, Ottowa
U. of Latrobe, Australia	Long Island Regional
Max Planck Institute, Germany	Instructional Computer Service
Stockholm University	Newport-Mesa School Dist., Calif.
Ramada Inns, Phoenix	Ctibank, N.Y.
General Kynamics, San Diego	Horizon Corp, Tucson
Washoe County, Nevada	Rochester (N.Y.) Gen Hospital
Catamore, Providence, R.I.	Keydata, Boston
Hawaii Water Board	ADP, Princeton
Canada Centre for Remote Sensitive	British Columbia Telephone Co.
Rolls Royce Ltd, England	Telepar, Brazil /T/C Company)
Whessoe, England (Engineering)	Tata Research Institute (India)
Alcan Aluminum, Canada	Compu-Serve, Columbus, Ohio
1st Data Corp, Waltham, Ma.	Tymeshare, Palo Alto, Calif.
Online Systems, Pittsburgh	Atomic Energy Commission
1st Church of Christ, Boston	Abbott Labs, Chicago
Powell-Duffryn, U.K.	

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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DEC-20 Customers

Marshall's Dept. Stores, Woburn, Ma.
Boston Dept. of Health
LaSalle College, Philadelphia, Pa.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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9.5 CDC SYSTEMS THAT COMPETE WITH 1100

Series	CDC Competition	Performance Estimates
1100/10	Cyber 172 Cyber 173 Cyber 174	1100/11 (131K) should provide performance comparable to Cyber 172 with 65K (60-bit words) but less than Cyber 172 with 98K. 1100/11 (262K) should fall short of Cyber 172 with maximum 131K. 1100/11 (393 & 524K) should outperform Cyber 172 (131K). 1100/12 should outperform Cyber 172 but fall short of Cyber 173. Cyber 174, dual processor version of Cyber 173, will substantially outperform 1100/12.
1100/20	Cyber 172 Cyber 173 Cyber 174	1100/21 (131K & 262K) should fall short of Cyber 172 (131K). 1100/22 (393K & 524K) should fall short of Cyber 173 (196K & 262K). 1100/22 (262K, 393K & 524K) should fall short of Cyber 173 (131K, 196K & 262K) and Cyber 174.
1100/40	Cyber 173 Cyber 174 Cyber 175	1100/41 (512K) should provide performance commensurate with Cyber 173 (262K) but well under Cyber 174 (262K). 1100/42 (512K) should outperform Cyber 174 (262K) but fall short of Cyber 175 (131K). 1100/44 (917K) should fall short of Cyber 175 (196K).
1100/80	Cyber 174 Cyber 175	1100/81 and 1100/82 should fall short of Cyber 175 (196K & 262K).

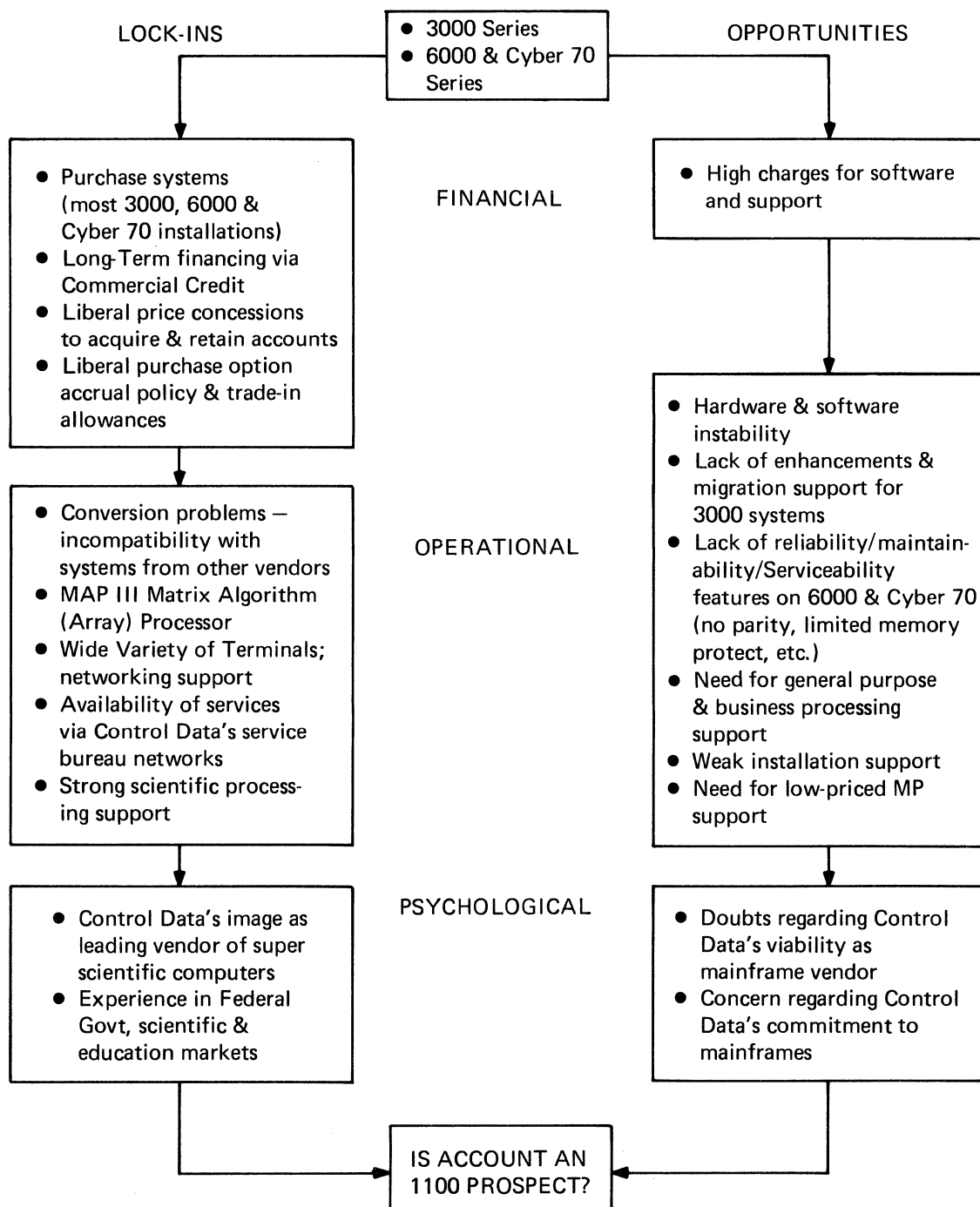
All main store capacities for Cyber 170 systems are expressed in 60-bit words while those for 1100 Series systems are expressed in 36-bit words.

Main store capacity for the Cyber 172 is limited to 131K and for the Cyber 173, 174 and 175 to 262K. Extended Core Storage can be configured with all four Cyber 170 models to "extend" main store capacities.

The above Cyber 170 models are marketed worldwide.

CONTROL DATA REPLACEMENT OPPORTUNITIES

Control Data Replacement Suspects



DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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**Relative Performance of Cyber 170,
Cyber 70 and 6000 Series**

Cyber 170 Series	Internal Perform. 6400=1	Cyber 70 Series	Internal Perform. 6400=1	6000 Series
		Cyber 72	0.8	6200
Cyber 172	1.2	Cyber 73*	1.0	6400
Cyber 173	1.7			6500 (2 X 6400)
Cyber 174	2.8	Cyber 74	2.3	6600
Cyber 175	4.6			6700 (1-6400 & 1-6600)
		Cyber 76	12.0	7700

*Cyber 71, announced in May 1976, is repackaged Cyber 73 priced to compete with 1100/10, DEC-20, Honeywell 6031, etc. Cyber 71 systems can be configured with 1 or 2 CPU's.

Cyber 170, Cyber 70 and 6000 series systems have same general architecture and internal design. Differences between Cyber 70 and 6000 series models are minimal. Cyber 170 series, however, departs from transistor logic and core memory (without parity) used in Cyber 70 and 6000 series; Cyber 170 features semiconductor logic and MOS memory with ECC.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Why A Prospect Should Buy An 1100/10 Over A Cyber 172

1. General Purpose Design — The initial design of Cyber 170 series systems is optimized for scientific processing whereas 1100 series internal design accommodates both business and scientific processing. The Cyber 170 series' 60-bit word, limited instruction repertoire, and lack of internal EBCDIC/ASCII support constrains business processing performance.
2. Main Store Expandability — Main store for the Cyber 172 is expandable to 131K (60-bit) words, about half the capacity of maximum main store for an 1100/10 (524K 36-bit words). While Extended Core Storage (ECS) can be configured as a backing store, ECS is not as effective as main store. Code cannot be directly executed in ECS; it must first be transferred to main store. Supplementing main store with ECS is a further indication of the scientific orientation of Cyber 170 series systems. ECS is ideal for storing large arrays. It can, however, also be used to store system and user routines in a time shared environment; non-resident portions of NOS, Scope and KRONOS; transaction processing routines in T/P implementations; etc.
3. Low Price Threshold To MP — Cyber 170 series MP support begins at the Cyber 174 level. To install a Cyber 174, a Cyber 172 must be field upgraded to a Cyber 173 and coupled with a 2nd Cyber 173 processor.
4. Failsoft Support — Besides offering limited multiprocessing, Cyber 170 systems provide limited failsoft support. NOS, KRONOS, and Scope control Cyber 170 systems via a dedicated peripheral processor designated the System Monitor (at dead-start time). Manual intervention is required should the System Monitor fail. No partitioning support is available. 1100 Series multiprocessor systems continue to operate should a CPU fail. They can be partitioned. This level of failsoft support is desirable in many large-scale real-time installations.
5. Hardware Supported Reentrancy — 1100/10 multibanking support offers an efficient mechanism for reentrancy, ensuring optimum main store utilization. No comparable mechanism exists in Cyber 170 design.
6. 8405 and 8434 Disk — No fixed disk nor high capacity 300 MB disk are available with Cyber 170 series systems. Control Data does offer an IBM 3350 disk on an OEM basis and as a plug-compatible replacement for IBM end-users. To date, however, it is not supported on Cyber 170 systems .
7. Single Operating System — Implementation delays and incompatibilities with earlier operating systems have plagued the development of the Network Operating System (NOS) and curtailed migration of Scope and KRONOS users to NOS. As a result three different and incompatible operating systems are currently supported on Cyber 170: NOS, Scope, and KRONOS. OS/1100 is supported on all 1100 Series Systems.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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8. Non-contiguous Memory Management — NOS, KRONOS, and Scope assign memory to jobs in a manner similar to OS/3 on Sperry Univac 90/30 systems. Jobs are assigned and executed in contiguous areas of main store. This approach to memory management lacks the flexibility and efficiency characteristics of the approach used by OS/1100.
9. One Price Service — All Cyber 170 software, including operating systems, is separately priced. Software, which is priced based on actual development costs, constitutes 25–30% of the total price of a Cyber 170 system. With the exception of selected application packages, 1100 series software is bundled.
10. Broad Application Experience — Most Cyber 170 systems are installed for scientific processing in U.S. Federal Government and education environments. Control Data's attempts to enter new markets has met with problems in the past, e.g., Union Bank in Switzerland, American Express, etc. 1100 Systems are installed in a broad range of application areas.
11. Commitment to Mainframe Business — Control Data's operations are widely dispersed. The Company engages in insurance, EDP service bureau activities, and peripheral manufacture and sale on both an OEM and IBM plug compatible basis. Over the past several years, these operations have substantially surpassed Control Data's mainframe business in terms of profitability and caused doubt in the industry as to whether Control Data would continue as a mainframe supplier.
12. Air Cooled Installations — All Cyber 170 series systems require an expensive installation of freon conduction refrigeration.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Why A Prospect Should Buy An 1100/20 Over A Cyber 172

1. General Purpose Design — The internal design of Cyber 170 series systems is optimized for scientific processing whereas 1100 series internal design accommodates both business and scientific processing. The Cyber 170 series' 60-bit word, limited instruction repertoire, and lack of internal EBCDIC/ASCII support constrains business processing performance.
2. Main Store Expandability — Main store for the Cyber 172 is expandable to 131K (60-bit) words, about half the capacity of maximum main store for an 1100/20 (524K 36-bit words). While Extended Core Storage (ECS) can be configured as a backing store, ECS is not as effective as main store. Code cannot be directly executed in ECS; it must first be transferred to main store. Supplementing main store with ECS is a further indication of the scientific orientation of Cyber 170 series systems. ECS is ideal for storing large arrays. It can, however, also be used to store system and user routines in a time shared environment; non-resident portions of NOS, Scope and KRONOS; transaction processing routines in T/P implementations; etc.
3. Low Price Threshold To MP — Standard Cyber 170 series MP support begins at the Cyber 174 level. To install a Cyber 174, a Cyber 172 must be field upgraded to a Cyber 173 and coupled with a 2nd Cyber 173 processor.
4. Failsoft Support — Besides offering limited multiprocessing, Cyber 170 systems provide limited failsoft support. NOS, KRONOS, and Scope control Cyber 170 systems via a dedicated peripheral processor designated the System Monitor (at dead-start time). Manual intervention is required should the System Monitor fail. No partitioning support is available. 1100 Series multiprocessor systems continue to operate should a CPU fail. They can be partitioned. This level of failsoft support is desirable in many large-scale real-time installations.
5. Hardware Supported Reentrancy — 1100/20 multibanking support offers an efficient mechanism for reentrancy, ensuring optimum main store utilization. No comparable mechanism exists in Cyber 170 design.
6. 8405 and 8434 Disk — No fixed disk no high capacity 300 MB disk are available with Cyber 170 series systems. Control Data does offer an IBM 3350 disk on an OEM basis and as a plug-compatible replacement for IBM end-users. To date, however, support for Cyber 170 systems is unannounced.
7. Single Operating System — Implementation delays and incompatibilities with earlier operating systems have plagued the development of the Network Operating System (NOS) and curtailed migration of Scope and KRONOS users to NOS. As a result three different and incompatible operating systems are currently supported on Cyber 170: NOS, Scope, and KRONOS. OS/1100 is supported on all 1100 Series Systems.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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8. Non-contiguous Memory Management — NOS, KRONOS, and Scope assign memory to jobs in a manner similar to OS/3 on Sperry Univac 90/30 systems. Jobs are assigned and executed in contiguous areas of main store. This approach to memory management lacks the flexibility and efficiency characteristics of the approach used by OS/1100.
9. One Price Service — All Cyber 170 software, including operating systems, is separately priced. Software, which is priced based on actual development costs, constitutes 25–30% of the total price of a Cyber 170 system. With the exception of selected application packages, 1100 series software is bundled.
10. Broad Application Experience — Most Cyber 170 systems are installed for scientific processing in U.S. Federal Government and education environments. Control Data's attempts to enter new markets has met with problems in the past, e.g., Union Bank in Switzerland, American Express, etc. 1100 Systems are installed in a broad range of application areas.
11. Commitment to Mainframe Business — Control Data's operations are heterogeneous. The Company engages in insurance, EDP service bureau activities, and peripheral manufacture and sale on both and OEM and IBM plug compatible basis. Revenues from mainframes represent only about 20% of Control Data's total revenues. Over the past several years, these operations have substantially surpassed Control Data's mainframe business in Terms of profitability and caused doubt as to whether Control Data would continue as a mainframe supplier.
12. Air Cooled Installations — All Cyber 170 series systems require an expensive installation of freon conduction refrigeration.

PAGE	PAGE REV.	TITLE	•	DOCUMENT NO.
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Control Data Cyber 170 Specifications

	Cyber 172	Cyber 173	Cyber 174	Cyber 175
PROCESSOR				
Cycle Time	50 ns	50 ns	Cyber 174 comprises two Cyber 173 CPU's arranged to operate as master-slave	25 ns
Instructions				
Type	Scientific 2, 3 or 4 instructions per 60-bit word	Same	Same	Same
Number	75	Same	Same	71 (4 Compare/more instructions omitted)
Options	None	Same		
Control Use	Not Applicable (Hardwired)	Same	Same	Same
Size				
Pipeline Design	No	2-word instruction overlap-look ahead	Same	Yes
Cache Type	Not Applicable	Same	Same	Small cache that can be used to capture iterative processes 12 60-bit registers 25 ns Not applicable
Size				
Cycle Time				
Hit %				
Modes of Operation	Real	Same	Same	Same
MAIN STORE				
Type	MOS	Same	Same	Same
Self-Correcting	Yes	Same	Same	Same
Word Width	60-bits; 8 word fetch per cycle	Same	Same	Same
Read Time	3.2 μ s per 8 words	Same	Same	Same
Write Time	3.2 μ s per 8 words	Same	Same	Same
Interleave	8-way	Same	Same	Same
Min Capacity	32K words	64K words	Same	Same
Max Capacity	131K words	256K words	Same	Same
Increments	16 and 32K words	32 and 64K words	Same	Same
RELATIVE MAINFRAME PERFORMANCE (EST)	1	2	3	6

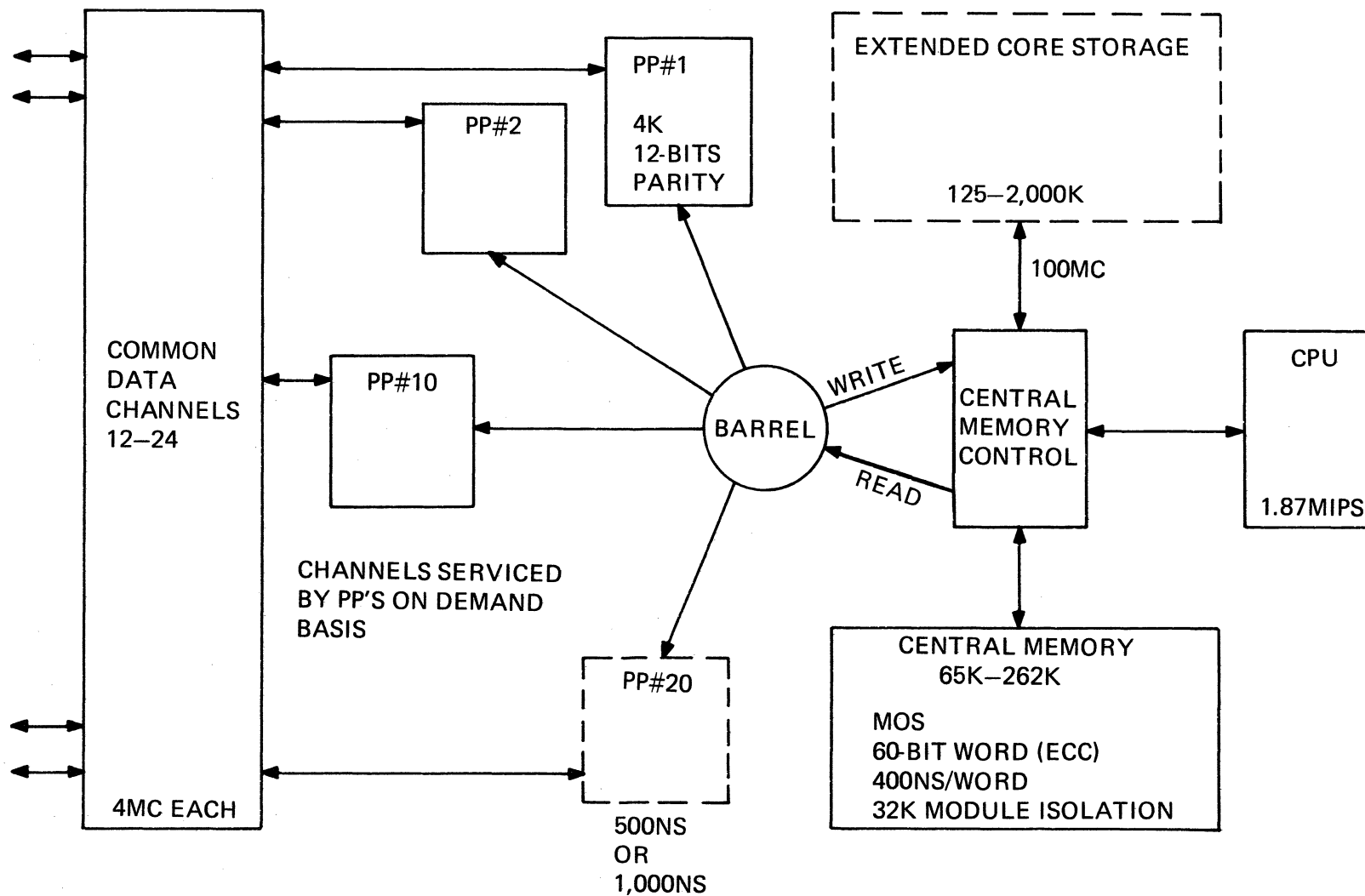
DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Control Data Cyber 170 Specifications (Cont.)

INPUT/OUTPUT				
Design	Multiple, programmed Peripheral Processors (PP's) service channels on a demand basis and perform all I/O operations independently of CPU	Same	Same	Same
No. of Channels	12 channels serviced by 10 PP's	12 to 24 channels serviced by 10–20 PP's	Same	Same
Channel Data Rates	Up to 4 MC/channel (C= 6-bit character)	Same	Same	Same
Aggregate Data Rate	40 MC/sec (max)	80 MC/sec (max)	Same	Same
SYSTEM CONSOLE				
Type	CRT and printer	Same	Same	Same
Options	2nd CRT and printer	Same	Same	Same

1. 196K and 262K main store options not supported on initial release of NOS.
2. Cyber 170's can optionally be configured with 125K to 2M words of Extended Core Storage (ECS). ECS is supported as a high speed backing store. It attaches directly to main store. Code cannot be executed directly out of ECS.

