Shugart

Associates

Original

Business Plan

Preface by Otis Page

Ivo. Thanks again for digitizing the my control copy of the Shugart Business plan and publishing it on the Internet for the Shugart Alumni.

I thought it is appropriate to record a few background facts about my relationship with Al Shugart, our times at IBM and Memorex, the decision to form Shugart Associates, and the factors that led to Al being dismissed and my resignation therafter.

Al and I first met in 1959. He had recently been involved with the development of the 305 RAMAC (IBM's first disc based product). He learned of my sales efforts in selling the first 305 to the Bangor & Arrostock Railroad, and my subsequent success in establishing a national program for installing of a number of 305s in the Coast Guard's area office, its shipyard in Baltimore, and the HQ in Washington DC. Al visited me in Washington DC where I was IBM's Program Manager for the Navy and the Coast Guard.

Al's visit was to explore the market for the 1301 Disk Drive, a stand alone disc system using the same 36" discs used in the 305 but with ten times the storage. We hit it off, and we had an expansive discussion of the problem of implementing disc storage devices with IBM tape drive systems that were batch data processors.

In 1960 I became the Product manager for Magnetic Tapes and Punch cards in IBM's supplies division located in New York City. I was responsible for releasing the magnet tape specification to appease the US Justice Department so that Memorex and Ampex could enter the market. At that time the 1311 disc storage system with removable 1316 discpacks was being planned. The question arose whether the Supplies Division should control discpack sales. I went to San Jose and saw Al. We both agreed the product was best controlled out of the San Jose plant and not in a Supplies Division facility, that was not invested in the intimate technology of heads and media.

In 1962 I became responsible for the Marketing of Storage Products (Tape Drives and Disc Drives) attached to IBM Systems. This put me in direct contact with all the development programs in San Jose and tape drives located in Poughkeepsie, NY. This eventually led to the development of the 2321 Data Cell drive also developed by AL, then the 2314 and 3330 that became the key in making IBM's System 360/370 systems a huge success in the 1964-1970 time frame.

In 1969 Al and the Lab Director at the San Jose plant had an emerging conflict, and to satisfy the problem, they offered Al a position back East in Harrison, NY. Al refused, resigned from IBM and joined Memorex. I thought then, and as now confirmed today, that was a very bad decision by IBM. Al was a star!

During this the period, 1965-68, I had a number of different assignments, including the management of IBM's special bidding to confront competition. This put me in a position where I worked with IBM attorneys on anti-trust issues. I then became the manager of

product planning for storage products (tape drives and disc products) in San Jose. I arrived as Al was departing.

The IBM San Jose environment turned out to be hostile. They could not believe competition could emerge in the disc drive technology arena. Al at Memorex was soon to dispel this illusion! IBM's management wished to protect it investment in the 2314 product base with its obsolete actuators where competition seized on the development of voice coil technology. I became very unpopular saying competition was real, well financed and competent. This led to me leaving IBM in 1971. And Al welcomed me at Memorex with open arms!

It didn't take too long for me to understand that Memorex was in deep financial trouble. I was instrumental in developing the marketing plan in 1972 at Memorex (the Data Base Plan) that "saved the day" in confronting IBM's predations with its 2319 tactic. But I suggested to Al we had better look to another opportunity – forming our own company. Al agreed, and we then started planning on what to do.

We had two alternatives: I could have secured a multi-million dollar contract from the Atomic Energy Commission for a huge hierarchical storage system or we could establish a plan now recorded in the Business Plan of low cost storage (floppy), a line printer and a low cost system.

Al and I attended a number of workshops of establishing a business – but we came to one conclusion – and that was we must really believed in what we planned to do. Al and I decided on the team (Massaro, Connor, Chou, Wartner, Thompson, Pyle, Scott), the apportionment of stock, and we all resigned from Memorex in 1973 and found a small office, and with the team prepared the business plan.