CYBER 173 ARCHITECTURE



PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Why A Prospect Should Buy An 1100/40 Over A Cyber 173 and Cyber 174

1. General Purpose Design — The internal design of Cyber 170 series systems is optimized for scientific processing whereas 1100 series internal design accommodates both business and scientific processing. The Cyber 170 series' 60-bit word, limited instruction repertoire, and lack of internal EBCDIC/ASCII support constrains business processing performance.
2. Main Store Expandability — Main store for the Cyber 173 is expandable to 262K (60-bit) words less than a third of the capacity of maximum main store for an 1100/40 (1,573 36-bit words). While extended Core Storage (ECS) can be configured as a backing store, ECS is not as effective as main store. Code cannot be directly Executed in ECS; it must first be transferred to main store. Supplementing main store with ECS is a further indication of the scientific orientation of Cyber 170 series systems. ECS is ideal for storing large arrays. It can, however, also be used to store system and user routines in a time shared environment; non-resident portions of NOS, Scope and KRONOS; transaction processing routines in T/P implementations; etc.
3. Extended Multiprocessing Support — Whereas only one additional CPU can be configured with a Cyber 173, forming a Cyber 174, three additional CAU's can be configured with an 1100/41, forming an 1100/44. The ability to add three additional CAU's to an 1100/41 provides more orderly installation growth. A Cyber 174 to Cyber 175 upgrade entails a mainframe swap-out.
4. Failsoft Support — Besides offering limited multiprocessing, Cyber 170 systems provide limited failsoft support. NOS, KRONOS, and Scope control Cyber 170 systems via a dedicated peripheral processor designated the System Monitor (at dead-start time). Manual intervention is required should the System Monitor fail. No partitioning support is available. 1100 Series multiprocessor systems continue to operate should a CPU fail. They can be partitioned. This level of failsoft support is desirable in many large-scale real-time installations.
5. Hardware Supported Reentrancy — 1100/40 multibanking support offers an efficient mechanism for reentrancy, ensuring optimum main store utilization. No comparable mechanism exists in Cyber 170 design.
6. 8405 and 8434 Disk — No fixed disk nor high capacity 300 MB disk are available with Cyber 170 series systems. Control Data does offer an IBM 3350 disk on an OEM basis and as a plug-compatible replacement for IBM end-users. To date, however, it is not supported on Cyber 170 systems.
7. Single Operating System — Implementation delays and incompatibilities with earlier operating systems have plagued the development of the Network Operating System (NOS) and curtailed migration of Scope and KRONOS users to NOS. As a result three different and incompatible operating systems are currently supported on Cyber 170: NOS, Scope, and KRONOS. OS/1100 is supported on all 1100 Series Systems.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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8. Non-contiguous Memory Management — NOS, KRONOS, and Scope assign memory to jobs in a manner similar to OS/3 on Sperry Univac 90/30 systems. Jobs are assigned and executed in contiguous areas of main store. This approach to memory management lacks the flexibility and efficiency characteristics of the approach used by OS/1100.
9. One Price Service — All Cyber 170 software, including operating systems, is separately priced. Software, which is priced based on actual development costs, constitutes 25–30% of the total price of a Cyber 170 system. With the exception of selected application packages, 1100 series software is bundled.
10. Broad Application Experience — Most Cyber 170 systems are installed for scientific processing in U.S. Federal Government and education environments. Control Data's attempts to enter new markets has met with problems in the past, e.g., Union Bank in Switzerland, American Express, etc. 1100 Systems are installed in a broad range of application areas.
11. Commitment to Mainframe Business — Control Data's operations are heterogeneous. The Company engages in insurance, EDP service bureau activities, and peripheral manufacture and sale on both an OEM and IBM plug compatible basis. Revenues from EDP systems represent only about 20% of Control Data's total revenues. Over the past several years, these operations have substantially surpassed Control Data's mainframe business in terms of profitability and caused doubt as to whether Control Data would continue as a mainframe supplier.
12. Air Cooled Installations — All Cyber 170 series systems require an expensive installation of freon conduction refrigeration.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Why A Prospect Should Buy An 1100/80 Over A Cyber 174 and Cyber 175

1. General Purpose Design — The internal design of Cyber 170 series systems is optimized for scientific processing whereas 1100 series internal design accommodates both business and scientific processing. The Cyber 170 series 60-bit word, limited instruction repertoire, and lack of internal EBCDIC/ASCII support constrains business processing performance. The Cyber 175 is more scientific oriented than the other Cyber 170 models in that four compare/move instructions implemented on the other models are not implemented on the Cyber 175. In contrast, the 1100/80 provides a comprehensive set of hardware implemented, byte oriented instructions that facilitate business processing.
2. Main Store Expandability — Main store for the Cyber 174 and 175 is expandable to 262K (60-bit) words, about one tenth the capacity of maximum main store for an 1100/80 (4,194 36-bit words). While Extended Core Storage (ECS) can be configured to supplement main store, ECS is not as effective as the main store/cache implementation on 1100/80 systems. Code cannot be directly executed in ECS; it must be transferred to and staged in main store for execution. While transfers can be overlapped with the execution of other jobs, transfers increase context switching overhead and job execution turnaround. Code is automatically staged in the 1100/80 SIU, simultaneously with execution as a result of the 1100/80 cache-based design. Context switching overhead and job execution turnaround are minimized. Supplementing main store with ECS is a further indication of the scientific orientation of Cyber 170 series systems. ECS is ideal for storing large arrays. It can, however, also be used to store system and user routines in a time shared environment; non-resident portions of NOS, Scope and KRONOS; transaction processing routines in T/P implementations; etc.
3. Cache Implementation — The Cyber 175 offers a very restrictive form of cache while the other Cyber 170 offer no cache. The 1100/80 features a state-of-the-art cache implementation that contributes substantially to performance.
4. Multiprocessing Support — Standard multiprocessing support is only available with the Cyber 174, a system roughly comparable to an 1100/81 in performance. Multiprocessing support is not available with the Cyber 175.
5. Failsoft Support — Besides offering limited multiprocessing, Cyber 170 systems provide limited failsoft support. NOS, KRONOS, and Scope control Cyber 170 systems via a dedicated peripheral processor designated the System Monitor (at dead-start time). Manual intervention is required should the System Monitor fail. No partitioning support is available. 1100 Series multiprocessor systems continue to operate should a CPU fail. They can be partitioned. This level of failsoft support is desirable in many large-scale real-time installations.
6. Hardware Supported Reentrancy — 1100/80 multibanking support offer an efficient mechanism for reentrancy, ensuring optimum main store utilization. No comparable mechanism exists in Cyber 170 design.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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7. 8405 and 8434 Disk — No fixed disk no high capacity 300 MB disk are available with Cyber 170 series systems. Control Data does offer an IBM 3350 disk on an OEM basis and as a plug-compatible replacement for IBM end-users. To date, however, it is not supported on Cyber 170 systems.
8. Single Operating System — Implementation delays and incompatibilities with earlier operating systems have plagued the development of the Network Operating System (NOS) and curtailed migration of Scope and KRONOS users to NOS. As a result three different and incompatible operating systems are currently supported on Cyber 170: NOS, Scope, and KRONOS. OS/1100 is supported on all 1100 Series Systems.
9. Non-contiguous Memory Management — NOS, KRONOS, and Scope assign memory to jobs in a manner similar to OS/3 on Sperry Univac 90/30 systems. Jobs are assigned and executed in contiguous areas of main store. This approach to memory management lacks the flexibility and efficiency characteristics of the approach used by OS/1100.
10. Broad Application Experience — Most Cyber 170 systems are installed for scientific processing in U.S. Federal Government and education environments. Control Data's attempts to enter new markets has met with problems in the past, e.g., Union Bank in Switzerland, American Express, etc. 1100 Systems are installed in a broad range of application areas.
11. Commitment to Mainframe Business — Control Data's operations are heterogeneous. The Company engages in insurance, EDP service bureau activities, and peripheral manufacture and sale on both OEM and IBM plug compatible basis. Revenues from EDP systems represent only about 20% of Control Data's total revenues. Over the past several years, these operations have substantially surpassed Control Data's mainframe business in Terms of profitability and caused doubt as to whether Control Data would continue as a mainframe supplier.
12. Air Cooled Installations — All Cyber 170 series systems require an expensive installation of freon conduction refrigeration.

Cyber 170 Multiprocessing Capabilities

Multiprocessing Capability	Support Systems	Software	Features
1. Unorthodox Tightly Coupled	Cyber 174	NOS Kronos Scope	The two Cyber 173 CPU's included in a Cyber 174 are mutually exclusive. Both are controlled by a single copy of NOS, Kronos, or Scope. NOS, Kronos, and Scope control the two CPU's via main store, from a peripheral processor designated the System Monitor. The CPU's function as instruction processors, e.g., CAU's. All I/O is managed by NOS, Kronos, or Scope via main store, from the System Monitor. The Cyber 174 multi-processing implementation lacks the failsoft benefits available with 1100 series systems. A Cyber 174 is rendered inoperable if the System Monitor fails. Manual intervention is required to designate a new System Monitor and restart the system.
2. Distributed Processing	Cyber 170 2550 Cyber 18	NOS	Network processing functions can be relegated to Control Data's minicomputer systems, e.g., Cyber 18, introduced in March 1976.

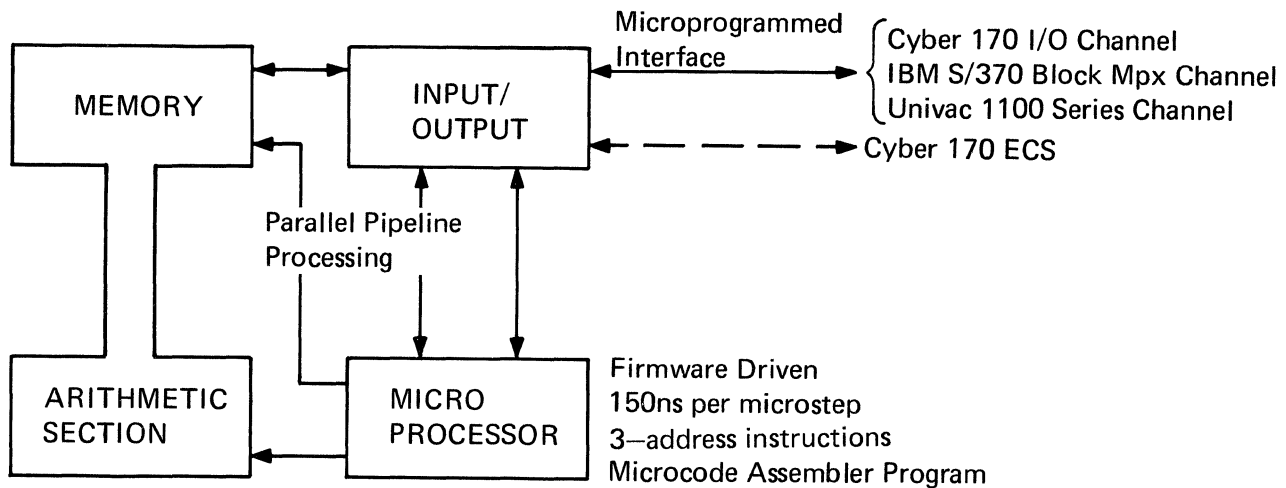
PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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CONTROL DATA MATRIX ALGORITHM PROCESSOR (MAP III)

3 separately accessible memories

"X" & "Y" – 8K to 96K 32-bit words

"Z" – 8K to 64K 32-bit words



Can comprise:

1–4 Multiply Units	}	150 ns per mpy/add/sub
1–4 Add/Subtract Units		
1–2 Divide Units		750 ns per divide
1–2 Square Root Units		600 ns per square root

Cyber 170 Operating Systems**EARLIER 6000 and CYBER 70
OPERATING SYSTEMS****NETWORK OPERATING SYSTEM
(CYBER-170 BASED)**

Compatible Upgrade

SCOPE 3.4

General Purpose System include:

- COMPASS — 3 Assembler
- Record Manager — 1
- Form — 1 (general purpose utility)

\$6,100 (Initial Installation Fee)

\$6,000 (with support)

NOS/BE

General Purpose System include:

- COMPASS — 3 Assembler
- Record Manager — 1
- Form — 1 (general purpose file utility)

\$6,100 (Initial Installation Fee)

\$6,000/month (with support)

Compatible Upgrade

KRONOS 2.1

T/S System include:

- COMPASS — 3 Assembler
- Record Manager — 1
- Export/Import 200 (RJE)

\$6,100 (Initial Installation Fee)

\$4,175/month (with support)

NOS 1.0

General Purpose System include:

- COMPASS — 3 Assembler
- Record Manager — 1

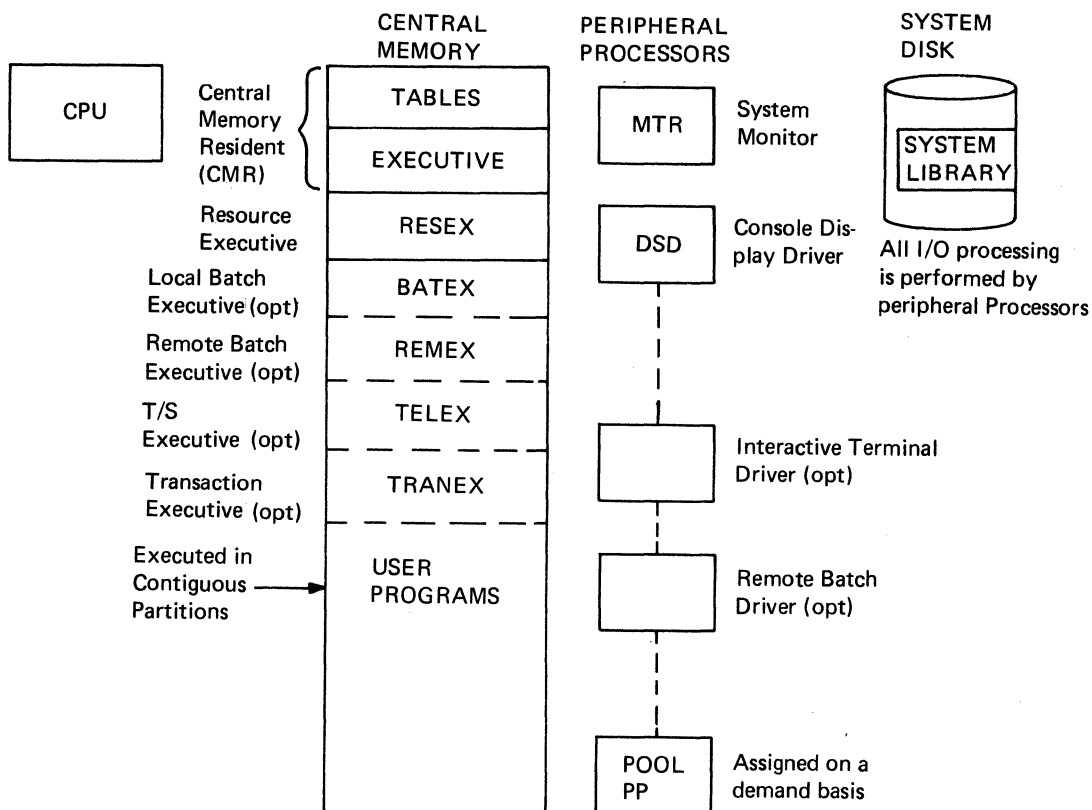
\$6,100 (Initial Installation Fee)

\$4,105/month (with support)

TELEX (T/S support) and Export/Import 200 (RJE Support) are separately priced

SCOPE, KRONOS, and NOS are supported on Cyber 170, Cyber 70 and 6000 Series models excluding Cyber 76.
A special version of SCOPE (SCOPE 2) supports Cyber 76.

Basic Structure of Cyber 170 Network Operating System (NOS)



- NOS controls system via System Monitor peripheral processor, which is designated at deadstart time.
- Pool peripheral processors, when assigned (dynamically) to service data exchanges with disk, magnetic tape, and unit record devices become dedicated for the duration of the exchanges. Unit record devices can, however, attach via a 2550 Series Host Communications Processor.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Control Data Product Strategy

- Mainframes

It appears that in an effort to constrain development costs, Control Data has designed the Cyber 170 series as an evolution of the earlier Cyber 70 and 6000 series. All three series incorporate the same architecture and basic design. The Cyber 170 series is differentiated from the Cyber 70 and 6000 series via its use of semiconductor versus transistor circuitry and MOS main store with ECC versus core without parity.

Currently there is no Cyber 170 series counterpart for the architecturally unique Cyber 76. A Cyber 176 is, however, in development as is a Cyber STAR, Cyber 170 front-end support for STAR.

- Peripherals

Control Data, in apparently an attempt to achieve economies of scale in the production of peripherals, has become a major manufacturer and vendor of peripherals. Peripherals are developed and manufactured in-house and on a joint venture basis, e.g.:

Computer Peripherals, Inc., equally owned by Control Data, NCR and ICL, develops and manufactures unit record equipment.

Computer Magnetics, Inc., 2/3's owned by Control Data and 1/3 owned by Honeywell, develops and manufactures disk magnetic tape equipment.

Peripherals are sold on an OEM basis and on an IBM S/360 and S/370 plug-compatible basis as well as for use with Control Data mainframes. Keeping abreast of IBM, Control Data has developed and offers plug-compatible alternatives to the IBM 3850 mass storage and IBM 3344/50 disk systems.

- Operating Systems

Network Operating System (NOS) is designed to be an upward compatible, superior performance alternative to Scope and KRONOS, with improved data communications support.

Control Data is one of the few mainframe vendors that charges separately for operating systems. Charges are high; they are based on actual development costs.

- Data Communications

As the leader in computer services, Control Data appears to be intent on expanding its hardware/software support for networks. Network Communications System (NCS), Control Data's answer to IBM's System Network Architecture (SNA) comprises a comprehensive selection of Host Communications Processors (2550), minicomputers for distributive networking, concentrators, intelligent terminals, etc.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Improved Business Processing Support For Cyber 170

Cyber 170 systems offer enhanced business processing support relative to their Cyber 70 predecessors. The enhanced business processing support establishes a trend. It would appear to be intended to:

- Enable Control Data to compete more effectively in business markets.
- Bring Cyber 170 systems closer in line with NCR Criterion systems.

Control Data and NCR are jointly developing "Swing" capabilities — hardware and software capabilities that enable NCR accounts to migrate upwards to larger-scale Control Data systems.

Cyber 170 systems offer enhanced support for both batch and on-line business-oriented processing. This support includes:

- New COBOL compiler (announced in April 1964 when the Cyber 170 series was announced) that runs 3 to 4 times faster than the earlier version. The compiler is currently being updated to COBOL '74.
- Network Operating System (NOS) — native operating system for the Cyber 170 — designed to efficiently support DB/DC implementations via programmed 2250 Series Host Communications Processors.
- Cincom's TOTAL, including inquiry and report writer facilities.
- DMS-170, an extended version of TOTAL that conforms to CODASYL standards and incorporates extensions as well (announced July 1975 for use with Cyber 170 only).
- New system availability features including parity and ECC for central and peripheral processors' memories, automatic isolation of malfunctioning peripheral processors, module lockout for central memory, etc.
- New peripherals including IBM 3330-11 type disk, "quality print" train printers 1200/1600/2000 lpm, etc.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Control Data Market Strategy

Control Data target markets Cyber 170 systems to large-scale scientific users in industry, government and education. Sales and support organizations are generally sparse, but well-experienced and proficient in scientific applications. Control Data appears to:

- Only pursues targeted accounts — accounts Control Data feels it has a better than 50/50 chance of success.
- Often reneges on running benchmarks and, instead, proposes simulations that favor Control Data.

Attempts to enter commercial processing markets in the past appear to have been thwarted by inexperience and product deficiencies and have caused problems for Control Data, e.g., in 1974 Control Data was ousted from Union Bank in Switzerland and American Express in the U.S.

Control Data is engaged in numerous joint ventures throughout the world. These joint ventures serve to establish national identity, furthering Control Data's marketing efforts.

Control Data is an unpredictable and flexible competitor. In sales encounters, Control Data may:

- Offer liberal discounts and trade-in allowances to win new business.
- Provide liberal price and support concessions to retain customers.
- Propose "Omega" systems: IBM 370 models configured with Control Data replacement main store and plug-compatible peripherals, instead of Control Data Systems.

Control Data's marketing flexibility results from:

- Its highly profitable line of systems, little changed from the original 6000 Series.
- Ownership of Commercial Credit, a large, wholly owned financial firm that engages in all types of capital equipment leasing, including IBM and Control Data EDP system leasing (all Control Data long-term leases are negotiated via Commercial Credit).
- Scope of peripherals production-Control Data is a large-scale manufacturer of OEM and IBM plug-compatible peripherals.
- Service bureau operations — Control Data is the largest factor in service bureau business. On occasion, Control Data recommends use of its service bureau for infrequent peak load processing to save investment in large-scale installations configured for peak loads.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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While affording flexibility, Control Data's involvement in finance, OEM and plug-compatible peripherals, and service bureau operations detracts from its mainframe business. Control Data's mainframe business, over the past several years, has been less profitable than its other businesses giving rise to rumors of Control Data's demise as a mainframe vendor.

Control Data and NCR may jointly market "swing" capabilities in the future. These capabilities currently under development, will facilitate upgrading of NCR users to larger-scale Control Data systems.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Cyber 170 Contracts and Pricing

Hardware

- 1 year, unlimited use, hardware only rental contract is standard.
- 3 to 7 year lease contracts, all types including lease purchase, financing, full-payout and operating, are available from Commercial Credit Computer Leasing, Inc.
- Liberal trade-in allowances for competitive installations capable of being resold by Commercial Credit.
- Liberal hardware discounts — lease and purchase, when accounts are targeted.

Maintenance

- Maintenance priced separately (like Sperry Univac).
- 9 hours Monday — Friday standard; extended coverage is optional.
- Price protection for 1—year; charges can then be increased upon 90—day notice.

Software

- All software, including operating systems, is separately priced.
- Software charges based on actual development costs.
- Total software charge can represent 20—30% of total system price.
- 20% discount on software used on more than one Control Data system installed at common site.
- Software is available with continued SA support (Category I) and without SA support (Category II). Software acquired under Category II is charged on paid-up license basis, wherein monthly fee is waved after paid-up license amount is accrued. There is an initial installation charge for major software, e.g., operating systems.
- Liberal software discounts when accounts are targeted.
- Liberal grant program for education — no education discounts, per se.

Support

- All training and SA support is chargeable with the exception of SA support included with software acquired under Category I as above.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Cyber — 172 Configuration

HARDWARE

MODEL	DESCRIPTION	QTY	PURCHASE	NET 1-YR LEASE	MAINT
172-6	Cyber 172 (98KW) 10 PPU's; 12 Chan System Console—CRT Power and Cooling Equip	1	\$ 828,450	\$13,880	\$2,527
			<u>\$ 828,450</u>	<u>\$13,880</u>	<u>\$2,527</u>
844-4	Disk Drive	5	\$ 183,750	\$ 4,110	\$ 615
7054-41	Disk Controller	2	196,350	3,874	644
883-60	Disk Pack (237 MC)	5	?	?	?
			<u>\$ 380,100</u>	<u>\$ 7,984</u>	<u>\$1,259</u>
669-4	MT Unit (320KB, PE)	4	\$ 113,400	\$ 2,116	\$ 624
7021-1	MT Controller (1 X 8)	1	28,875	624	145
			<u>\$ 142,275</u>	<u>\$ 2,740</u>	<u>\$ 769</u>
2550-1	Host Comm Proc (24K)	1	\$ 42,420	\$ 1,068	\$ 463
2554-8	Mem Expansion — 8K	1	3,360	90	43
713-10	Conversational CRT	1	2,095	63	18
2560-3	Synch Adapter (2 @ 9600 bps)	1	762	26	8
2561-1	Asynch Adapter (2 @ 9600 bps)	1	657	23	7
2570-2	LP (1200 lpm)	1	52,500	1,641	483
2571-2	CR (600 cpm)	1	8,400	259	79
			<u>\$ 110,194</u>	<u>\$ 3,170</u>	<u>\$1,101</u>
			<u>\$1,461,019</u>	<u>\$27,774</u>	<u>\$5,656</u>

SOFTWARE

TYPE	DESCRIPTION	INSTALLATION FEE	MONTHLY ROYALTY (with support)
F501-01	NOS 1.0	\$6,100	\$4,105
F501-02	Maint Pkg	0	0
F501-06	Network Access Methods	?	?
F501-08	High Speed Batch	110	535
F501-12	FORTRAN	110	860
F501-13	COBOL	110	645
F501-14	Sort-Merge	110	375
F501-26	RJE Facility	110	325
F501-28	TOTAL	1,000	\$1,100 (for 30
F501-25	CCP Support Software	535	270 mos)
		<u>\$8,185</u>	<u>\$8,215</u>

NOTES:

- 173-12 pricing — 1/30/76; all other pricing — September 1975 (from Datapro); pricing has probably changed — new ones, however, are unavailable.
- Above configuration excludes cost for site preparation — installation of freon refrigeration system.
- Extended term leases negotiated via Commerical Credit.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Cyber — 173 Configuration

HARDWARE

MODEL	DESCRIPTION	QTY	PURCHASE	NET 1-YR LEASE	MAINT
173-12	Cyber 173 196K 60-bit words 10 PP's System Console-CRT	1	\$1,529,220	\$34,030	\$ 4,136
7012-1	2nd Console CRT	1	20,550	457	78
711-121	30 cps hard-copy printer	2	8,002	294	114
10318-1	ECS Coupler	1	0	0	0
7030-2	ECS: 262K 60-bit words	1	335,370	10,540	1,886
			<u>\$1,893,142</u>	<u>\$45,321</u>	<u>\$ 6,214</u>
7054-41	Disk Controller	2	\$ 196,350	\$ 3,874	\$ 644
844-41	Disk Drive	8	294,000	6,576	984
883-60	Disk Pack (237 MC)	8	?	?	?
			<u>\$ 490,350</u>	<u>\$10,450</u>	<u>\$ 1,628</u>
669-3	MTU (240/120KC, PE/NRZ)	10	\$ 254,630	\$ 4,790	\$ 1,400
7021-2	MT Controller (2 X 8)	1	63,525	300	1,439
7021-1	MT Controller (1 X 8)	1	28,875	145	624
			<u>\$ 347,030</u>	<u>\$ 5,235</u>	<u>\$ 3,463</u>
508-16	LP (Train, 1600 lpm) and Ctrl	2	\$ 167,896	\$ 3,698	\$ 766
595-04	Train Cartridge	2	6,930	180	68
405	CR (1200 cpm)	1	26,156	79	401
3447-2	CR Controller	1	15,561	75	238
415-30	CP (250 cpm) and Ctrl	1	48,951	157	785
			<u>\$ 265,494</u>	<u>\$ 4,189</u>	<u>\$ 2,258</u>
2550-1	Host Comm Proc (24KW)	1	\$ 42,420	\$ 1,068	\$ 463
2562-1	Time Div Mpx Line Adapter	1	\$ 5,250	142	53
2560-3	Line adapter — 2 lines @ 9600 bps	3	2,286	69	21
713-10	Conversational Display Term	1	2,095	63	18
			<u>\$ 52,051</u>	<u>\$ 1,342</u>	<u>\$ 555</u>
			<u>\$3,048,067</u>	<u>\$66,537</u>	<u>\$14,118</u>

SOFTWARE

TYPE	DESCRIPTION	INSTALLATION FEE	MONTHLY ROYALTY (with support)
F501-01	Network O.S.	\$6,100	\$ 4,105
F501-02	Maint Pkg	0	0
F501-03	T/S Module	110	1,820
F501-04	Tranex-1	110	2,355
F501-08	High Speed Batch	110	535
F501-12	FORTAN	110	860
F501-13	COBOL	110	645
F501-14	Sort-Merge	110	375
F501-17	Interactive BASIC	110	640
F501-22	Math Library	580	580
F501-29	TOTAL	1,000	1,100 (for 30 mos)
F501-06	Network Access Methods	?	?
F501-25	CCP Support Software — 1	535	270
		<u>\$8,985</u>	<u>\$13,270</u>

NOTES:

- 173-12 pricing — 1/30/76; all other pricing — September 1975 (from Datapro); pricing has probably changed — new ones, however, are unavailable.
- Above configuration excludes cost for site preparation — installation of freon refrigeration system.
- Extended term leases negotiated via Commerical Credit.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Cyber – 174 Configuration

HARDWARE

MODEL	DESCRIPTION	QTY	PURCHASE	NET 1-YR LEASE	MAINT
174-12	Cyber 174 (196 KW) 10 PP's; 12 Chan System Console—CRT Power and Cooling Equip	1	\$1,842,000	\$ 41,005	\$ 5,055
10314-1	4 Additional PP's	1	77,700	1,617	431
7012-1	2nd Console—CRT	1	20,550	457	78
711-121	30 cps hard-copy printer	2	8,002	294	114
10318-1	ECS Coupler	1	0	0	0
7030-4	ECS—503K words	1	596,085	18,910	2,693
			<u>\$2,544,337</u>	<u>\$ 62,283</u>	<u>\$ 8,371</u>
7054-42	Disk Controller	6	\$ 815,850	\$ 15,126	\$ 2,328
844-41	Disk Drive	24	882,000	19,728	2,952
883-60	Disk Pick (237 MC)	24	?	?	?
			<u>\$1,697,850</u>	<u>\$ 34,854</u>	<u>\$ 5,280</u>
669-4	MTU (320/160KB,PE/NRZ)	16	\$ 453,600	\$ 8,464	\$ 2,496
7021-2	MT Controller (2 X 8)	2	127,050	2,878	6000
			<u>\$ 580,650</u>	<u>\$ 11,342</u>	<u>\$ 3,096</u>
580-20	Train Printer (2000 lpm)	3	\$ 306,180	\$ 6,339	\$ 910
596-01	Train Cartridge	3	10,395	270	102
405	CR (1200 cpm)	2	52,312	802	158
3447-2	CR Controller	2	31,122	476	150
415-30	CP and Controller (250 cpm)	1	48,951	785	157
			<u>\$ 448,960</u>	<u>\$ 8,672</u>	<u>\$ 1,477</u>
2552-1	Host Comm Proc (32KW)	1	\$ 77,910	\$ 1,967	\$ 781
2554-8	Mem Exp — 8 KW	3	10,080	270	129
2556-3	Comm Line Exp — to 64 lines	1	3,696	100	36
2556-4	Comm Line Exp — to 96 lines	1	3,696	100	36
713-10	Comm Line Exp — to 128 lines	1	3,696	100	36
2561-1	Conversational CRT	1	2,095	63	18
	Synch Line Adapter — 2 @ 960 bps	50	38,100	1,300	400
			<u>\$ 139,273</u>	<u>\$ 3,900</u>	<u>\$ 1,436</u>
			<u>\$5,411,070</u>	<u>\$121,051</u>	<u>\$19,660</u>

SOFTWARE

TYPE	DESCRIPTION	INSTALLATION FEE	MONTHLY ROYALTY (with support)
F501-01	Network O.S.	\$6,100	\$ 4,105
F501-02	Maint Pkg	0	0
F501-03	T/S Module	110	1,820
F501-04	Tranex—1	110	2,355
F501-08	High Speed Batch	110	535
F501-12	FORTRAN	110	860
F501-13	COBOL	110	645
F501-14	Sort-Merge	110	375
F501-17	Interactive BASIC	110	640
F501-22	Math Library	580	580
F501-29	TOTAL	1,000	1,100 (for 30 mos)
F501-06	Network Access Methods	?	?
F501-25	CCP Support Software — 1	535	270
		<u>\$8,985</u>	<u>\$13,270</u>

NOTES:

- 173-12 pricing — 1/30/76; all other pricing — September 1975 (from Datapro); pricing has probably changed — new ones, however, are unavailable.
- Above configuration excludes cost for site preparation — installation of freon refrigeration system.
- Extended term leases negotiated via Commercial Credit.

Cyber 170 Customers

- | | |
|---|----------------------------|
| 1. Bell Telephone Company of Pa. | Cyber 172 |
| 2. Societe Industrielle Aerospatiable (France). | Cyber 172 |
| 3. McDonnell Douglas Automation. | (2) Cyber 173 |
| 4. National Institute of Agrarian Research (Spain). | Cyber 172 |
| 5. Bank of Pusan (Korea). | Cyber 172 |
| 6. United Computing Systems (Kansas City). | Cyber 175
(2) Cyber 174 |
| 7. University of Stuttgart (Germany). | Cyber 174 |

9.6 AMDAHL SYSTEMS THAT COMPETE WITH 1100

Series	IBM Competition	Performance Estimates
1100/80	470 V/6	1100/82 should fall short of 470 V/6 while 1100/84 should substantially outperform 470 V/6.

Internal performance of 470/6 is 2 to 3 times IBM 370/168-3. Throughput performance of 470/6 running under IBM OS, OS/VS and CP-67 ranges from 1.4 to 2.5 times IBM 370/167-3.

Amdahl 470 V/6 is currently only marketed in U.S. and Canada. Fujitsu markets M-190, 470 V/6 counterpart, in Japan and rest of world.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

**Why a prospect should buy an
1100/80 over an Amdahl 470 V/6**

1. Multiprocessing support — Amdahl 470 V/6 cannot currently be configured as a multiprocessor system
2. Superior cache implementation — Amdahl 470 V/6 cache operates similarly to 110/80 cache but cannot be configured and provides substantially less storage capacity.
3. Hardware supported reentrancy — Amdahl 470 V/6 like 370/168 provides no hardware support for reentrant code execution and management
4. Channel & device switching support — Amdahl 470 V/6 like 370/168 does not support SPI's, per se. All channel switching is performed programmatically.
5. 1100 OS CTS, DMS & TIP — Amdahl 470 V/6 runs IBM and proprietary software. The IBM software confronts same problems as encountered on 370/168-3.
6. One price service — Amdahl 470 V/6 customer pays license fees for all IBM and proprietary software used, except operating systems.
7. Sperry Univac financing — Amdahl 470 V/6 systems are sold outright. Lease financing must be arranged through 3rd party firms such as Data Processing Financial (commercial leases), First Municipal Leasing Corporation (S & L government leases) and, in some cases, through Mitsubitshi (Canadian Pacific Railroad and NASA — Columbia University installations.
8. Sperry Univac financial stability — the financial stability of Amdahl Corporation, which went public in August 1976, is questionable in light of anticipated IBM 370/168 successors.
9. Full range of products — Amdahl 470 V/6 customer must rely on IBM, proprietary software houses, and plug-compatible peripheral vendors. Sperry Univac can provide an 1100/80 system complete with all hardware and software.
10. Less Threat of IBM obsolesence — IBM's successor to the 370/168-3, anticipated within two years, will probably be plug-compatible proof.
11. Large sales & support organization — as of 8/76 Amdahl Corporation had only 32 salesmen and system engineers in the U.S.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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AMDAHL VS IBM SYSTEM SPECIFICATIONS
(part 1 of 2)

PROCESSOR	AMDAHL 470/V6	IBM 370/168-3	IBM 370/168-1
Cycle Time	30 ns	80 ns	80 ns
Instructions Type	Identical to 370/168 except for STIDP, STIDC, & TIC	General Purpose Variable Length	Same
Number	168 Standard	168 Standard	Same
Options	None (High Speed Mpy is standard)	High Speed Multiply	Same
Control Memory Use	Instruction Microcode Channel & Emulator Control Cache Control Algorithm	Instruction Microcode Channel & Emulator Control	Same
Size	—	33.7 KB (expandable for integral disk support)	Same
Pipeline Design	Yes; 8-deep instruction stacking	Yes; operand stores overlapped with instruction execution	Same
Cache Type	Non-Store Through (Similar to 1100/80; control algorithm can be altered to conform to installation reqt's.	Store-through (No I/O)	Same
Size	16KB	32KB	16KB
Cycle Time	30 ns	80ns	Same
Hit%	90-95%	90-95%	90%
Modes of Operation	Virtual - std; Real - opt.	Virtual-std; Real-opt	Same
MAIN STORE			
Type	MOS	MOS	Same
Self-Correcting	Yes	Yes	Same
Word Width	8-byte	8-bytes	Same
Read Time	300 ns	480 ns	Same
Write Time	300 ns	480 ns	Same
Interleave	4-way	4-way	Same
Min Capacity	1 MB	1 MB	Same
Max Capacity	8 MB	8 MB	Same
Increments	1 MB	1 MB	Same
RELATIVE MAIN-FRAME PERFORMANCE (EST)	2.00 - 3.00	1.05 - 1.18	1.0

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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AMDAHL VS IBM SYSTEM SPECIFICATIONS*(part 2 of 2)*

AMDAHL 470/V6		IBM 370/168-3	IBM 370/168-1
INPUT/OUTPUT			
Design	Channels integrated into CPU & controlled programatically via control store; interface to main store via cache (non-store-through design) results in no CPU interference	Channels integrated into CPU & controlled programatically via control store; store-through design causes some CPU interference	Same
No of Channels	16 are standard; channels can be implemented as byte or block mpxrs or selectors	None are standard; 1-2 Byte Mpxrs 1-11 Block Mpxrs	Same
Aggregate Data Rate	16 MB/second	16 MB/second	Same
SYSTEMS CONSOLE			
Type	CRT operating in IBM emulation mode; includes System Control Panel for maintenance (ability to check over 16,000 latches)	Combined system (CRT) and maintenance console; separate Service Processor	Same but no service Processor
Options	85-character per second hard-copy (IBM) printer	85-character per second hard-copy printer	Same
• AMDAHL 470/V6 is air cooled vs water chill for 370/168 - 1 & 3. • AMDAHL 470/V6 does not support multiprocessing (currently). • AMDAHL 470/V6 supports IBM and plug-compatible peripherals.			

Amdahl Product Strategy

The Amdahl 470 V/6 mainframe is designed to serve as a superior price: performance, compatible alternative to the 370/168-3 mainframe. Compatibility is achieved via:

- Implementation of a compatible S/370 instruction set and data structure that enables:
 - All application software (IBM, proprietary and user written) prepared for S/360 and S/370 to run "as is".
 - Non-proprietary IBM operating systems including OS/MFT and MVT, OS/VS – VS1, SVS, and MVS, and CP–67 to run, after modification of I/O interfaces by Amdahl Corporation.
- Implementation of a compatible S/370 I/O hardware interface design that enables support of IBM S/360 and S/370 and plug-compatible peripherals.

Superior price: performance is achieved via:

- IBM compatible design, which enables Amdahl Corporation to constrain its investments in software and peripherals
- Use of more advanced and higher speed circuits, which lower costs and enhance performance

Amdahl 470 V/6 mainframes are priced 8–12% below equivalent 370/168-3 mainframes and provide 20–120% more processing performance.

In addition to offering superior price: performance, Amdahl 470/ V/6 provide the following unique functional capabilities relative to the 370/168–3:

- Air cooling versus water chill
- Lower floor space requirements
- Superior non-store-through cache implementation (similar to 1100/80)
- Installation tailorable cache control algorithm
- More I/O channels
- Tailorable I/O channels that can be arranged as block or byte multiplexors or selectors

It is anticipated that the 470 V/6's major shortcoming – lack of tightly-coupled and attached processor MP support, will be rectified in the future.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Amdahl 470 V/6 Market Strategy

Limited markets

- U.S. and Canada (Fujitsu markets M-190 in Japan, Spain and rest of world but can market in U.S. & Canada)
- 32 salesmen & systems engineers (8/76) in U.S. (regional offices in N.Y., Chicago, Houston, Detroit, and Washington; headquarters in sunnyvale, California)
- Joint agreement under negotiation with Fujitsu whereby 470 V/6 and M-190 would be jointly manufactured and marketed in countries other than U.S., Canada, Spain and Japan)

Superior price: performance alternative to 370/168-3 for:

- Price: performance sensitive IBM large-scale users (e.g. Federal and S & L Government)
- Disgruntled IBM large-scale users (e.g. 370/155 & 165 accounts)
- IBM competitors (A.T. & T.)

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DOCUMENT NO	TITLE	PAGE REV.	PAGE
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Amdahl Hardware Contracts

Purchase only

Leases available from:

- Data Processing Financial Inc. (DPF)
- First Municipal Leasing Corp. (FMLC)
- Mitsubishi International Corp.

Maintenance contracts separate

- 1 year with renewals for up to seven years
- 10% price increase option upon each renewal

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

470 V/6 Customers

1. NASA (installed at Columbia University in N.Y.)
2. Computer Usage Corporation
3. Massachusetts Mutual Life Insurance Corporation
4. Southwestern Ohio Regional Computing Center
5. National CSS Incorporated
6. Liberty National Life Insurance Company
7. Scientific Time Sharing Corporation
8. University of Michigan
9. Texas A & M University
10. University of Alberta (Canada)
11. A. T. & T.
12. A. T. & T. — Western Electric Company
13. A. T. & T. — Bell Laboratories
14. Charles Stark Draper Laboratory, Inc.
15. Canadian Pacific Limited
16. Industrial Life Insurance Company
17. Canadian Government Bureau of Statistics (Ottawa)
18. Industrial Life Incorporation. (Montreal)

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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9.7 NCR SYSTEMS THAT COMPETE WITH 1100

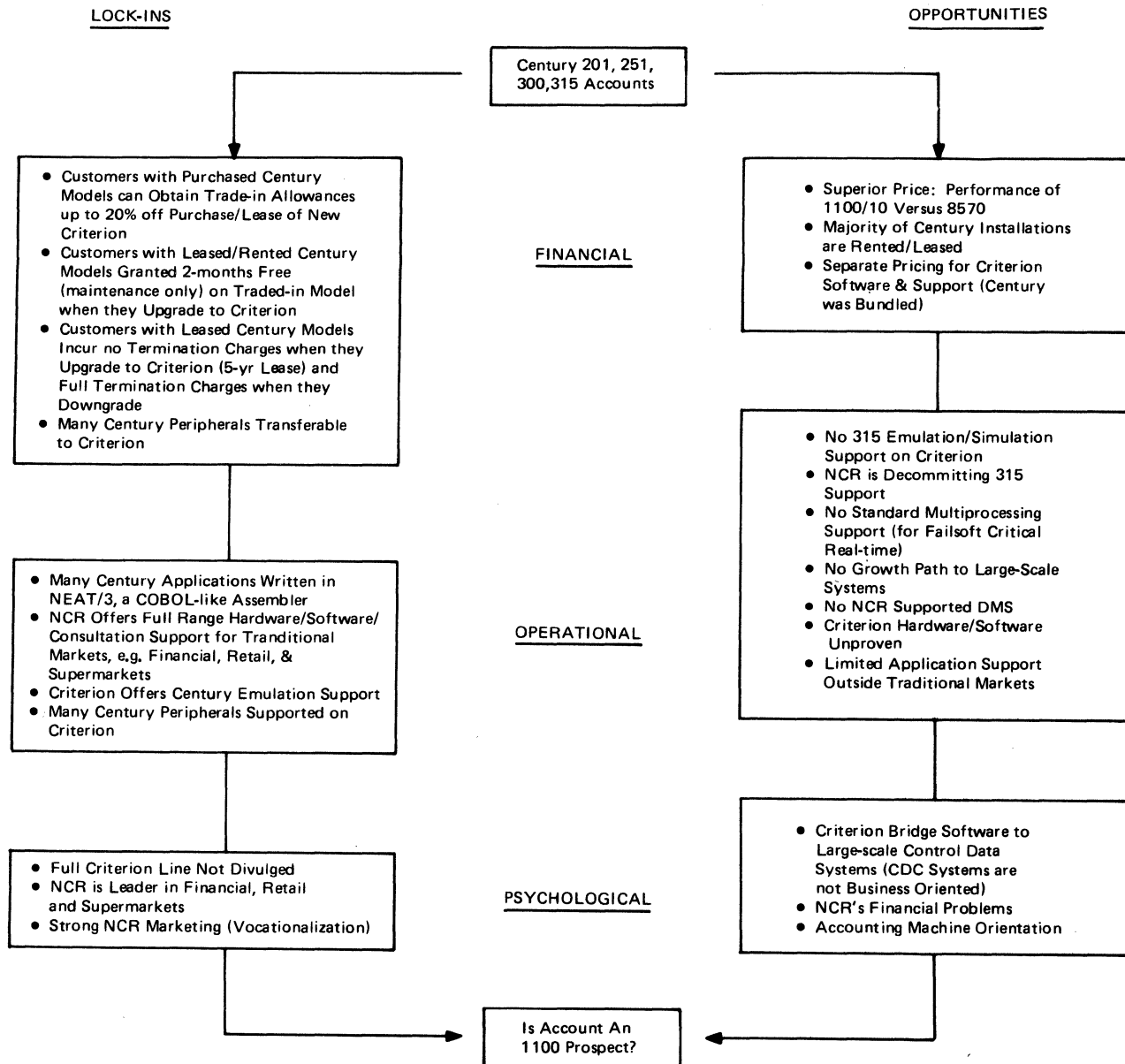
Series	NCR Competition	Performance Estimates
1100/10	8570	1100/11 (roughly equivalent to a 370/148) would substantially outperform a 8570 (according to NCR 35% faster than a 370/135, i.e. comparable to a 370/148 – 2 x 370/138. No MP support is currently available for 8570.

A new, larger-scale Criterion model, the 8700, is anticipated late in 1976. The 8700 will offer multiprocessing capability.

The Criterion 8570 is marketed worldwide along with the smaller-scale (90/30 class) 8550.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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QUALIFYING NCR ACCOUNTS AS 1100 SERIES PROSPECTS



DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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**Why a prospect should buy an
1100/10 over an NCR Criterion 8570**

1. Superior price: performance — 1100/11's offer substantial price: performance advantages over comparably configured 8570.
2. Growth potential — the 1100/11 supports larger main store (512KW versus 1,024 KB) and affords convenient upgrades to larger-scale 1100 series systems (8570 Criterion model).
3. Multiprocessing — multiprocessing support has not been announced for the 8570.
4. Proven hardware & software — whereas 1100/10 systems are installed with full 1100 OS support, selected Criteria hardware and software capabilities will not be installable until the 2nd–4th quarters of 1977. For example, 6590 disk (70MB, IBM 3340 technology) — 2nd quarter; virtual mode operation (VS1 firmware and VRX software) — 2nd quarter; and VRX RJE support — 4th quarter Scheduled installation dates could conceivably slip.
5. Wide range of peripherals — NCR doesn't offer very large capacity 8450 disk (8433 type is largest capacity available), 6250 bpi tape, nor 8405 type fixed head disk peripherals for use with the 8570.
6. Programmable front-end communications support — the 621–101 and 103 Communications Multiplexors used to support large communications networks (over 10 lines) with the 8570 are hard-wired and, hence, allow limited offloading of data communications overhead. The integrated communications subsystem, while firmware driven, supports only 1-10 low speed (up to 2400 bps) lines.
7. Large-scale system experience in diversified markets — NCR does not offer a system in the performance range of an 1100/20–80 (except perhaps custom 350's installed in Japan). NCR's market experience is generally confined to financial and retail.
8. DMS/1100 — NCR does not offer and support a full-level data management system with the 8570 (only the Criterion Access Method — CAM). Cincom will furnish TOTAL.
9. Sperry Univac one-price posture — NCR charges separately for support services and all software other than operating systems.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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NCR CRITERION SPECIFICATIONS

PROCESSOR	8570	8550
Cycle Time	56 ns (ECL Circuits)	112 ns (ECL Circuits)
Instructions		
Type	Calls on firmware routines stored in Control Memory	Same
Number	—	—
Options	Fast Floating Point	Same
Control Memory		
Use	Instruction Microcode Testware Routines Real Storage (RS1) Firmware Virtual Storage (VS1) Firmware COBOL '74 Firmware Century Emulators	Same
Size	10 KB for RS1 24 KB for RS1 + VS1	8 KB for RS1 24 KB for RS1 + VS1
Pipeline Design	Yes	Same
Cache		
Type	Not Applicable	Same
Size		
Cycle Time		
Hit %		
Modes of Operation	Real or Virtual	Same
MAIN STORE		
Type	MOS	Same
Self-Correcting	Yes	Same
Word Width	32-bits	Same
Read Time	475 ns	Same
Write Time	475 ns	Same
Interleave	2-Way	None
Min Capacity	256 KB	128 KB
Max Capacity	1,024 KB	512 KB
Increments	128 KB	64 KB
RELATIVE MAINFRAME PERFORMANCE (EST)	35% faster than IBM 370/135 (approx = 370/138)	35% faster than IBM 370/115

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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NCR CRITERION SPECIFICATIONS

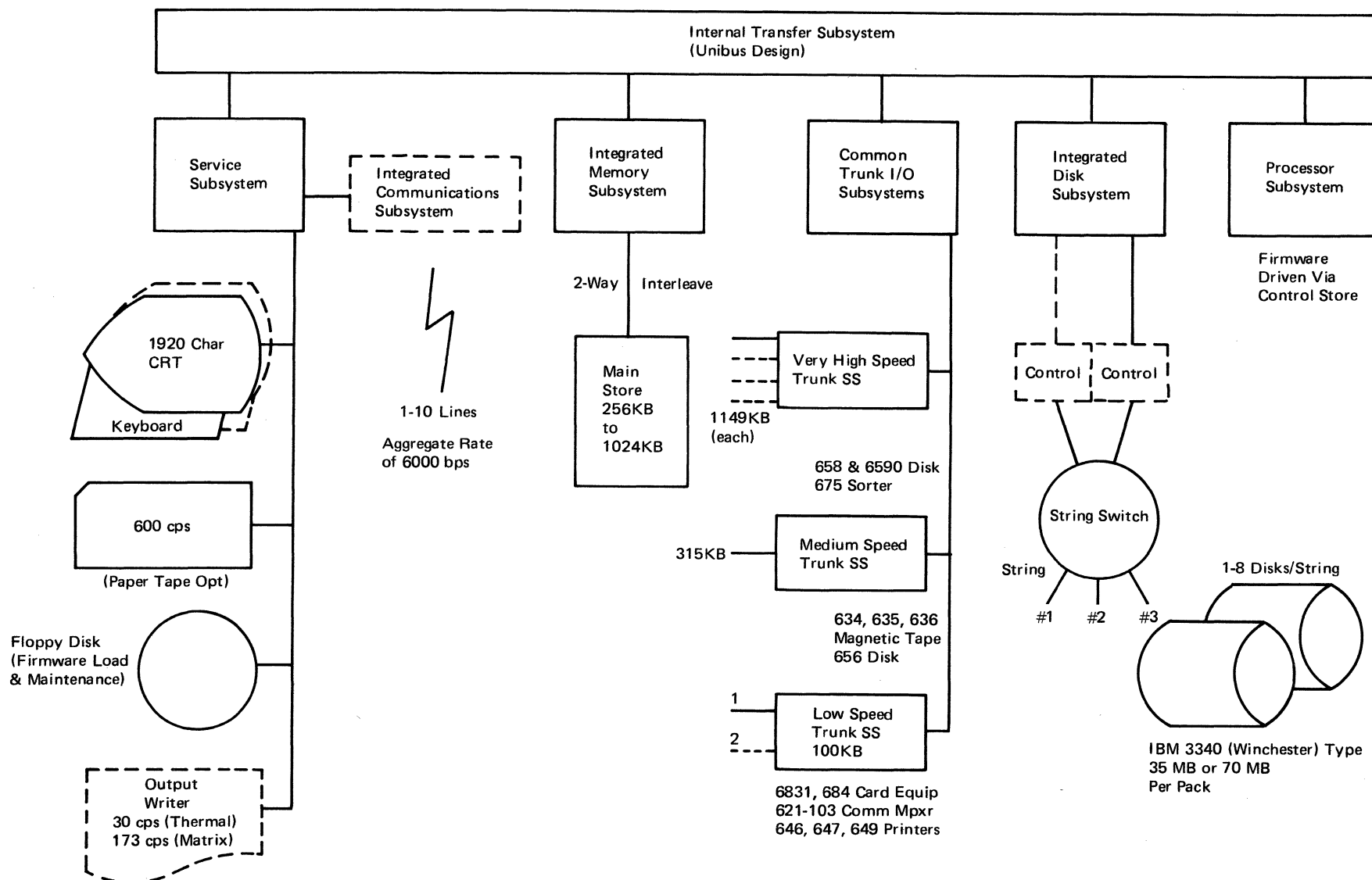
INPUT/OUTPUT	8570	8550
Design	• Integrated attachments for disk & communications; controls interface directly to main store via bus • Low-speed, medium-speed and very high-speed trunks. Low and medium speed trunks multiplex; very high-speed trunk exchanges data directly with main store	Same
No. of Channels	• 1-2 integrated attachment for disk and another for communications • 3 trunks std; 6 are max • 1 or 2 low-speed trunks • 1 medium-speed trunk • 1-4 very high speed trunks	• One integrated attachment for disk and another for communications • 2 trunks std; 4 are max • 1 or 2 low-speed trunks • 1 medium-speed trunk • 1-3 very high-speed trunks
Channel Data Rates	• 100 KB/s combined rate for 1 or 2 low-speed trunks • 1.8 MB/s for integrated disk attachment • 1149 KB/s for very high speed • 315 KB/s for medium speed trunk	• 50 KB/s combined rate for 1 or 2 low-speed trunks • 1.8 MB/s for integrated disk attachment • 1018 KB/s for very high speed trunk • 150 KB for medium speed trunk
Aggregate Data Rate	—	—
SYSTEM CONSOLE		
Type	Service processor attaches 1920 character CRT, floppy disk for firmware loading, card reader, and integrated communications subsystem	Same
Options	Console output writer: 30 cps (thermal) or 173 cps (matrix) <u>OR</u> 2nd CRT	Same

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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NCR Multiprocessing Capabilities

- While multiprocessing support for the Century series, predecessor to the Criterion series, was not promoted in the U.S., it has been promoted in Japan. An NCR 350, comprising multiple Century 300's, was sold via NCR's Special Systems Division (Torrey Pines, California) to Sumitomo Bank. Sumitomo Bank has multiple, triplex Century 300 installations arranged for fail-soft, heavy volume, on-line transaction processing. The 350's operate in a tightly coupled mode under RSX, a special version of the Century B-4 operating system.
- The bus architecture of the 8570 will easily support mutli-processor capability, although this capability is not currently announced.
- The larger-scale Criterion 8700 (1100/10 and 20 competitor) anticipated late in 1976 will support multiprocessing.
- Multiprocessing capability — host based and distributed intelligence networks, is a vital necessity for NCR — to support large POS and EFT networks in a failsoft mode.

NCR Criterion 8570 System Architecture



PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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NCR PRODUCT STRATEGY

- Criterion series was long overdue when announced in April 1976. series, introduced in March 1968, was becoming obsolete despite NCR's successive announcements of repackaged and repriced models, e.g. 201 and 251. Century customer base, predominantly a lease base, was becoming vulnerable to competitive replacement.
- Support of Century series emulation is designed to protect the Century customer base from competitive exploitation. This support facilitates migration from Century to Criterion models and affords NCR time to implement Criterion native virtual support, currently scheduled for release 3rd quarter of 1977. The first Criterion system, a 8550, was installed at Dart Industries in Los Angeles. Operating in emulation mode, it outperforms a Century 201 by 30%.
- The Criterion product strategy exhibits many aspects of Burroughs 800 strategy: substantial reliance on firmware, exclusive compiler level programming, and COBOL'74 support across all models.
- The current lack of multiprocessing support and strong data communications support for the 8550 and 8570 are disappointing. These capabilities are essential for real time installations in NCR's traditional markets: retail POS, financial CIF, and supermarket checkout. They are essential to support NCR's expanding and very profitable lines of terminals. Announcements of multiprocessing support and IBM SNA—like support are anticipated in the future.
- The Criterion models are differentiated by their integral support for IBM 3340 type (Winchester) disk, which is acquired on an OEM basis from Control Data.
- NCR has a close relationship with Control Data. For example, NCR's 8430 and 8433 type disk are acquired OEM from CDC. NCR has one-third interest in Computer Peripherals, Inc., a firm jointly owned by CDC, ICL, and NCR, which develops and manufactures unit record and magnetic tape equipment.
- The larger-scale, yet-to-be introduced Criterion models are expected to provide software bridges to Control Data's Cyber 170 or successor systems.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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NCR Market Strategy

- NCR's traditional and target markets are:

	Est. % of WW Revenues
Financial (Commercial banks & thirft)	25%
Retail	40%
Commercial-Industrial (incl. mining & construction)	20%
Medical, Education and S & L Govt.	15%
	<u>100%</u>

- NCR supports these markets with a wide selection of application software and specialized terminals and data entry equipment.
- Criterion will be aggressively marketed in these markets to preserve and expand NCR's penetrations.
- In 1976 NCR enhanced its capabilities in manufacturing markets via the acquisition of Data Pathing, a well-reputed West Coast based producer and vendor of terminals and source data entry systems for manufacturers.
- Over the past two years NCR has conducted an ambitious Vocationalization Program. Salesmen have been extensively trained to offer consultation services and to sell NCR products in selected markets.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Criterion Contracts & Pricing

- Rental — 1 year, unlimited use
- Lease — 5 years, 10% discount
- Purchase option accruals:

Months

Install. (MI) List Purchase Price (LPP) Less:

1–12 .015 X MI X LPP

13–24 [.180 + .0100 X (MI–12)] X LPP

25–36 [.300 + .0075 X (MI–24)] X LPP

Over 36 [.390 + .0050 X (MI–36)] X LPP up
to a maximum of 50% of LPP

- 10% Education discount — Rental, Lease & Purchase
- Investment Tax Credit — Lease and Purchase
- Conversion Allowances provided to Criterion customers that replace NCR and competitive systems and EDP services — six months of reduced payments
- Separate pricing for application software and all systems software other than operating systems (RS1 and VS1)
- Separate charges for systems support and all training

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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NCR CRITERION 8570

Model	Description	Qty	Gross 1-Year Rental	Purchase	Maint
5600-0401	Processor (256 KB) Low, medium, & very high speed trunks 10 KB of Control Store Console	1	6,900	\$ 282,700	\$ 743
5600-P440	Addit Low-Speed Trunk	1	100	4,150	10
6831-0201	System CR (600 cps)	1	275	11,500	30
5600-P498	VS-1 Pkg (14 KB Ctrl Store)	1	400	13,350	105
5600-P420	256 KB to 384 KB	1	1,000	42,100	64
5600-P421	384 KB to 512 KB	1	1,000	42,100	64
5600-P422	512 KB to 640 KB	1	1,000	42,100	64
5600-P423	640 KB to 768 KB	1	1,000	42,100	64
5600-P401	Fast Floating Pt Assist	1	150	6,400	10
5601-P104	260 Thermal Output (30 cps)	1	100	3,700	20
	Cables (estimated)		—	720	—
	Raceways (estimated)		—	200	—
			\$11,925	\$ 491,120	\$1,174
6590-0101	Data Module Drive	16	\$14,400	\$ 600,000	\$1,360
6591-0201	70 MB Data Module	16	1,360	32,000	T&M
5600-P446	IDC, 6590 Attachment	4	160	6,000	0
6590-P003	Rot. Position Sensing Kit	16	320	11,200	64
5600-P445	Integrated Disk Ctrl	1	560	20,700	110
5600-P455	IDC, Dual Ctrl Attach	1	600	20,700	100
5600-P448	IDC, 2nd String Ctrl	1	100	4,100	10
5690-P001	Drive String Attach	2	80	2,250	16
635-109	MT (PE, 160 KB)	4	1,940	85,500	412
624-401	MT Ctrl	1	580	24,150	65
			\$20,100	\$ 806,600	\$2,137
640-200	Train Printer (1500 lpm)	1	\$ 1,285	\$ 49,000	\$ 129
960-104	Print Train	1	100	2,950	N/A
626-101	Printer Ctrl	1	325	14,000	29
			\$ 1,710	\$ 65,950	\$ 158
5600-P954	Five Low Speed Lines	1	\$ 200	\$ 6,000	\$ 70
5600-P955	Five Additional Lines	1	200	6,000	70
621-101	Comm Mpxr (15 lines)	1	210	12,000	43
	Asynch. Adapter	20	1,300	35,700	200
			\$ 1,910	\$ 59,700	\$ 383
			\$35,645	\$1,423,370	\$3,852
	5 YEAR LEASE (10% discount)		\$32,080		

SOFTWARE LICENSE FEES

Type	Description	License Fee
8210-0903	COBOL-74, VRX	\$ 90
8210-0904	COBUG, VRX	10
8210-0906	Sort/Merge, VRX	40
8210-0907	Term Comm Proc	60
8210-0908	Network Def Lang	25
8210-0909	On-line Progl Dev.	50
8210-0910	RJE, VRX	40
8210-0911	Symbolic Debug, VRX	10
8210-0912	CAM/VRX Utilities	10
		\$335/month
TOTAL is available from CINCOM for use as data management system		
NOTES: 1. Rental/lease contracts provide unlimited use.		
2. Disk configured above (OEM from CDC) is comparable to IBM 3340 (Winchester).		
Read/write heads are incorporated in the data modules.		

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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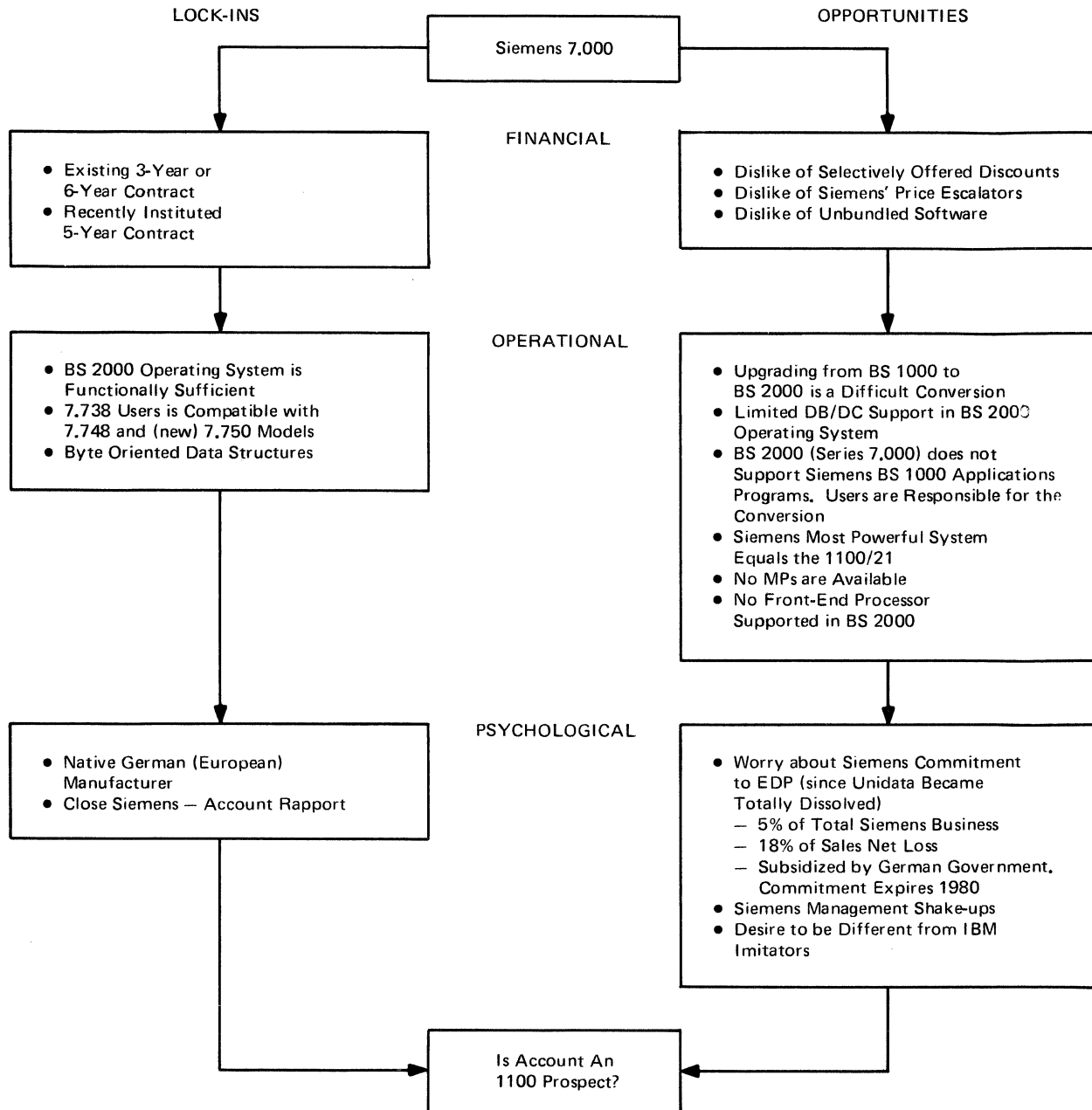
9.9 SIEMENS SYSTEMS THAT COMPETE WITH 1100

Series	Siemens Competition	Performance Estimates
1100/10	7.738	The 1100/11 (without overlap) is slightly more powerful than the 7.738. The 1100/11 with overlap should significantly outperform the 7.738. The 1100/11 with overlap is slightly more powerful than the 7.748. No multiprocessor configurations are available in the SIEMENS 7.000 Series. The 1100/12 will significantly outperform either of these Systems, and provide the availability and functionality that SIEMENS cannot match.
1100/20	7.748	The 1100/21 is slightly more powerful than the newly announced 7.750. The 1100/21 is equal in performance to the existing 7.755. No multiprocessors are available in the SIEMENS 7.000 Series. The 1100/22 will outperform either of these systems, and provide the availability and functionality the SIEMENS cannot match.
1100/40	7.750 (new) 7.755	The 1100/41 is significantly more powerful than the 7.755, which is the top of the SIEMENS 7.000 Series

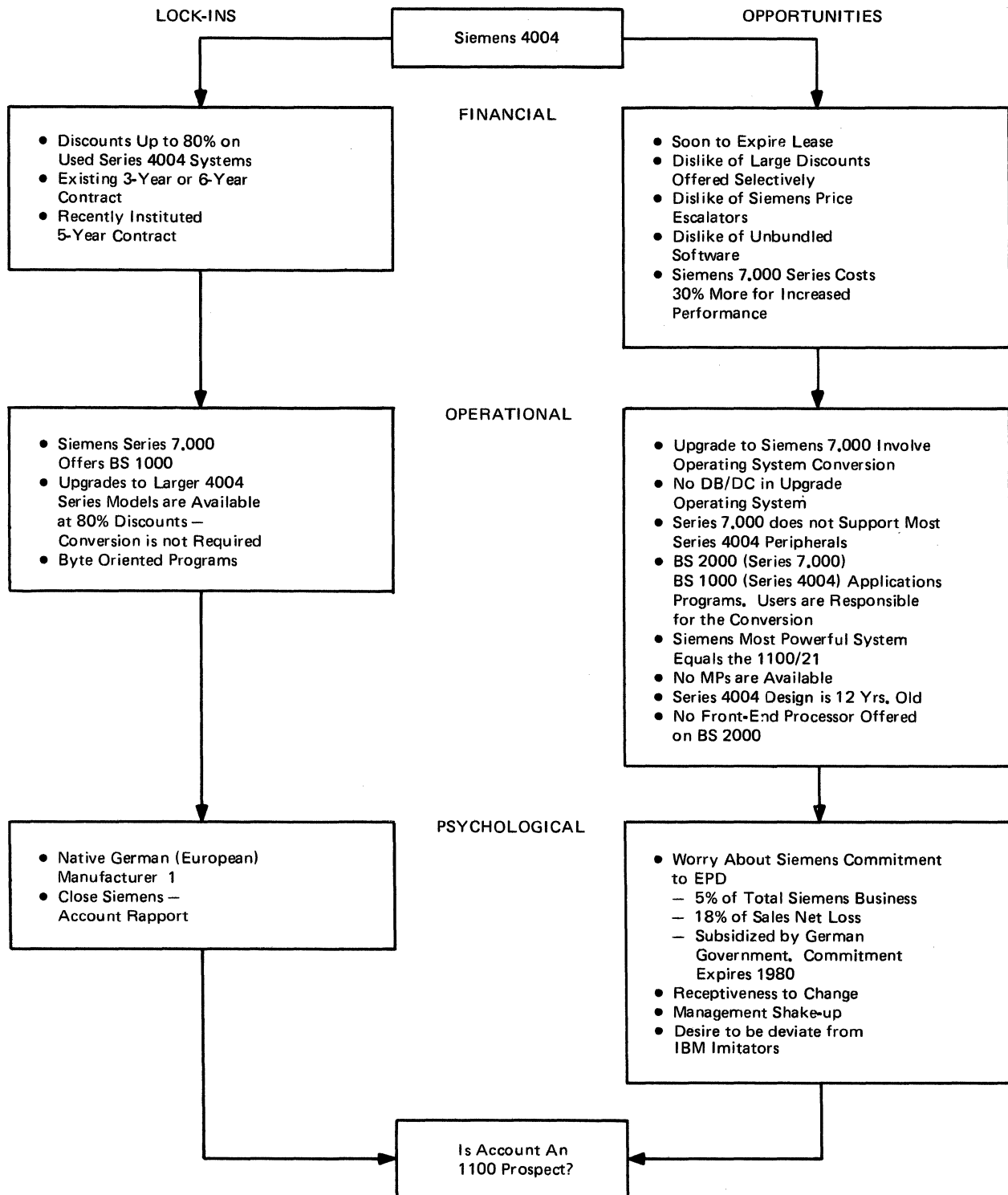
Siemens, a West Germany based firm, markets the above models within ECC and COMECON countries and the USSR. In 1975, Siemens vacated South Africa and South America (Brazil). Siemens customer base in Barazil was sold to Sperry Univac.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Qualifying Siemens 7.000 Accounts as Series 1100 Prospects



Qualifying Siemens 4004 Accounts as Series 1100 Prospects



PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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SIEMENS OPERATIONAL DIFFICULTIES

Operational Difficulties – Details

FCS's of the Siemens 7.000 Series began in March, 1975. The large majority of 7.000 Series accounts will be 4004 Series customers who must upgrade.

Conversion Problems

The most serious problem confronting users of the 4004 series, is converting from BS1000 operating system to BS2000 operating system, especially in the areas of data management and communications software. Currently, no BS1000 to BS2000 conversion tools are announced.

Most Siemens application programs — especially the commercially oriented programs — are only available under BS1000. This means that even the standard application programs must be converted by the user to run under BS2000.

Most System/4004 peripherals are not supported with the 7.000 series. This may impose further problems for the users in converting to the 7.000 series.

If the user elects to stay with BS1000 which is also supported on the 7.000 series, he will not be able to use the increased power and functionality of his new system. This is due to the fact that the BS1000 was originally designed in 1965 and that this operating system lacks efficient memory management, does not support virtual storage techniques and does not provide for relocation of programs during run time.

Increased Function Requirements

At present, BS2000 does not support a Data Base Management System.

At present, the TRANSDATA 960 front-end processors are not supported by BS2000.

No multiprocessor capabilities are available with the 7.000 series. The new 7.750 is merely a 7.750 with Instruction Pre-Fetch added.

In contrast to the 4004, the 7.000 series does not support drums or fixed-head disks. This will be considered as a big disadvantage by 4004/46 and 4004/151 users who have used such devices for paging.

All 4004 systems no longer provide the user with the necessary computing power. This is especially true for users of models 4004/55, 60, 150 and 151, who need a significant performance improvement.

All 4004 installations which include two or more loosely coupled systems to get more computing power and/or to achieve a higher degree of redundancy. These users are prime candidates for 1100 series MP systems.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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All 4004 users who are planning to implement DB/DC — based applications, together with a state of the art operating system. At present, only BS1000 provides for DB/DC — based application.

All 4004 users who already have implemented DB/DC — based application under BS1000 but who would like to get a more efficient operating system (BS2000).

All users who are dissatisfied with SIEMENS commitment to future development of hardware and software enhancements for the 4004 and BS1000 operating system.

Another source fo dissatisfaction may be the pricing strategy of SIEMENS by which SIEMENS is offering used 4004/45 systems at up to 80% discount, although the older 4004/45 users are paying normal prices.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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**Why a prospect should buy an 1100/10
over a Siemens 7.738 or 7.748**

1. Tightly coupled multiprocessors are available — the rapid expansion of communications based applications is causing many prospects to become conscious of system availability. Siemens offers, at best, some shared disk applications. These are very inferior to tightly coupled MP in terms of resource shareability, asynchronous program execution, and overhead (2-copies of the operating system must be maintained).
2. Growth Potential — Siemens largest system (the 7.755) is only 2.1 times the performance of the 7.738 and 1.4 times the performance of the 7.748. In view of the heavy subsidy the German government contributes for the present level of operations, it is unlikely that larger systems will be developed.
3. 8405 Disk — Siemens 7.000 Series does not support any fixed head disk or drum. The 8405 when used as a backing store is a reasonably priced and practical high performance disk.
4. 8450 — Siemens maximum capacity disk is 200 MB; furthermore, there is no capability to intermix 100MB and 200MB disks on the same control unit.
5. 1100 OS — 1100 OS offers functionality superior to BS2000 and vastly superior to BS1000. BS1000, which is 12 years old, does not allow full use of the Siemens 7.000 Series. The memory management of BS1000 is primitive. BS2000, while newer, does not support data Base/Data Communications, DB/DC; Front End Processors; or Siemens supplied applications programs, which are available on BS1000, only.
6. CTS — CTS offers facilities for both on-line problem solving and program development.
7. DMS & TIP — Outstanding program products. There is no counterpart in Siemens new Operating System, BS2000. Siemens obsolescent Operating System BS1000, while offering DB/DC, so restricts system functionality that it is not a viable alternative to 1100 OS using DMS & TIP.
8. Sympathetic Migration Policies — Whereas Sperry Univac has continued to support 1100 systems that preceded the 1100/XX Series with the latest releases of 1100 OS and new peripherals, Siemens' customers have an extremely difficult conversion. BS1000 is not compatible with BS2000. The customer is responsible for converting Siemens supplied programs from BS1000 to BS2000. Peripherals supported by Siemens previous series, the 4004, are not supported by the 7000 Series.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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9. One Price Service — All 1100/10 programming aids, including compilers, applied software such as DMS and TIP, and some application packages are provided without additional charges. Sperry Univac's visible pricing policy enables customers to perform long-term budgetary planning with certainty and enables them to capitalize on a wide range of software support without incurring added charges.
10. Price Protected 5-Year Lease — Siemens long-term leases have escalator clauses affording Siemens option to raise prices during the term of the lease.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

**Why a prospect should buy an 1100/10
over a Siemens 4004/55,/60, or /151**

1. Tightly Coupled Multiprocessors are Available — The rapid expansion of communications based applications is causing many prospects to become conscious of system availability. Siemens offers, at best, some shared disk applications. These are very inferior to tightly coupled MP in terms of resource shareability, asynchronous program execution, and overhead (2-copies of the operating system must be maintained).
2. Growth Potential — Siemen's largest 4004 system is equal to the performance of the 1100/11 without overlap. Conversion to the Siemen's 7.000 Series requires removal of the Series 4004 peripherals. Ultimately, the 4004 user must convert to an incompatible operating system that lacks many features of his existing operating system. Additionally, conversion will increase his rental. His ultimate growth is limited to less than 2 times his existing performance. In view of the heavy subsidy the German government contributes for the present level of operations, it is unlikely that larger systems will be developed.
3. 8405 Disk — Siemens 7.000 Series does not support any fixed head disk or drum, while the Siemen's 4004 Series did. The 8405, when used as a backing store, is a reasonably priced and practical high performance disk.
4. 8450 — Siemens maximum capacity disk is 200 MB; furthermore, there is no capability to intermix 100MB and 200MB disks on the same control unit.
5. 1100 OS — 1100 OS offers functionality superior to BS2000 which is available on the Siemen's 7.000 Series, only. 1100 OS is vastly superior to BS1000. BS1000, which is twelve years old, does not allow full use of the Siemens 7.000 Series. The memory management of BS1000 is primitive. BS2000, while never, does not support Data Base/Data Communications, DB/DC; Front End Processors; or Siemens supplied applications programs, which are available on BS1000, only.
6. CTS — CTS offers facilities for both on-line problem solving and program development.
7. DMS & TIP — Outstanding program products. There is no counterpart in Siemens new Operating System, BS2000. Siemens obsolescent Operating System BS2000, while offering DB/DC, so restricts system functionality that it is not a viable alternative to 1100 OS using DMS & TIP.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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8. Sympathetic Migration Policies — Whereas Sperry Univac has continued to support 1100 systems that preceded the 1100/XX Series with the latest releases of 1100 OS and new peripherals, Siemens customers have an extremely difficult conversion. BS1000 is not compatible with BS2000. The customer is responsible for converting Siemens supplied programs from BS1000 to BS1000. Peripherals supported by Siemens previous series, the 4004, are not supported by the 7000 Series.
9. One Price Service — All 1100/10 programming aids, including compilers, applied software such as DMS and TIP, some applications packages are provided without additional charges. Sperry Univac's visible pricing policy enables customers to perform long-term budgetary planning with certainty and enables them to capitalize on a wide range of software support without incurring added charges.
10. Price Protected 5-Year Lease — Siemens long-term leases have escalator clauses affording Siemens options to raise prices during the term of the lease.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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**Why a prospect should buy an 1100/20
over a Siemens (new) 7.750 or 7.755**

1. Tightly coupled multiprocessors are available — the rapid expansion of communications based applications is causing many prospects to become conscious of system availability. Siemens offers, at best, some shared disk applications. These are very inferior to tightly coupled MP in terms of resource shareability, asynchronous program execution, and overhead (2-copies of the operating system must be maintained).
2. Growth Potential — Siemens largest system (the 7.755) is at best 1.1 times the performance of the (new) 7.750. In view of the heavy subsidy the German government contributes for the present level of operations, it is unlikely that larger systems will be developed.
3. 8405 Disk — Siemens 7.000 Series does not support any fixed head disk or drum. The 8405 when used as a backing store is a reasonably priced and practical high performance disk.
4. 8450 — Siemens maximum capacity disk is 200 MB; furthermore, there is no capability to intermix 100MB and 200 MB disks on the same control unit.
5. 1100 OS — 1100 OS offers functionality superior to BS2000 and vastly superior to BS1000. BS1000, which is 12 years old, does not allow full use of the Siemens 7.000 Series. The memory management of BS1000 is primitive. BS2000, while newer, does not support data Base/Data Communications, DB/DC; Front End Processors; or Siemens supplied applications programs, which are available on BS1000, only.
6. CTS — CTS offers facilities for both on-line problem solving and program development.
7. DMS & TIP — Outstanding program products. There is no counterpart in Siemens new Operating System, BS2000. Siemens obsolescent Operating System BS1000, while offering DB/DC, so restricts system functionality that it is not a viable alternative to 1100 OS using DMS & TIP.
8. Sympathetic Migration Policies — Whereas Sperry Univac has continued to support 1100 systems that preceded the 1100/XX Series with the latest releases of 1100 OS and new peripherals, Siemens' customers have an extremely difficult conversion. BS1000 is not compatible with BS2000. The customer is responsible for converting Siemens supplied programs from BS1000 to BS2000. Peripherals supported by Siemens previous series, the 4004, are not supported by the 7000 Series.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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9. One Price Service — All 1100/10 programming aids, including compilers, applied software such as DMS and TIP, and some application packages are provided without additional charges. Sperry Univac's visible pricing policy enables customers to perform long-term budgetary planning with certainty and enables them to capitalize on a wide range of software support without incurring added charges.
10. Price Protected 5-Year Lease — Siemens long-term leases have escalator clauses affording Siemens options to raise prices during the term of the lease.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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**Why a prospect should buy an 1100/40
over a Siemens (new) 7.750 or 7.755**

1. Tightly coupled multiprocessors are available — the rapid expansion of communications based applications is causing many prospects to become conscious of system availability. Siemens offers, at best, some shared disk applications. These are very inferior to tightly coupled MP in terms of resource shareability, asynchronous program execution, and overhead (2-copies of the operating system must be maintained).
2. Growth Potential — The 7.755 is the largest entry in the 7.000 Series. It has much less performance than the 1100/41. In view of the heavy subsidy the German government contributes for the present level of operations, it is unlikely that larger systems will be developed.
3. 8405 Disk — Siemens 7.000 Series does not support any fixed head disk or drum. The 8405 when used as a backing store is a reasonably priced and practical high performance disk.
4. 8450 — Siemens maximum capacity disk is 200MB; furthermore, there is no capability to intermix 100MB and 200MB disks on the same control unit.
5. 1100 OS — 1100 OS offers functionality superior to BS2000 and vastly superior to BS1000. BS1000, which is 12 years old, does not allow full use of the Siemens 7.000 Series. The memory management of BS1000 is primitive. BS2000, while newer, does not support data Base/Data Communications, DB/DC; Front End Processors; or Siemens supplied applications programs, which are available on BS1000, only.
6. CTS — CTS offers facilities for both on-line problem solving and program development.
7. DMS & TIP — Outstanding program products. There is no counterpart in Siemens new Operating System, BS2000. Siemens obsolescent Operating System BS1000, while offering DB/DC, so restricts system functionality that it is not a viable alternative to 1100 OS using DMS & TIP.
8. Sympathetic Migration Policies — Whereas Sperry Univac has continued to support 1100 systems that preceded the 1100/XX Series with the latest releases of 1100 OS and new peripherals, Siemen's customers have an extremely difficult conversion. BS1000 is not compatible with BS2000. The customer is responsible for converting Siemens supplied programs from BS1000 to BS2000. Peripherals supported by Siemens previous series, the 4004, are not supported by the 7000 Series.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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9. One Price Service — All 1100/10 programming aids, including compilers, applied software such as DMS and TIP, and some application packages are provided without additional charges. Sperry Univac's visible pricing policy enables customers to perform long-term budgetary planning with certainty and enables them to capitalize on a wide range of software support without incurring added charges.
10. Price Protected 5-Year Lease — Siemens long-term leases have escalator clauses affording Siemens options to raise prices during the term of the lease.
11. Advanced System Architecture — Siemen's 7.000 Series lacks independently functioning I/O processors. The I/O logic is contained in the CPU control store which results in CPU performance degradation in the case of heavy I/O.
12. Higher Aggregate I/O Rate — 24 MC/sec per IOAU in the 1100/40 vs 6MB/sec total for the Siemens 7.755.
13. More Flexible Channel Concept — in total, only 7 channels for the Siemen's 7.555 (1byte and up to 6 block multiplexor channels); only 3 control unit positions per block multiplexor channel.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

Siemens System Specifications

	7,738	7,748
PROCESSOR		
Cycle Time	150 ns	50
Instructions		
Type	General Purpose Variable Length 360/370 Set	Same
Number	156	—
Options	—	—
Control Memory	Hard ROM	Hard ROM
Use	Instruction microcode Iris 46-60 & Phillips P1000 Emulators I/O Control	Instruction Microcode Iris 45-60 Emulators I/O Control
Size	63-99 KB	54 KB
Pipeline Design	No	No
Cache		
Type	Working storage for CPU enabling execution of interactive procedures at cache speed	Working storage for CPU; storage for maintenance diagnostic & test programs
Size	1.28 bytes	2 or 4 KB
Cycle Time	180 ns	50 ns
Hit %	Not Applicable	Not Applicable
Modes of Operation	Hdwre assisted virtual-std; Real-optional	Same
MAIN STORE		
Type	MOS-FET	Same
Self-correcting	Yes	Same
Word-width	8-bytes	8 or 16
Read Time	615 ns	Same
Write Time	785 ns	Same
Interleave	No	2-way
Min Capacity	128 KB	128 KB
Max Capacity	1024 KB	2048 KB
Increments	64,313 & 256 KB	Same
RELATIVE MAINFRAME PERFORMANCE (EST)	1.0 0.7 X 370/148	1.6 1.1 X 370/148
INPUT/OUTPUT		
Design	Microcode controlled via control memory (similar to IBM S/370); I/O contends for control memory access with CPU	Same
No. of Channels	5-Total 1-Byte Mpxr (8 ctrl positions) 1-4 Block Mpxrs (2 or 3 ctrl pos)	7-Total 1-Byte Mpxr (8 ctrl positions) 1-6 Block Mpxrs (3 ctrl pos)
Channel Data Rates	Byte Mpxr: 140 KB/s Block Mpxr: 1.5-2.4 MB/s	Byte Mpxr Block Mpxr
Aggregate Data Rate	4.5 MB/s	6.0 MB/s
SYSTEM CONSOLE		
Type	Service processor attaches floppy disk for microcode load; system display console (1280-char screen)	1280-character CRT
Options	Hard-copy printer - 20 or 180 cps 1-2 additional CRT's	Hard-copy printer - 20 or 180 cps

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

Siemens Product Strategy

Protect Customer Base

The Siemens 4004 Series is now 12 years old; while the 7000 Series is less than 2 years old. Users are to be migrated to the new systems if possible. If this is not possible, the existing 4004 systems are offered at discounts up to 80%.

Unbundled Software

All new or significantly improved software products, including compilers, will be unbundled. At present, there are 21 software products for which the user is charged. The license fees range from approximately \$90 to \$475 per month.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

Siemens Market Strategy

- IBM hardware compatibility

Siemens Systems are patterned after S360. The older 4004 Series was nearly identical to the RCA Spectra 70 Series. Their systems offer easy conversion from IBM and Univac Series 90 Systems.

- Native German/European Manufacturers
- Subsidy from the German Government

Siemens Computer operations lost approximately 18% of sales revenue. The German Government absorbed this loss. Their prices are artificially low.

- 6 year Contracts

To protect accounts, leases with terms up to 6 years are offered.

9.12 THIRD PARTY LEASING FIRMS**Partial List Of Major
Leasing Firms in U.S.**

Leasing Company	Portfolio Composition	Principal CPU
Itel	S/370	370/158
Decimus	S/370	370/158
LFC	S/370	370/158
Atlanthus	S/370	370/155
Dearborn	S/360	360/65
Diebold	S/360	360/30—50
Greyhound	S/360	360/30
DPF	S/360; some S/370	360/40
Randolph	S/360; some S/370	360/40
Leasco	S/360; some S/370	360/30
Booth	S/360	360/30—50
Computer System of America	S/370; some S/360	370/135
CIT	S/360; some S/370	360/30—40
Comdiso	S/360; some S/370	—

- Numerous other firms (largely banks) lease computers (largely S/370's) in the United States.
- Data Processing Financial (DPF) engages in the leasing of Amdahl systems.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

S/370 3rd Party Lease Base**Expiration Dates On Sample Of 91
S/370 3rd Party Leases In Effect At 12/75**

Year of Expiration	% Leases Expiring
1977	13.9
1978	15.8
1979	18.2
1980	13.3
1981	20.0
1982	9.7
1983	6.1
1984 and later	3.0
	100.0

Source: IDC 1976 370/360 Migration Study

Discounts typically range from 20–50%
off IBM MAC

S/360 3rd Party Lease Base**Expiration Dates on Sample of 222
S/360 3rd Party Leases in Effect At 12/75**

Year of Expiration	% Leases Expiring
1976	33.2
1977	26.7
1978	23.8
1979	10.4
1980	5.4
1981 and later	0.5
	<u>100.0</u>

Source: IDC 1976 370/360 Migration Study

Discounts typically range from 30 to 70%
off IBM MAC

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

**Why A Prospect Should Buy An 1100/10, 20, 40 or 80 Over A
New Or Used IBM S/370 From A Leasing Firm**

1. System Benefits — Listed in Subsection 9.1.3 of the IBM Section 9.1.
2. Single Vendor Relationship — The leasing firm customer often has to deal with IBM for maintenance and support and, perhaps, plug compatible vendors, in addition to the leasing firm.
3. Five Year Lease On New Systems — To compete with IBM rates, leasing firms often have to resort to 7—year and longer term leases requiring the customer to make a longer 5—year commitment.
4. Sympathetic Migration Policies — Leasing firm objectives are contrary to IBM objectives. Leasing firm customers incur the risk that they will be “left behind” and unable to easily rejoin the IBM mainstream in the future.
5. Price/Performance — The price/performance adjustments IBM made to the 370/138 and 148 make it difficult for leasing companies to compete for 370/138 and 148 business. In many cases, the same price/performance advantages 1100 series systems enjoy over 370/138 and 148 systems sold by IBM apply to those offered by leasing firms, as well.
6. Sperry Univac Financial Stability — 3rd party leasing can be a risky business, especially for firms with portfolios comprised primarily of S/360’s. The used computer market for S/360’s is rapidly eroding. In 1975, ITEL, a major leasing firm, sold its entire S/360 portfolio at a substantial loss, resorting strictly to S/370 leasing.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

Leasing Firm Objectives VS IBM Counter-Objectives

	Leasing Firm Objectives	IBM Counter-Objectives
Installed S/360's and S/370's	Keep installed after lease termination. Replace with higher priced new or used system after lease termination.	Retain control of customers by enrolling under IBM leases. Replace older systems with higher priced newer models, scrapping the older systems in the process.
Used S/360's and S/370's	Find subsequent uses for displaced systems as soon as possible, minimizing revenue loss during transition period. Negotiate highest rate and longest term possible.	Enlarge the hardware/software technology gap between new S/370 models and earlier S/360 models, deflating demand for the earlier models. Adjust price/performance and pricing structure for new S/370's encouraging S/360 users to reenter IBM mainstream under IBM leases (e.g., 370/138 and 148).
New S/370's	Install under long-term leases at rates below those available from IBM. Recover costs and realize profit.	Set stage for introduction of S/370 successor and S/370 obsolescence.
All systems	Build and maintain lease portfolio that provides increasing revenues. Stagger lease expirations to avoid revenue losses while reinstalling and when retiring non-market-able systems.	

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

Lease Rate Determinants For New S/370 IBM Versus Leasing Firm

	Leasing Firm Considerations	IBM Considerations
Purchase Price of New S/370	Lowest price available.	Purchase business is least profitable; lease business most profitable; and lease-purchase business intermediately profitable.
Lease Rate Determinants		
Term of Lease	The longer the lease term, the lower the lease rate. Term on new S/370 must be more than 4 years, the term available from IBM. Leasing firm will generally offer 5 year operating lease or 7–9 year financial or payout lease. 6 year term is infrequent to ITC qualifications.	4–year leases are available on S/370 mainframe at about 9% discount off of rental rates
Ownership	Leasing firm retains ownership under operating and financial leases and relinquishes ownership after last payment under payout lease. Relinquish of ownership results in loss of residuals and, therefore, higher lease rates than for operating and financial leases.	IBM offers liberal purchase option policies affording fast equity buildup and encouraging customer to enact lease purchase conversions within the term of a lease contract.
Investment Tax Credit (ITC)	Leasing firm will generally retain ITC but will, if demanded, pass on to customer. If passed on, lease rate will be higher than otherwise. ITC enables 10% of the purchase price amount to be directly deducted from a firm's tax liability to the IRS.	If demanded, IBM will provide ITC privileges to customer. Value of ITC to lease customer, however, is substantially less than value of ITC to purchase customer.
Depreciation	Leasing firm retains depreciation privileges. Depreciation can be deducted in income statement reducing net income and tax liability to IRS. About 50% of depreciation amount declared can be deducted from tax liability in a given year.	IBM retains depreciation privileges.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

Insurance, Property Tax	Leasing firm offers a net lease that excludes costs. They are incurred by customer.	IBM offers a gross lease that includes these costs. Insurance costs are about ½% of gross lease rate. Property taxes are typically about 3% but can range higher. As system gets older, property taxes decrease in importance.
Financing Costs	Leasing firm generally applies fixed interest rate bases on present rates and anticipated future rates over the term of the lease. If high inflation is anticipated, interest rate is increased accordingly.	IBM leases include financing costs to IBM, 5% escalator privilege affords hedge against inflation.
Early Termination Option	Leasing Firm rarely offers early termination option. When demanded, lease rate is substantially increased and/or one-time termination charges are incurred by customer.	IBM offers early termination option to lease customers. Commercial customers incur one-time charges and S & L Government customers no charges for early termination.
Overhead Costs	Leasing firm rates must compensate for S, G, and A expenses. These are in addition to those for IBM, which are built into the purchase price. S, G, and A expenses are small, however, relative to IBM's. Little variance exists between small — and large-scale systems; hence they are proportionately less for large-scale systems.	IBM lease rates and purchase prices compensate for overhead expenses such as S, G, and A.
Resale Costs	Leasing of use systems to 2nd users is extremely profitable to leasing firms. S/360 experience indicates an average 2% overall revenue loss when installed systems come off-rent and a new buyer is sought. Rates for operating and financial lease are adjusted to compensate for such revenue losses.	IBM does not have the same problems as leasing firms in finding second buyers for used systems. In fact, IBM often wants to scrap used systems so that buyers will invest in new ones.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

Maintenance

IBM's standard warranties and maintenance policies apply when a leasing firm purchases a new S/370 from IBM, i.e., one year "free" maintenance on main-frame and 90—days on peripherals. When free maintenance periods expire, customer must contract with IBM or service firm for maintenance. To obtain 24—hour, 7—day maintenance like IBM provides under its leases, IBM's Minimum Monthly Maintenance Charges (MMMC's) must be increased by about 40%.

Charges for 24—hour 7—day maintenance are built into IBM's lease rates. The customer incurs no additional charges. If FE costs increase, IBM can invoke its escalator privilege.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

Leasing Firm Strategies To Retain Accounts With Soon-To-Expire Leases

- Use of combination of in-house salesmen for consistent coverage and outside brokers for wider coverage.
- Encourage accounts to keep system longer by lower rates, upgrades, and technical evaluations of requirements.
- Insist on long termination notice in original lease and stay in close contact to ascertain what account is thinking in advance.
- Arrange with plug-compatible vendors to supply add-on memory and peripherals as required to enhance the capability and price of the system.
- Minimize off-rent time via detailed scheduling and management of transportation and installation.
- Monitor availability of similar systems month-to-month, avoiding marketing during periods of temporary oversupply.
- Sell new users on the desirability of features that are available on replacement system — features user might not otherwise be willing to pay for.
- Enhance installations via software available from proprietary software firms.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

10 CONVERSION

10.1 CONVERSION IN AD

As the 1100 family expands in its range of processing power, it opens up a larger market place with more opportunities. This larger market brings with it the potential of additional new business but also the increased requirement for a conversion from a much wider variety of systems and environments. For this reason, the question of conversion must be addressed early and become an integral part of the overall sales strategy.

There are many conversion situations that will be encountered by the Sperry Univac Sales Representative. In regard to competitive replacement, a recent study showed that a fairly consistent attitude among users has been that a vendor change is traumatic. The same study, however, indicated that the question of a vendor change is not completely closed, particularly to the medium-scale prospect who is currently interested in a change.

As the size of the system increases, of course, the magnitude of the conversion increases to a point where the user may not be able to easily justify a change. Here a much stronger emphasis on the benefits he will obtain from moving to the SPERRY UNIVAC 1100 System will be needed with a convincing conversion story. This prospect may well have a conversion to face even if he does not change vendors. This point should be emphasized along with reassurance that a well-planned and executed conversion by Sperry Univac can minimize any disruption to his computer operations.

The upgrade of other Sperry Univac systems to the 1100 Series is another conversion situation that will be encountered. The question of conversion is, in many cases, just as important to the Sperry Univac customer as it is to the competitive user. The approach may be different here, but the emphasis and the degree of planning will be just as important.

An even greater challenge exists for the Sperry Univac Sales Representative who is proposing an 1100 System to replace many smaller systems in an effort by a user to consolidate his data processing function. This prospect has already accepted the fact that some amount of conversion is imminent. In this case, the vendor with a well-planned conversion will have a definite advantage at decision time.

It is important to note here that an early investigation into the availability of industry-oriented application packages should be made. Conversion to such application packages could ease the entire conversion question and lend a positive element to the selling effort.

The objectives of this section are to define what is involved in a conversion and to identify those resources available to help plan and implement one. It is of primary importance that the Sperry Univac Sales Representative establish prospect confidence by approach the conversion question in a professional manner and conveying to him the experience and quality of assistance that is available to him.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

10.1.1 How to Sell a Conversion

The Sperry Univac Sales Representative's prospect must be aware of the long-term economic value in the proposed system change. The prospect's D.P. Manager will have to get the conversion job done and may be opposed to it or very doubtful about it. It is this person, in particular, that will have to be convinced that a conversion to a 1100 System is certain of success and reasonable in cost and time. Sperry Univac can do this because of the solid, proven conversion capabilities that it now has.

A few general points that can be made about conversion to a SPERRY UNIVAC 1100 System are:

- It has been done successfully before. Many systems have been converted to 1100 series family systems. In many cases, multiple systems have been replaced by a single 1100.

Non-Sperry Univac systems have comprised more than 80 percent of those replaced by conversion, and older model Sperry Univac systems the remainder. Systems which have been replaced include those of IBM, Honeywell, (and G.E.), RCA, Burroughs, ICL, Siemens, and NCR.

A few recent successful conversion sites are:

<u>CUSTOMER</u>	<u>BRANCH</u>	<u>CONVERTED ENVIRONMENT</u>
Fischer-Price Toys	Buffalo	HIS 405 & 415 – COBOL
Consolidated Papers, Inc.	Milwaukee	360/40
National Gypsum	Buffalo	360/30 – COBOL
Burndy Corporation	Bridgeport	360/40–S/70 – COBOL
Kansas City Power and Light	Kansas City	S/70
Westinghouse Research	Pittsburgh	B5500–ALGOL– FORTRAN–COBOL

Note: Contact should be made only with the sales Representative of these customers if more information is needed.

In addition, many other customers with incumbent non-Sperry Univac systems have successfully installed 1100 Systems to process new applications.

- Excellent conversion tools exist. A planned program for the development and support of translators has been carried out for years. This, together with extensive conversion experience, has resulted in highly effective, proven translators for a large number of languages and dialects, and for data. The program is structured for easy addition of new dialects, as needed.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

The following is a list of available conversion products with a short statement of the capabilities and/or limitations of each. These products, for the most part, are used and supported by 1100 Series Field Support (Conversion group). Check with this group to determine the latest support details and status. They're at Extension 5601, in Eagan.

Table 10-1. Current Conversion Products Available

<u>Name</u>	<u>Function</u>	<u>Comment</u>
ACCS	COBOL to COBOL	Translates COBOL syntax for various vendors. Resulting program requires minimal effort for clean compilation.
FC	File Conversion	Processes file description directives to convert a foreign vendor format to another vendor format. Most files can be converted unless special user defined structures and file access exists.
FCM	File Compare	Provides comparison of two files of various formats.
FORCONV	FORTTRAN Translator	Translates IBM Level G & H and S/70 FORTRAN to FORTRAN V. Also translate FORTRAN V to ASCII FORTRAN.
Special Conversion Macros		Various macros exist to provide adequate syntactical conversion i.e., IBM PL/I to UNIVAC PL/I.
AUTOCO	Autocoder to COBOL	Translator converts 1401, 1410 and SPS to COBOL.
BALCO	BAL to COBOL	Translator converts most BAL-ALC statements for UNIVAC, RCA and IBM equipment.
BALT	BAL to 1100 ASM	Translator converts BAL to 1100 assembler.
PLICO	PL/I to COBOL	Translator provides significant assistance in converting simple IBM PL/I source.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

<u>Name</u>	<u>Function</u>	<u>Comment</u>
RPGCO	RPG to COBOL	Translator provides some conversion assistance. Manual work also required.
SUPERTIDY	FOR to FOR	Resolves various FORTRAN differences for most vendors' FORTRAN languages.
Inverse Compiler	494 Absolute to COBOL	Translator is used to assist SPERRY UNIVAC 494 customers to move to the 1100 Series.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

**Table 10-2. Current COBOL Syntax Conversion
Capabilities in ACCS
(Automated COBOL Conversion System)**

<u>Vendor</u>	<u>Hardware</u>	<u>Operating System</u>	<u>Compiler Version</u>
Burroughs	3500		
Burroughs	4700		
Burroughs	5500		
Burroughs	6700		
CDC	3300		
Honeywell	200		
Honeywell	200		ANSI
Honeywell	200		H
Honeywell	200	Mod 1	ANSI
Honeywell	200	Mod 1	F1
Honeywell	200	Mod 4	ANSI
Honeywell	2000		ANSI
IBM	360		
IBM	360		ANSI
RCA	SPECTRA		
RCA	SPECTRA		ANSI
RCA	3301		
UNIVAC	494		
UNIVAC	1100		DOD
UNIVAC	1100		FIELDATA
UNIVAC	9400		

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

In each selling situation, it is important for the Sperry Univac Sales Representative to determine the prospect's specific concerns about the conversion. What type of conversion is wanted — a straight program-to-program conversion or a complete resystemization (redesigning and rewriting) or a combination of both? Does the prospect desire or have the capabilities for a full on-site conversion, or are other arrangements necessary?

Once these facts are known, the Sales Representative can begin to direct his efforts to demonstrate to the prospect how Sperry Univac can best meet his particular requirements. In answering specific conversion questions, a number of side benefits can also be identified for instance, conversions are:

- An excellent time to redesign obsolete or ineffective systems, refine old processes, and incorporate desired new features.
- A convenient time to upgrade documentation — a good conversion depends on good documentation and a knowledge of how programs work and fit within the overall processing flow of the organization.
- A chance to incorporate new techniques and ideas in programs and systems.
- A means of upgrading programs written in an obsolete language. These programs must be converted someday — generally the longer the prospect waits the more expensive it will be.
- A convenient time to make minor modifications that can increase the efficiency of a program — thereby reducing future run times.
- The ideal time to review the whole approach to developing and maintaining computer programs and systems — make the necessary changes in standards and procedures to lay a firm foundation for future growth.

As the conversion strategy develops, it is important to get complete involvement by the prospect so that he will acquire a better understanding of the direction Sperry Univac is planning. This closer relationship allows the Sales Representative to observe how each suggested approach is being accepted by the prospect so that, if necessary, a shift in strategy can be made.

In summary, selling a conversion can be accomplished if the Sales Representative shows his prospect that the advantage of converting to a SPERRY UNIVAC 1100 System far outweigh the problems of a conversion, and that Sperry Univac has an excellent track record in past conversions. We have the tools and the expert personnel to assist him in accurately estimating the conversion time and cost. He will get this same experienced help, when the time comes to implement and manage his conversion. Finally, it should be stressed that future conversion will be unnecessary because of Sperry Univac's long-standing commitment to provide upgrade through the 1100 Series without conversion.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

10.1.2 Specific Conversion Environments

This section gives additional details of specific conversions. It will be expanded and updated in the future.

10.1.2.1 IBM Conversion Environment

The IBM-to-SPERRY UNIVAC 1100 Conversion occurs more frequently than any other conversion to the 1100 series. This section presents some of the specific items encountered in this type of conversion and indicates some of the methods and procedures currently used to deal with them.

Some of the aids used in IBM conversions are:

1. ACCS tables to handle IBM COBOLS D, F, and ANSI and a general capability to handle variations.
2. FC (also known as TAPETTRAN) will convert most sequentially unloaded IBM files and has the capability to process several standard unload formats.
3. The direct loading of a sequentially unloaded ISAM file is possible unless there exists collation sequence problems.
4. Automatic analysis of record contents to assist in determining unknown record layouts.
5. Verification software to assist the analyst in the validation of output.
6. IBM COBOL conversion field manual (COOKBOOK) to assist in problems not handled via automated methods.
7. IBM PL/I conversion problems document.
8. FORCONV used to convert IBM FORTRAN G and H to FORTRAN V
9. BAL-ALC cross-reference capability.

The areas of education and personnel talents also contribute to a successful IBM conversion. The 1100 Field Support Conversion group in Eagan (at Ext. 5601) can assist in these areas. Some of the specifics are:

1. ACCS and FC classes specifically geared to IBM conversion.
2. Specialists in ACCS and FC use who have frequently assisted in IBM-to-SPERRY UNIVAC 1100 conversions.
3. Specialists in transaction processing and database conversion.
4. A large pool of analysts who have been successful in previous IBM-to-SPERRY UNIVAC 1100 conversions.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

5. Specialists trained in rewrite and redesign to make full use of the new hardware.
6. Personnel able to set up and execute a large IBM-to-SPERRY UNIVAC 1100 conversion project.

10.1.2.2 SPERRY UNIVAC 400 Series Environment

It is Sperry Univac's desire to direct and encourage 400 Series users to convert to the 1100 Series Systems. Specific encouragement should be given to the users to develop new applications and convert and resystemize old applications around the 1100 Series Data Management System and Transaction Interface Processor and, in some cases, use the 400 System as a front end processor.

The Americas Division Product Marketing organization is monitoring all 400 Series accounts, particularly those currently engaged in upgrade activity. If you, as a Sales Representative with a 400 Series account, require any information about 400-to-1100 Series upgrade we encourage you to contact Product Marketing in Blue Bell at extension 2509. You should capitalize on the fact that Sperry Univac has the best approach for your customer because only Sperry Univac knows both the installed 400 Series system and the 1100 Series system that is being proposed.

10.1.2.3 SPERRY UNIVAC 494 Environment

A number of approaches and aids have been developed to assist the 494 user to upgrade to the 1100.

A hardware aid that can be used in many different approaches is the Intercomputer Coupler Unit (ICCU). Sperry Univac Software handlers for the ICCU are being developed. The ICCU can be used to ease the conversion by connecting the new 1100 System to the 494 system being replaced, for passage of data between the two. This hook-up can be used for a number of approaches; the most common is to use the 494 system as a front-end to the 1100 system. In many cases, this arrangement could be used as a more permanent approach, where the 494 would be used as a front-end after conversion of applications to the 1100 Series system is complete. A less frequently-used approach would be to use the 1100 system as a front-end to the 494 system during the conversion period. This approach could be used as a short term solution where network requirements cannot be met on the installed 494 system. The communication handling would be transferred to the 1100 system with transaction processing continuing on the 494 until applications can be developed around a new data base on the 1100.

Another hardware aid that should be considered by the Sperry Univac Sales Representative is the use of peripheral switching. This aid, which is available on an RPQ basis, allows some of the existing peripherals at the customer's site to be switched between the 494 and 1100 system during the conversion period. A transfer switch is used to transfer the peripheral control unit from the 494

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

channel to the 1100 channel. The control unit is then modified so that a switch within the unit can be used to go from 30 to 36 bit mode. This space saving advantage, along with a savings in the cost of not having to duplicate peripherals, could be helpful.

The 494-to-1100 conversion effort can be reduced with a number of software conversion tools. The following is a brief description of those that have been used in A.D.

- Inverse Compiler

The Inverse Compiler is a category 1 software product designed to take the absolute code of one computer system and generate a higher level target language, which will compile and run on another computer system. This is the inverse of the operation of a compiler which generates absolute code from a high level source language — hence the name Inverse Compiler. The 494-to-1100 Inverse Compiler accepts 494 absolute code as input and generates 1100 ASCII COBOL source statements as output. The inverse compiler operates on the 1100 system.

- Features and Benefits

- Highly mechanized process which results in significant savings in conversion time and cost.
- Generates a high level language which is understandable by more people, easier to maintain and allows use of DMS.
- Completely analyzes converted programs that may or may not be documented.
- Analyzes data usage to assist data conversion.

The Inverse Compiler is made up of the analyzer, decompiler and the optimizer. The 494 absolute element and associated assembly and map listings from either SPURT or ASM are used as input to the analyzer and decompiler. The absolute element is the only required input, but, if the others are available, they will assist in the process. It is the function of the analysis modules to produce a report flagging any missing library calls or other linkage, along with any portion of the program that the decompiler will have difficulty in converting. After manual attention, the adjusted files are inputted to the decompiler which produces COBOL statements. These statements are then inputted to the standard ASCII COBOL compiler. Along with these inputs, there is also a decompiler user interface to allow for any additional updates or inputs. The optimizer can optionally be used to improve the readability of the generated COBOL source.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

- COBOL to COBOL Translator

ACCS is an Automated COBOL Conversion System supported by the 1100 Field Support organization in Eagan. The system has been designed to simplify the task of converting large files of COBOL programs to 1100 ASCII COBOL. It is a table-driven system that will convert any COBOL to 1100 COBOL providing the appropriate translate table has been developed. Experience has shown that this system will convert between 96 and 99% of the COBOL statements, once the appropriate translate table has been developed, tested and tuned. Recently, translate tables have been developed for both 490 and 494 COBOL.

- SPASM

SPASM is a SPURT-to-1100 ASM translator which is available from the 494 Software Support Group in Roseville.

- General Data Translator

The 1100 Field Support organization has a General Data Translator which can be used to convert 494 data files to 1100 format. It is a tape-to-tape translator which requires the user to dump his mass storage files to tape for translation and then load his 1100 data base from tape once the translation is complete.

- General Conversion Aids

There are several conversion aids contained in the 1100 Software which can increase efficiency and productivity of any conversion effort. The capabilities provided by FLAP (Flow Analysis Processor), FURPUR (File and Program Utility Routines), ED Processor (Text Editor) and Processor Interface Routines allow convenient, flexible and efficient modification of program and data elements and files.

FLAP is an 1100 software processor used for finding inefficiencies and bottlenecks in 1100 code after the conversion process is completed. Significant performance improvements can be realized with the use of FLAP.

10.1.2.4 SPERRY UNIVAC 418 Series Environment

There are a number of 418 series customers presently upgrading to 1100. The Board of Education — City of Chicago's upgrade from a 418 III to an 1110 has already been successfully completed.

The same upgrade approaches which are available to the 494 users are available to the 418 III users. Connecting the 418 to the 1100 as a front-end processor may be more desirable to the user of 418 equipment than to the 494 user. This approach can be implemented either with an ICCU or a high speed communications hook-up.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

Because the 418 can be connected to a 36-bit control unit, there will be a number of customers that will be able to move their peripherals to the 1100, if desired. This can be a definite competitive advantage for a Sperry Univac Sales Representative in developing a 418 upgrade.

A redesign of applications to move to DMS 1100 and TIP will be the most frequent software conversion approach taken by 418 users.

10.1.2.5 A Final Word About Conversion

Don't let the conversion question get blown up out of proportion in a marketing situation. With proper preparation, it becomes a normal part of your marketing plan. Sell the BENEFITS of conversion!

10.2 CONVERSION IN EAAD

To successfully penetrate the competitive market, one of the key questions a salesman has to address with his prospect is that of conversion. You should not allow your prospect to become preoccupied with conversion. It is merely a means to an end, the process the user must go through to gain the benefits of the 1100 Series; and, in particular, 1100 OS. Naturally, it must be considered in the cost justification calculations, and you may have to overcome some unreasonable fears and prejudices. However, if the prospect is well qualified and your solution sufficiently attractive, convert he must.

Typically, conversion becomes an emotive issue at two points in a sales case. At the very beginning, when the prospect is attempting to evaluate whether a good reason exists for considering Sperry Univac, he will wish to establish that conversion is feasible. At the very end, it is common for EDP management to get "cold feet" on the subject and to require further assurances. You should take this into account in your strategy, possibly deferring the conclusive "proof" of convertibility to a late stage in the case. Before a user can be convinced of conversion, he has to see a detailed plan, which will not involve excessive first-year costs. He will usually expect conversion support from Sperry Univac — and practical conversion tools.

10.2.1 Conversion Candidates

Analyzing conversion prospects you will find that two general groups exist:

- Prospects who either desire or are receptive to a change of vendors. He has already decided that a conversion is acceptable, and probably has a good idea of its impact on his organization. Here the emphasis should be on how well Sperry Univac can support and aid his conversion, and how the conversion can be used to refine his program base and increase his capabilities.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

- Prospects who wish to upgrade their systems and will convert only if it is absolutely necessary to obtain this goal. Here the initial emphasis should be on countering the resistance to a conversion. Remind him that even if he stays with his current vendor, he may well have to convert to grow. Show him how the conversion can be accomplished with minimum disruption, and highlight and benefits he can enjoy by converting to a SPERRY UNIVAC 1100 System.

It is of primary importance that you establish confidence in your prospect by meeting the conversion question head on. Don't avoid the issue. Show him that you are well aware of the problems and pitfalls of a conversion, and that he can draw upon Sperry Univac's experience and help in accomplishing his conversion.

10.2.2 Conversion Strategy

Today, medium and large scale computer systems have become more and more an integral part of a user's overall business operations. High system availability is therefore absolutely essential and minimization of business disruption is an important criterion in the selection process for a computer system.

Conversion from one system to another (usually a larger, newer generation configuration) generally necessitates moving and changing the data base, data media (normally tape-to-disk), job streams, sort and utility streams, and in many cases, extensive source libraries of production programs. Source language libraries normally require modification and recompilation because compiler implementation differs for manufacturer to manufacturer, from system to system, or when it is to facilitate reprogramming a system into a higher level language, usually COBOL.

It can be understood, that this change is only acceptable to a prospect if he can be assured of a smooth, and efficient transition. He, therefore, must be convinced that conversion need not be feared, that it is an integral part of his transition from one computer system to another, which will occur irrespective of vendor change, if the new system is to be utilized at its optimum. Your sales plan, therefore, can only be successful if it includes a solution to a prospect's conversion needs from the very beginning; don't offer just a business problem solution (hardware and software), but incorporate conversion as an integral part of your strategy. This complete response to a prospect's total requirements is called "Total Systems Conversion".

10.2.3 Conversion Approaches

Key to a successful conversion is a well-prepared conversion plan. Two basic approaches to conversion can be taken, and it is important that the prospect understands his roll in this effort.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

10.2.3.1 One-For-One Conversion

This approach means simple program conversion with as little changes as possible. Several advantages will result from this method:

- Fast Conversion: Programs are converted sequentially in a “production line” fashion, capitalizing on the increasing experience of programmers during the conversion process.
- Easy Checkout: Parallel run of programs is facilitated, as input/output media and methods remain unchanged.
- No Redesign: Only little conversion preparation is required, as program structures are not modified.
- Easy Use of Language Converters: Efficient translators should successfully provide 80% to 95% of source statement conversion, with nonconverted language being flagged for subsequent manual modifications. As the program logic is not changed, manual modification is facilitated and a clean compile on the target system can be obtained faster.
- Minimal Test Time: Test time requirements are limited to those resulting from mechanical clean-up actions and are not related to logical program checkouts.
- Short Term Cost Advantage: One-for-one conversion as can be seen from the above discussion, should generally provide a rather fast initial transition to the new system. Thus, start-up costs for conversion are comparatively low, but will soon be off-set by costs arising from sub-optimal utilization of the new system.

In summary, one-for-one conversion should be considered the preferred method for fast transition to a new system. But it will prove to be a short-term solution only, as it might prevent the user from taking full advantage of the enhanced capabilities of his new system.

10.2.3.2 Resystemization

Using this approach, a user will redesign and rewrite systems, rather than single programs, to capitalize on new techniques and features. Some advantages of this method are:

- More efficient System Results: Redesign of systems will take into account any particularities of the new system, resulting in most effective use of its features. Even minor program modifications can increase the efficiency of a program – thereby reducing future run times.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

- Use of New System Features: Redesign is an excellent time to modify obsolete or ineffective systems, refine old processes, and incorporate desired new features. This includes the upgrading of programs written in an obsolete language. These programs must be converted someday anyway — generally the longer this conversion is postponed, the more expensive it will be.
- Clean Base for Future Growth: Resystemization is a good opportunity to take a hard look at programs which must be modified frequently to meet changing requirements. Usually, the difficulty of making a change to a program is directly proportional to the number of changes that have preceded it. Streamlining or partial redesign as part of the conversion can greatly reduce the difficulty of future changes. This process, naturally, includes housecleaning, getting rid of programs that have not been used in years.

At the same time the whole approach to developing and maintaining programs and systems should be reviewed (and possibly modified) and the necessary changes in standards and procedures made to lay a firm foundation for future growth. This includes upgrading of documentation also: a good conversion depends on good documentation and a knowledge of how the programs work and fit within the overall processing flow of the organization.

- Long Term Cost Advantage: Costs of conversion should be calculated over the life time of a system. Obviously, resystemization will be more time-consuming than a straightforward conversion, and as such more costly. Regarding cost of conversion, however, as part of total system costs will result in substantial overall cost savings by utilizing the new system at its optimum.

Most conversions will most likely be a combination of both approaches, with emphasis on resystemization and the one-for-one method being used as a preliminary step to off-load the old system quickly, or to convert routine type programs (reports, etc.) which may not be worth resystemizing.

10.2.4 Conversion Planning

Whatever conversion method is proposed, it must make both economic and technical sense to the prospect. A plan may solve all economic problems, but if the prospect is not involved heavily in the conversion, he will not be able to support the converted system.

Developing of a conversion plan must therefore take the following aspects into consideration:

- Prospect Involvement: The prospect should be involved in general planning. This will help you determine what ancillary benefits he hopes to gain from the conversion and will insure that he is aware of the scope of the job and his role in the conversion.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

- Involvement of Technical Operations Department: Enlist the help of a branch systems analyst, back-up by subsidiary, regional, and EAAD headquarters specialists, to size the conversion and to develop the preliminary plan. A more detailed plan should be developed by the project manager after selection.
- Salesman's Personal Involvement: Lastly, and most importantly, don't leave the planning phase entirely to the prospect and the systems analyst. Remember that the conversion plan is an integral part of your sales campaign, make sure that it is developing in a manner that satisfies the requirements and fits with your sales strategy.

Elements that should be incorporated in the conversion plan are:

- Definition of the Task — the scope of the conversion effort must be defined. Elements of a good definition should include:
 - Number of Programs
 - Language
 - Average Size (number of statements)
 - Relationship with other programs (e.g., this program is part of a system)
 - File usage, organization, size (e.g., tapes in/out, disk index seq., 200K characters)
 - Brief description or narrative of each program/system
 - Description of any unique techniques or language extensions used
- Methodology — the manner in which the conversion is to be accomplished should be defined. This definition should include at least the following areas:
 - Specific definition of responsibilities of both the customer and Sperry Univac
 - General timeframe
 - Description of how the conversion is to be done and the tools to be used
 - Mechanics of turnover/acceptance
 - Availability of resources to accomplish task (e.g., machine time, manpower, work space, etc.)
 - Description of the standards to be adhered to during the conversion.
 - Statement of foreseeable problem areas

One major decision that will have to be made according to the needs of the specific case is which applications will be converted "as is" and which will be redesigned and rewritten. Communications applications are usually redesigned to take full advantage of the new facilities. Users often take the opportunity of a system change to redesign and improve applications which no longer serve their

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

purpose or are inefficient. These can be eliminated from the conversion proper. If an emulation capability is provided for the source machine, timing constraints can be less critical. The conversion of infrequently used programs can be deferred until resources are available, and applications which will be redesigned later can be run temporarily in their original form without the need for conversion. Emulation provides a measure of flexibility in this respect as well as providing backup security after conversion.

10.2.5 Conversion Tools

To ease the process of conversion Sperry Univac has available a wide range of automatic conversion aids for both programs and data files. Tools, where they are required, exist for most vendors and cover all the commonly used programming languages. Although it is not practical to address, in this document, every conversion product available in the 1100 library, some impression of the scope of our conversion capabilities can be gained from the following brief descriptions of the most commonly encountered conversion areas.

COBOL to COBOL

Sperry Univac has available the Automatic COBOL Conversion System ACCS. This is a well established product and has been used at many sites around the world.

ACCS provides the capability to convert one or more files of COBOL source programs to the Sperry Univac ASCII COBOL syntax. A simple easy to use parameter interface describes and directs the input and processing operation. Inputs to the converter may be recorded on either tape or mass storage; COBOL libraries if present are converted to Sperry Univac format and subsequently processed; syntax conversion is performed on source and library files according to the input vendor specified; each program is compiled using the latest ASCII COBOL Compiler; all files are saved on mass storage; and reports are printed giving details of files saved and the results of the conversion and consequent compilation.

ACCS currently has the capability to accept and convert COBOL input for most models of IBM, Burroughs, Honeywell, CDC and RCA. The product is highly efficient and will generally convert completely automatically in excess of 95% of the original source.

Byte Assembler Language

Although Sperry Univac has available products to convert from Byte Assembler Languages (BAL) to 1100 Series Assembler the preferred approach in EAAD is to convert BAL programs to ASCII COBOL. The product used for such conversions, BALCO, supports conversion from several assembly languages — prominent amongst these are IBM 360, IBM 370, ICL System 4, Siemens 4004 and Honeywell Series 100. Associated with the BALCO translator is a complete set of utility programs to perform such tasks as library and data file conversion pretranslation and file comparison.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

BALCO is a well established tool and is continually being enhanced. In cooperation with Nippon UNIVAC Kaisha EAAD have set up a development plan for the future improvement of BALCO and this work will be done in London by the Systems Conversion Group who support the product.

PL/1

The PL/1 user moving to the 1100 Series can choose one of two alternative approaches. He may either convert his programs to COBOL using Sperry Univac PL/1 to COBOL conversion package or more desirably he can retain his programs in PL/1 using our own ECMA standard compiler. Currently PL/1 on the 1100 series approximates closely to the IBM Level F and has in addition the ECMA standard features of the language. Sperry Univac has a development plan for PL/1 covering the next two years with the intention of further enriching the product. Plans exist to provide 'optimizing' and 'check-out' features and in addition a batch debugging feature.

Utilities to assist and speed up PL/1 to PL/1 conversion are currently being produced in London and a pre-processor which can be used to identify and flag potential problem areas in conversion will be released soon.

FORTTRAN

For most vendors' FORTRAN we require no specific conversion aids other than the ASCII FORTRAN Compiler itself. Certain aids and utilities do exist but they rarely are required to be used.

Data Files

The Sperry Univac File Converter has the ability to handle even an odd parity files, non-standard or omitted labels, multi-reel files and multi-file reels, records that are variable in length, records which span blocks and even records which are undefined in format. It is an extremely powerful tool and one which is invaluable in the process of conversion.

To complement the File Converter, Sperry Univac has also developed a File Compare Processor. Whereas in the past all converted files and files produced by converted programs had to be laboriously checked to deduce the accuracy of the conversion process, this product has now completely automated the task and at the same time reduced the element of human error. File Compare directives can be generated automatically as a function of file conversion or externally by a programmer or operator. The tool offers a wide selection of options which are valuable not only in the verification of final results but also in the testing involved in the conversion process.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

MACRO

Technically expressed, Syntax Translators in their entirety require a free format syntax scanning and editing capacity plus algorithmic and procedural capacities. Sperry Univac have now developed a completely general system, called MACRO, to accomplish this. This provides us with a tool therefore to develop translation tools on an as-needed basis quickly and efficiently, thus giving us the capability to develop automatic conversion aids for products for which no aid previously existed or in situations where existing products prove inadequate to the task.

It is probable that all new syntax translators for the 1100 Series will merely be applications of MACRO.

CONCLUSION

A complete library of all known 1100 Series conversion tools and aids is maintained in London. Further information on areas described or any other products can be supplied by the Systems Conversion Group.

10.3 CONVERSION SUPPORT

To assist field marketing in this area a specialist group, the Systems Conversion Group, has been established in the Central Support Department of Technical Operations in EAAD Headquarters.

The group is staffed with highly experienced technical personnel who have also a project management background; most members of the group have managed more than two 1100 Series projects and in addition to their field experience of conversion projects each person has undergone extensive training on Sperry Univac's conversion products in the U.S.A. The group is multinational and hence multi-lingual.

The group has been set up with the principle objectives of increasing bookings from conversion business and also to ensure successful implementation of conversion projects, thus protecting revenue. Support offered by the group can be discussed under the following headings:

- Presales Support
- Post Sales Support
- Product Development and Support

PRESALES

As has been already stated Conversions can be approached either on a "one for one" basis, on a "resystemization" basis or some combination of both. Choosing the correct approach can be fundamental both to winning the order and ensuring successful implementation. The task of researching into existing systems on the

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

other vendors' equipment, deducing an accurate inventory and assessment of what is required to be converted, choosing the best technical approach, translating the approach into a technical and resource plan, and generally producing a series of reports which can directly be mapped into the proposal and Profit and Loss Account for any business is referred to as 'SIZING.'

The extensive experience both in the technical and project management aspects of this group make them ideally equipped to accomplishing this key task in conversion business. The accurate and professional sizing of a conversion workload will allow us, as a vendor, to treat conversions in an anticipatory rather than reactionary fashion and will communicate to the customer prospect that Sperry Univac clearly understands the business of conversion. The group can also participate in the actual production of Conversion proposals, are available to make presentations on conversion and conversion tools and to a degree limited by the size of the group to accept and participate in benchmark conversions or conversions leading to benchmarks.

It is to be expected that the utilization of personnel from the group will, in the eyes of the prospect, convey the impression that Sperry Univac has a thorough understanding and scientific approach to conversion and generally instil confidence in the prospect during the period when he is most likely to be in need of it.

POST SALES

Conversion projects can be expected to contain all the problems implicit in other implementation projects and specialized others besides. For this reason it is essential that during the start-up phase of the project, all technical, managerial and scheduling problems are properly addressed, resolved and reflected in a project plan, with associated standards and procedures, which will ensure successful implementation. Based on the results of the sizing exercise we should be aware in gross terms of the work to be achieved in conversion but at this stage it will be necessary to match tasks to actual people and to plan at the detailed level all aspects of the project.

If this function is performed properly and professionally, the project should be ensured of success; realistic, detailed and accurate planning is the foundation upon which conversion projects can be completed in time, within costs budgeted and to the satisfaction of the customers technical expectations. Here again the Systems Conversion Group can assist in the planning of such projects with local project management. It is important that local project management be involved from the start as it will be their responsibility following this phase to implement the plan and a complete understanding of the strategy and thinking behind it is essential.

Experience decrees that even the best planned projects do on occasions for some reason go out of control and fail to meet their implementation milestones. The same unfortunately is true for conversion projects and when this occurs support from the group will be forthcoming to establish the reasons for deviation from plan, to recommend remedial action and if necessary stay with the project until such action can be proven to be sufficient to return the project into a controlled situation.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

PRODUCT DEVELOPMENT AND SUPPORT

In Section 10.3 some brief mention of conversion tools and aids available was mentioned. Previous to the establishment of the System Conversion Group, we in EAAD had to rely on outside assistance and support for the available Sperry Univac conversion products.

Support of these products is now available from London and requests for support, enhancements or problem fixing may be directed there.

Also as has been stated in the previous section, the group is actively working on the development of specific conversion aids important to our prospects in the division. One of the factors that contributes most to our capabilities to convert with speed and efficiency is the availability of automatic conversion tools. Any needs or product gaps in this area should be communicated to the System Conversion Group for consideration.

USE OF THE GROUP

Services of the group are precharged on an allocation basis and therefore no charge is made to subsidiaries for field support. If you require support in conversion, you should request this via your subsidiary technical manager.

10.3.1 Conversion References

A good number of users worldwide have converted from competitor's equipment to the SPERRY UNIVAC 1100 Series. The following list — which is an excerpt of the "European and Worldwide 1100 Conversion Sites Information Handbook" published by EAAD Tech. Ops. Central Support Group — names some reference accounts. It goes without saying that you have to check with the responsible subsidiary about details, and obtain permission for quoting before any external reference is made.

<u>Replaced System</u>	<u>Customer Name</u>	<u>Location</u>
Burroughs 5500	Westinghouse Research	USA
Control Data 3170	Interdata Zurich	Switzerland
Honeywell Series 400	DEMAG	Germany
	Fafnir Bearings	USA
	Fischer-Price Toys	USA
	Lebole	Italy
	RPS (Swedish Police)	Sweden
Honeywell Series 200	Les Assurances Federales	Belgium
Honeywell Series 100	Bassani Ticino	Italy
	Fafnir Bearings	USA
Honeywell Gamma Series	Energoinvest	Yugoslavia
	SEPT	France
	Burndy Corporation	USA

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

<u>Replaced System</u>	<u>Customer Name</u>	<u>Location</u>
IBM 360/370 OS	Shell Netherlands	Netherlands
	University of Miami	USA
	Ciments Lafarge	France
IBM 360/370 DOS	Consolidated Papers Inc.	USA
	Ensidesa	Spain
	Selenia (IRI)	Italy
IBM 360/370 Unqualified	Aquitaine Total Organico	France
	Fjerndata	Norway
	Italcantieri	Italy
	University of Bergen	Norway
	University of Stellenbosch	S. Africa
IBM 360/20	Selenia (IRI)	Italy
	Social Fund (SFB)	Netherlands
IBM 1401	Consolidated Papers	USA
	Norsk Hydro	Norway
IBM Miscellaneous	C.P.E.	Portugal
	Italsider Taranto	Italy
	Shell Netherlands	Netherlands
	S.N.P.E.	France
	University of Freiburg	Germany
ICL 4-50	INA Zagreb	Yugoslavia
ICL 1902A	James Neill Ltd.	England
Miscellaneous	NATO Saclant Center	Italy
	S.A. Coal, Oil & Gas	S. Africa
NCR Century	Data Cybernetics	S. Africa
	SAPPI	S. Africa
NCR 315	Gasunie	Netherlands
	Dansk Dataservice	Denmark
RCA/SIEMENS	Public Service Electric Co.	USA
UNIVAC 1100	Burmeister & Wain	Denmark
	Deutsche Beamtenversicherung	Germany
	Dutch PTT	Netherlands
	Institute Gustave Roussy	France
	Shell AG	Germany
UNIVAC III	CCN Heerlen	Netherlands
UNIVAC 9400	IKOSS	Norway
	K.A.V.	Germany
	SEDA	Italy
UNIVAC 9300	Ministero Tesoro	Italy
	Rijeka Shipyard	Yugoslavia
	Union Kraftstoff	Germany
	Van Hool & Zonen	Belgium
UNIVAC 1050	K.A.V.	Germany

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

10.3.2 Benefits of Conversion

Conversion is a major cost factor that has to be considered in an investment justification. Show your prospect that we, at Sperry Univac, are well aware of this fact, and that you are prepared to discuss this subject intelligently.

Hardware and communications costs continue to decrease, while personnel and the associated cost of data processing increase. Since personnel and associated cost represent the major part of data processing expenditures today, the net effect is that total EDP costs continue to rise. A prospect will therefore only consider conversion if his (new) EDP expenditure provide him with a proper return on investment.

SPERRY UNIVAC 1100 Series systems derive their economic advantage in two basic ways:

- by saving time, and
- by outstanding system performance.

Time is saved in the personnel area by providing an easy to use operating system, effective language compilers with complete diagnostics to speed up programming and debugging and interactive program development. A great contributor to time saving is 1100 OS with its uncomplicated but powerful and flexible JCL. Programmers time is spent in productive applications, not coding (and debugging!) of job control statements.

Superior equipment performance, the second basic element of savings, results in a reduced cost of hardware necessary to accomplish a given workload. All system resources, which includes memory and the various peripheral devices, are controlled dynamically by 1100 OS. Through dynamic allocation of resources the need for physical devices is reduced, lowering the hardware costs for 1100 Series systems.

Consider, on the other hand, the cost of not converting, which might — of course, — vary in kind and extent in each customer's installation.

- Cost to maintain obsolete programs: The more difficult task of maintaining programs written in a previously used or low level language causes increased maintenance expenses that could be eliminated if the program library was converted to a high level programming language like COBOL.

Continued training in former language syntax and debugging tools is a cost item which could be eliminated by changing to a higher programming language. This cost may become apparent when new staff must be hired who do not have current experience in a now obsolete program language.

- Cost of running programs designed for prior hardware: Computer programs are frequently designed for the specific machine they were written for. Consequently the efficiency of those programs on new systems is reduced. It is difficult to quantify the cost for inefficient use of a computer system, but it remains a real cost item until conversion is completed.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

- Cost of additional hardware: This can be substantial if required to run obsolete programs. Additional memory necessary for emulation or sometimes for running two operating systems, additional peripherals required for executing programs designed for prior systems — that all adds up and is a very expensive way to continue to use obsolete programs.

This list of costs of not converting is certainly not an all-inclusive list, and it still does not consider at all the cost of a lost opportunity to increase the return on EDP investment. Once the EDP budget is spent, and much of it is spent in duplicate costs that could be eliminated by conversion, the money cannot be spent in developing the new system. This means less advantages gained from the new system and, consequently, less return on investment. The cost of lost opportunity is probably one of the greatest costs by not making the necessary conversion.

A conversion to the 1100 Series, on the other hand, does not only reduce the cost of data processing and in turn increases the return on investment, but it also reduces the cost of EDP change.

A conversion to the 1100 Series eliminates the need for future change to different operating systems: it protects the user's investment. The compatibility between all members of the 1100 Series provided by the single source of 1100 OS pays off!

Can you think of a stronger argument to support our long-term marketing strategy?

11 SALES AIDS

11.1 SALES AIDS FOR AD

Many sales aids are available for use in your 1100 Series marketing efforts. Your Sales Manager may have many of the items on file and your branch librarian may have additional copies of brochures and other documentation. The same may be true of slide presentations and product demonstrations. In the event that some items are not immediately available, ordering procedures or other information is given with each sales aid description.

The topics discussed within this section are:

- Brochures and Manuals
- Slide Presentations
- Demonstrations
- Benchmarks
- Marketing Support
- Customer/Prospect Visits
- Customer Education
- Representative 1100 Users

11.1.1 Brochures and Manuals

There are many publications dealing with 1100 Series Hardware and Software that are in your branch library or can be ordered from the Customer Information Distribution Center. To order from locations within the United States, submit Form UD1-578 to:

Customer Information Distribution Center
Sperry Univac
P. O. Box 448
King of Prussia, Pa. 19406

Outside of the United States, submit Form UD1-1371 to:

International Publications Dissemination Dept.
Sperry Univac
M2-148
P.O. Box 500
Blue Bell, Pa. USA 19422

A complete list of available brochures and manuals appears in the Systems Publications Catalog, UP-7920, which should be in your branch library or can be ordered from CIDC.

Described here are some of the more popular sales promotion brochures which you may want to keep in your personal library for quick reference.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Title: 1100/10 Systems – U5836

Format: Two sections – Glossy cover, 12-page section in full color, 36-page section in two colors.

Objective: Management overview in first section, description of product features and values in second section.

Content: Identifies 1100/10 as the starting point of the series as part of the high-level product description in the first section, followed by “Facts and Figures” section detailing the hardware and software.

Audience: Management
Professional Evaluators
Selection Committees
Data Processing Managers

Title: 1100/20 Systems – U5731

Format: Two sections – Glossy cover, 12-page section in full color, 36-page section in two colors.

Objective: Management overview in first section, description of product features and values in second section.

Content: High-level product description in first section, followed by “Facts and Figures” section detailing the hardware and software.

Audience: Management
Professional Evaluators
Selection Committees
Data Processing Manager

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

Title: 1100/40 Systems – U5732

Format: Two sections – Glossy cover, 12-page section in full color, 36-page section in two colors.

Objective: Management overview in first section, description of product features and values in second section.

Content: High-level product description in first section, followed by “Facts and Figures” section detailing the hardware and software.

Audience: Management
Professional Evaluators
Selection Committees
Data Processing Manager

Title: 1100/80 Systems – U6004

Format: Two sections – Glossy cover, 12-page section in full color, 36-page section in two colors.

Objective: Management overview in first section, description of product features and values in second section.

Content: High-Level product description in first section, followed by “Facts and Figures” section detailing the hardware and software.

Audience: Management
Professional Evaluators
Selection Committees
Data Processing Manager

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

Title: Unis 1100 Industrial System . . .an Executive Overview – U5791

Format: Two sections – Glossy Cover, 8-page section in full color, 36-page section in two colors.

Objective: Management overview in first section, description of product features and values in second section.

Content: Good business-value treatment in first section followed by an excellent explanation of how UNIS 1100 is used in the step-by-step control of production and inventory. Very readable “mini-course” on the subject, with concise descriptions of every facet involved.

Audience: Management
Professional Evaluators
Selection Committees
Customer Project Leaders
Data Processing Managers

Title: Author System for Education and Training, ASET – U5687

Format: Glossy Cover, full color throughout, 8 pages plus covers.

Objective: High-level product overview, with brief descriptions of features and benefits – “Beyond Traditional Computer-Assisted Instruction”.

Content: Mostly pictures – views of students, authors, at terminals. Emphasizes the fact that ASET is much more than just a CAI package.

Audience: Management
Professional Evaluators
Selection Committees

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Soon to Be Released

- Title:** Total Information Management System, TIMS — U5918 (Not yet available).
- Format:** Two Sections — Glossy cover, first section full color throughout; second section two color.
- Objective:** Management overview in first section, description of features and values in second section.
- Content:** High-level product description in first section. Second section describes the software modules in detail. Good treatment of how CMS, TIP, DMS QLP/QRW and RPS fit into the overall scheme of managing users' data.
- Audience:** Management
Professional Evaluators
Selection Committees
Customer Project Leaders
Data Processing Managers.

11.1.2 Presentations

A good marketing effort usually includes presentations of important features of hardware and software. Slide presentations exist for most 1100 Series products and can be ordered from CIDC just as you would order publications.

Many of the presentations were produced by, or released through, the Univac Education Center and are listed in the Education Materials Catalog, UE-624, which also can be ordered from CIDC.

Listed here are some of the more recent presentations, which you may not yet have.

- Title:** SPERRY UNIVAC 1100 Series Systems U5837.2
- Description:** Marketing presentation covering all 1100 models, emphasizing benefits. Slides have pictorial backgrounds, keyed to printed subject matter. This set is produced by World Wide Marketing & Services, and is updated to include each new 1100 Series system as it is announced. Copies of it are sent to all sales locations with the managers' announcement kits. Additional copies may be ordered from CIDC.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Title: 1100/10, /20, /40 Slide Set UE 749, Rev. 1

Description: Made up of 114 slides with script, this presentation can be used as a series overview or to emphasize a particular model. Included are slides of many of the 1100 Series peripherals. Originally released for /20 and /40 models, and updated to include the /10 in March, 1976.

You may already have slide set UE-749 (see page 22 of the Education Materials Catalog, UE-624), which covers the history, design philosophy, components, configurations and the operating system of the 1100 Series. If you do, you'll want to order the update to the slide set - UE-749A, now available through CIDC. This update contains nineteen slides and a script. Four of the new slides replace slides of UE 749 which had errors. The other fifteen slides are completely new, mainly devoted to adding the 1100/10 to the set. Also included with the update is a script for an updated slide set. There was no script with UE-749 before, only the slides were available.

So, to update a copy of slide set UE-749 that you *now* have, order a copy of UE-749A (19 slides, script @ \$5.21) from CIDC.

From now on orders for UE-749 will automatically include the update, UE-749A, @ \$29.21 for a complete, updated presentation.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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Title: Introduction to DMS 1100 — UE—769.1
DMS 1100 Functional Overview — UE—769.2
(Coordinated Presentations)

Description: "Introduction to DMS 1100" (UE 769.1), is ideal for a first-look presentation to prospects who are not familiar with the concepts of data base management. It gives the pros and cons of file management and data base management, in a non-technical manner. It is an excellent presentation for Sales Representatives to use in initial marketing efforts at the management level.

A companion presentation, "DMS 1100 Functional Overview" (UE—769.2), can be used as a follow-up presentation to UE—769.1 or it can be combined with slides from UE—769.1 for a more detailed initial presentation. This presentation is structured into two levels of depth so that the amount of technical content is variable for a more tailored presentation.

The scripts include parenthetical remarks by the authors, providing helpful hints for arrangement and presentation of the material.

Although both presentations have the same visual format, they were produced as separate items. This was done to permit Sales Representatives to order personal copies of the "Introduction to DMS 1100" for their use. The greater portion of the slides, which are of a more technical nature, are in "DMS 1100 Functional Overview". Since one or two copies of this larger set of slides would normally be sufficient for a branch, costs can be kept to a minimum.

UE—769.1 Introduction to DMS 1100

37 slides and script \$ 9.85

UE—769.2 DMS 1100 Functional Overview

94 slides and script \$24.85

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
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Title: Transaction Interface Package, TIP 1100 — UE 770

Description: This 35-mm color slide presentation includes 161 slides plus a script. The presentation is an overview of the TIP 1100 System and is divided into three areas: User Preparation, System Operation, and Transaction Flow. The presentation uses the "build-up" technique, and if all slide are used, will take approximately three hours to present. The User Preparation Section explains what the user must do in order to use the TIP system successfully, the System Operation Section shows how the system operates, and the Transaction Flow Section takes a transaction message through the system from its input from the terminal operator to the output message that is sent out. A suggested sequence of slides for a shorter presentation is also included. This slide presentation obsoletes and replaces UE 7025.7. 161 slides and script is \$41.97 per set.

Title: An Introduction to Software Engineering — UE 772

Description: This 35-mm slide presentation includes 61 color slides and a script. The subject is treated as software independent and reviews the major techniques of software engineering including:

- Structured Programming
- Top down design
- Chief Programmer teams

61 Slides and script are available as a set, for \$15.98.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
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11.1.3 Demonstrations

For sheer impact in a marketing effort, nothing beats a good demonstration. You may have already heard about some of the following demonstrations and the facilities now available through the Marketing Test Center at Egan, Minnesota. More are coming, but right now you can demonstrate the following via a terminal:

- RPS
- QLP
- CTS

These demonstrations are extremely well-documented and were produced primarily for use by Sales Representatives. In the past, field demonstration response times were not always as fast as most would like. This new facility is set up so that, with a minimum of 24 hours advance scheduling of a live demo to a prospect, operations will reduce the system load during the actual demo to enable good response times at the terminal.

To schedule a demonstration or to request information about the 1100 Series "Dial-A-Demo" facility, call the Field Interface at the Marketing Test Center — Extension 2454 or 2474.

11.1.4 Benchmarking

Often, the final step in a sales campaign is the running of a benchmark. They are expensive, but unavoidable in some cases. The Benchmark Center at Univac Park in Egan is the most advanced facility of its kind in the world. The 1100 Series Benchmark Monitoring Display system (BMD 1100), used at the center, gives a comprehensive analysis of the benchmark, providing both real-time color video display and hard-copy graphics. It is most impressive to a prospect to be able to see exactly what is happening in the system, *as it happens*.

The Benchmark Monitor Display System is described in the brochure, BMD 1100, U5830. If you don't already have one, or want additional copies, order it through CIDC.

The Branch S/A Manager controls all benchmark activity for you, and must be advised as soon as possible of any upcoming benchmark needs so that the effort can be scheduled and properly prepared.

Working with the fine staff of professionals at the Benchmark Center, the branch benchmark team skillfully "tunes" each phase of the effort to get the best possible results. And it takes time. That's why it's so important to give as much advance notice as you can of any marketing effort where you anticipate the need for a benchmark.

Of course, you would avoid the effort and expense of a benchmark if at all possible. A typical 1100 Series benchmark, all costs considered, totals up to about \$60,000 — and around \$12,000 of that is borne by the branch office in the form of salaries and expenses. But, if you must benchmark, you can rest assured that it will go in grand style.

11.1.5 Marketing Support

You are probably familiar with the 1100 Series Sales Memos and Sales Success Bulletins that are published by the 1100 Series Product Marketing office in Blue Bell, Pa. The people in this group stand ready to answer any question you might have concerning the 1100 Series. You would normally contact the Major Systems Marketing Manager in your Operations if you had a question that couldn't be answered at the Branch Support level. But, sometimes you can't reach the right people, and you need the answer right away. In that case, you can call Blue Bell, Extension 3310, and someone from 1100 Series Product Marketing will either give you the answer, or get it and call you back — guaranteed!

11.1.6 Customer/Prospect Visits

You can arrange for visits to Headquarters, plant locations and user sites as part of an 1100 marketing campaign. If you haven't already made use of the first-rate facilities for such visits, especially at Blue Bell, you're in for a real treat. The Sperry Univac Customer Conference Center in the Home Office provides you with total meeting services and facilities:

CONFERENCE THEATRE

Better communications is the primary objective of this new Conference Theatre. The purpose of any meeting is to impart or transfer information and to do so in a manner that can be instantly grasped and understood by your audience.

It is a multi-sensory communications center in which virtually the total environment is controlled to produce maximum impact.

- Two podiums for dual presentations, one can be an interpreter when necessary
- Quality sound and control
- Remote control for slide projections at each podium
- Multi-lighting for controlled atmosphere
- Overhead projection when needed
- 16mm motion pictures shown by themselves or in conjunction with slides
- Seating capacity for up to 70 people

The Conference Theatre is equipped with a forty foot panoramic screen, which allows three projected images at one time. The three images allow you to simplify complex information and achieve maximum interest, retention and recall.

This multi-sensory communications system is versatile, flexible and powerful. And more important, it is the most effective way for you to transfer information and to motivate your audience to act on that information.

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

CONTROL CENTER

The control room audio-visual specialist stands ready to control and operate your presentation remotely on "cue," allowing you, the presenter, the maximum in flexibility and total control.

Using the theatre staff plus skillfully prepared material, you will be able to make your presentation extremely effective in the eyes of your audience.

The control room is the nerve center of the Conference Theatre. One man can control lights, recorded sound, microphones, six 35mm slide projectors and one 16mm movie projector, either automatically or in unison with the speaker at the podium.

If you give the staff a little time, they will give you all the help you need. Graphic Services and Engineering Graphics (photo lab) can also help you plan and prepare your visuals.

INTERNATIONAL LOUNGE AND CONFERENCE ROOMS

Just outside the Conference Theatre is the large conference/ meeting area. . .The International Lounge. It is designed to accommodate a variety of different kinds of meetings. You just pick the kind of room setup that best meets your specific needs and the staff will do the rest.

Two other Conference rooms are available for smaller meetings and they are equipped for 35mm slides and overhead projection.

It is really up to you to explore the potential and use these facilities to your best advantage.

Although not as extensive as the Blue Bell Facilities, other locations – such as Roseville, Eagan and Salt Lake City – provide guest services for visits.

The way to schedule such visits is described in PM – 5.1.11 of the Policy Manual, from which the following is reproduced:

A. SCOPE

This policy applies to all Marketing and Services personnel requesting prospect or customer visits to Corporate Headquarters, Sperry Univac plant locations, or Sperry Univac user locations. It is required in order to permit Sperry Rand, Sperry Univac and User Management to better prepare for visits by prospects and customers.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

B. POLICY

It is the Policy of Marketing and Services that:

1. All requests for prospect/customer visitations to Sperry Rand or Sperry Univac facilities are made on form UD1-1842, Visitor Requests, by the Marketing Branch which services the prospect/customer.
2. Visitor Requests are prepared and mailed to arrive at the appropriate location not less than two weeks prior to the requested visitation date, as follows:
 - a. Corporate Headquarters and Blue Bell visits:

Sperry Univac, Worldwide Guest Services
P.O. Box 500
Blue Bell, Pennsylvania 19422
Telephone (215) 542-3034
 - b. Visits to Roseville or Salt Lake City:

Sperry Univac, Worldwide Guest Services
P.O. Box 3942
Roseville, Minnesota 55113
Telephone (612) 633-6170

or

Sperry Univac, C&T Guest Services Coordinator
M/S R1-1
322 North 22nd West
Salt Lake City, Utah 84116
Telephone (801) 328-8066, Ext.4408
 - c. In the event a prospect/customer visitation is requested to a location not listed above, the Visitor Request is sent to and coordinated by the Blue Bell Worldwide Guest Services.
3. No arrangements are made, nor confirmation given, for proposed prospect/customer visitations until a completed Visitor Request form is received by the appropriate location.
4. A request for the use of Sperry Rand Corporation facilities Corporate jet, or Corporate Management's participation must be approved by the Executive Vice President — Worldwide Marketing and Services.
5. A member of the Executive Vice President's immediate staff must be present at the time of a visit to the Corporate Office. A briefing paper must be available at the time the request is made for Corporate participation.

DOCUMENT NO	TITLE	PAGE REV	PAGE
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6. A request involving only the office of the Sperry Rand Guest Services Department Coordinator may be initiated by Worldwide Guest Services, Blue Bell. This applies to situations wherein a visit to Sperry Rand Headquarters Building is desired but the visit does not involve Corporate Offices or facilities.
7. Notification of intent to visit is also sent by the requesting location to their divisional management.
8. Visitor Request forms are ordered through Sperry Univac Forms Management, Blue Bell.

11.1.7 Customer Education

A big plus for users of Sperry Univac equipment is the education provided to them free of additional charge. This yields a big initial saving to the user for start-up training, as well as a continuing no-charge means of keeping personnel up-to-date on features and capabilities of new hardware and software. You should promote the benefits of Sperry Univac's education policies to both new prospects and your current customers.

Two publications concerning Customer Education can be of help to you in your 1100 Series Marketing efforts:

- Customer Education Course Catalog — UE 750

The Customer Education Course Catalog lists and describes all courses available to Sperry Univac customers. It includes standard course offerings conducted by the Sperry Univac field education organization and the UEC organization at Princeton. The curriculum outlined in this catalog relates to the use and operation of hardware and software. Some courses are specific to a product line while many relate to more general subjects.

This catalog is published twice a year and covers a six-month period. It is distributed to operations and branch offices, education centers, and support groups.

- Customer Course Schedule — UE 25

The Customer Course schedule is designed to be used with the Customer Education Course Catalog described above. While the catalog indicates courses which are actually scheduled, it lists titles, locations, start dates but does not describe the courses.

The schedule is published monthly and covers a three-month period. It is pocket-sized for handy reference by users — you can fit several of them into your briefcase. Your branch education coordinator will be happy to supply you with copies.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

Should a user wish to register for a course, fill out a Student Enrollment Form — UD1-432, and give it to your branch education coordinator or forward it to the organization holding the course. Courses are offered at the Univac Education Center outside Princeton, N.J. and many other locations, including the Operations. For your convenience, they are listed here:

Sperry Univac Education Center — UEC
P.O Box 1110
Princeton, N.J., USA 08540

OPERATIONS EDUCATION MANAGERS

Americas-Domestic Operations

- Eastern Operations

Mr. T. Smith
Sperry Univac
480 East Swedesford Road
Wayne, Pennsylvania 19087
Tie Line: X-115-228
Direct: (215) 293-0300

- Central Operations

Mr. S. Malis
Sperry Univac
5725 N. East River Road
Building 100
Chicago, Ill. 60631
Tie Line: X135-261
Direct: (312) 693-4600

- Southern Operations

Mr. Ralph D'Orio
Sperry Univac
6700 West Loop South
Suite 160
Bellaire, Texas 77401
Tie Line: X-118-71-200
Direct: (713) 661-2053

- Canada

Mr. Roger Dawson
55 City Centre Drive
Mississauga, Ontario Canada
Tie Line: X-146-377
Direct (416) 270-3030

- Federal Systems

Mr. Bob criddle
Sperry Univac Training Center
Tyson's Corner
McLean, Virginia 22101
Tie Line: X-131-294
Direct: (703) 893-0060

- National Accounts

Ms. M. Sankey
Sperry Univac
P. O. Box 500
Blue Bell, Pennsylvania 19422
Tie Line: X-4888
Direct: (215) 542-4011

- Western Operations

Mr. Paul Kelley
Sperry Univac
10880 Wilshire Blvd, S-900
Los Angeles, Calif. 90024
Tie Line: X-136-74-235
Direct: (213) 475-8661

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

Americas-International Operations

Mr. D. Malone
Sperry Univac
P.O. Box 500
Blue Bell, Pennsylvania, USA 19422
Direct: (215) 542-3701/02

CURRENT COURSE ANNOUNCEMENTS (Those Offered at UEC)

As the date approaches for a course to be given at UEC, the course description — as it appears in UE-570 — is sent to the managers in each branch office, as an advance notice of the date it is being held. Recipients know when, in the near future, the course is offered and are spared the necessity of referencing the description of it in UE-570.

If you wish to receive current course announcements for your personal notification and quick reference, contact Mr. Al Breller, Sperry Univac Education Center, P.O. Box 1110, Princeton, New Jersey 08540 or telephone either Blue Bell tie line 116+256, or 201-329-4071, Ext. 256.

11.1.8 Representative 1100 Users

Reference selling can be very helpful in any marketing effort, and the 1100 Series can be found in almost every industry. For a complete listing of 1100 users in a particular industry or by SIC, Code, contact your Operations MIS coordinator. You can also refer to 1100 Series Sales Memo 148 for detailed user profiles.

Note: Under no circumstances should the account be contacted directly.
All requests for references should be made through the responsible Sales Representatives.

11.2 SALES AIDS FOR EAAD

A comprehensive array of sales aids is available to help you market 1100 Series systems. Only English language material is referenced, but you should be able to easily identify the respective local language material in cases where translations exist.

PAGE	PAGE REV.	TITLE	DOCUMENT NO.
------	-----------	-------	--------------

11.2.1 Total 1100 Series

11.2.1.1 General Sales Aids

BMD-1100 (The Sperry Univac Benchmark Monitor Display System)	U-5830
"TIMS" — Total Information Management System	U-5500
The new registration system for automobiles and driving licenses in Sweden	U-5750
Motor Vehicle Registration and Licensing	U-5678
Texas Water Oriented Data Base	U-5723
Sperry Univac in the Service of Government	U-5815
Sperry Univac in the Service of Finance	U-5829
Computer Information Systems in Health Care	U-5851
Swedish Computer Service in Justice	U-5678
Seismic Processing	U-5746
Italian Court Brochure	U-5760
Total System Conversion — A Sperry Univac Success Story	
The EAAD Support Center	

11.2.1.2 Proposal Aids

8405 Fixed Head Disk	U-5736
8430 Disk Storage Subsystem	U-5648
8433 Disk Storage Subsystems	U-5737
UNISERVO 14 Magnetic Tape Subsystem	U-5838
Type 0861 UNISERVO 12 Magnetic Tape Unit	U-5141
Type 0862 UNISERVO 16 Magnetic Tape Unit	U-5142
UNISERVO 12/16 Control Unit	U-5143
UNISERVO 20 Magnetic Tape Unit	U-5320
UNISERVO 30 Series Magnetic Tape Subsystem	U-5968
General Communication Subsystem	U-5715
Communications/Symbiont Processor	U-5735
DCT 1000 Data Communications Terminal	U-5873
UNISCOPE 100 Display Terminal	U-5001
UNISCOPE 200 Display Terminal	U-5708
UTS 400 Universal Terminal System	U-5885
UTS 400 Text Editor	U-5893
UTS 700 Universal Terminal System	U-5897
0716 Card Reader Subsystem	U-5870
0776 Line Printers	U-5957
0770 High Speed Printers	U-5458

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

11.2.1.3 Application Software

1100-ICES (Integrated Civil Engineering System)	U-5830
ASET (Author System for Education and Training)	U-5687
RPS-1100 (Remote Processing System)	U-5664
"UNIS" Capabilities in Manufacturing	U-5447
"UNIS" Manufacturing Control for Profits	U-5448
"UNIS" Inventory Control for Profit	U-5480
"UNIS" Bill of Materials Control for Profit	U-5481

11.2.2 System Dependent Documentation

In addition to the documents which are generally applicable to the entire 1100 Series, system dependent material is provided.

11.2.2.1 Sales Aids for 1100/10

In addition to the generally applicable sales aids, the following documentation is provided:

Hardware System Description	UP-8337
System Sales Brochure	U-5836
1100 Series Slide Presentation	U-5857

11.2.2.2 Sales Aids for 1100/20

In addition to the generally applicable sales aids, the following documentation is provided:

Hardware System Description	UP-8215
System Sales Brochure	U-5731
1100/20-1100/40 Systems Presentations	U-5740
1100 Series Slide Presentations	U-5837

11.2.2.3 Sales Aids for 1100/40

In addition to the generally applicable sales aids, the following documentation is provided:

Hardware System Description	UP-8216
System Sales Brochure	U-5732
1100/20-1100/40 Systems Presentation	U-5740
1100 Series Slide Presentation	U-5837

DOCUMENT NO.	TITLE	PAGE REV.	PAGE
--------------	-------	-----------	------

1100 SERIES SIM GLOSSARY ITEMS

- ACP** Airline Control Program. IBM's simple, high throughput, transaction oriented, low overhead, very limited function operating system used with IBM airline reservations systems and with certain on-line, transaction oriented financial systems.
- IPARS** International Programmed Airline Reservation System. IBM's application software system providing airline reservations services for airlines having international route structures. Initial development done by BOAC (now part of British Airways).
- PARS** Programmed Airline Reservation System. IBM's application software system providing airline reservations services for airlines having domestic route structures. Initial development by IBM in concert with American Airlines.
- SABRE** Originally, the name of the airline reservations system implemented on IBM 7000 Series equipment by American Airlines. Now refers to the communication line discipline used by IBM airline systems — a high throughput, full duplex, synchronous, very limited function communications procedure.
- UAUA** Univac Airline Users Association. A users association representing all airline users of Sperry Univac data processing systems. Contact Airline Operations in Minneapolis for further information.
- USAS** Univac Standard Airline System. A comprehensive library of proprietary software application modules designed to satisfy the real-time processing requirements of commercial airline companies operating on 1100 Series systems.
- ARM** Availability, Reliability and Maintainability. The 1100 Series has a first order criterion to continue to enhance ARM features.
- AIET** Average Instruction Execution Time. The average time taken to execute a large number of program instructions. This average will vary from program to program depending on the particular "mix" of instructions executed. Sperry Univac uses defined standard "mixes" to help in comparisons.