I contacted Stu Greenfield in New York, who at that time was with Donaldson, Lufkin and Janrette, and told him of our intentions. He was interested. He and his partner, Ed Glassmeyer, helped drive home the deal for a $500K initial investment, a lot of money in those days, when the venture capital business was really in its infancy. We were on our way.

But we stumbled one year later. We ran out of money. Al could not close a deal with the banks for working capital financing. Like today, the business climate was bad. And the first design of the floppy disc drive crumpled the center of the discs!

Warren Dalziel saved the day here, with an ingenious design: an eight fingered "arachnid" shown in Dalziel's Design Patent 246,177. This design solved the problem. Shugart as a business would surely have failed if Warren hadn't "saved the day"!

Don Massaro and I believed the company had to cut back and be floppy based only if we were to secure additional financing. Al strongly disagreed, in that he felt the investors should stand by their original commitment. But Stu Greenfield advised me that we either cut back or the business would not be financed further. This was a hard time. Al had to go.

Some investors felt that without Al the business would not survive. I supported Don as being competent to be the next CEO – that the company's success was based on the product and not on the reputation of one individual. This became the decision by the Board.

It was my impression at the time that the investors thought I should leave also. And I did resign and joined Calcomp to assist them in their anti-trust suit against IBM. I later secured consulting contracts for Al that helped keep him alive, before he and Finis Connor did their thing in forming Seagate.

I am delighted today that all (founders, employees, and investors) that were part of the deal benefited financially, and that it became a spring board for other successful ventures.

Al and I were very good friends. And he is certainly one of the most interesting personalities I have come to know.

To all in the Shugart Alumni who are responsible for the company's eventual success, I thank you.

TABLE OF CONTENTS

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SHUGART ASSOCIATES

$3,350,000

Consisting of $3,100,000 Common Stock and
$250,000 Convertible Subordinated Debentures.

The undersigned assisted in the placement of these securities.

Donaldson, Lufkin & Jenrette
SECURITIES CORPORATION

Hambrecht & Quist

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9-9-74

PREFACE

Shugart Associates was incorporated in the State of California on February 2, 1973. Nine employees of Memorex Corporation agreed to provide initial capitalization and become employees of the new company. Resignations from Memorex occurred during late January through early February with Shugart Associates efforts starting in founders' homes as terminations from prior employment became effective.

Robert Wenzel of the San Jose firm of Adams, Ball, Wenzel and Terry was engaged as legal counsel, and a banking relationship was established with the El Camino-Kiely Branch of the Bank of America. 1480 square feet of temporary office space in Sunnyvale was rented on a month to month basis. Necessary furnishings were obtained by renting and from personal donations, and formal operations were moved from the founders' homes in mid February, 1973.

The Controller and chief financial officer of Aertech Industries joined Shugart Associates in early March, bringing the founders of the company to a total of ten.

Alan F. Shugart is President/Treasurer, and Otis S. Page Jr. is Vice President/Secretary. The Board of Directors includes the two officers and Finis F. Conner, Donald J. Massaro, Donald L. Wartner, Herbert E. Thompson, and David B. Scott, all founders of the company.

The following pages outline the rationale and strategy for success of this new corporation.

INTRODUCTION TO THE BUSINESS PLAN

Track Record

The founders of Shugart Associates have a record of accomplishment extending over the past decade. Substantial contributions were made at IBM in establishing that company's technical and marketing strategy which has helped IBM to its predominant position in direct access products. The Shugart team developed products which enabled Memorex Corporation to establish an asset base of installed direct access products exceeding 100 million dollars in a period of less than four years.

It is with the above heritage that the Shugart team views a new venture opportunity: to seize the advantage in a product area of truly outstanding potential in the world wide data processing markets of the 1970's.

Business Thrust

Shugart Associates will develop, manufacture, and market a number of products to suppliers of data processing systems and subsystems in the data processing industry. These products will be sold separately or in combination as systems and subsystems.

Product Thrust

The initial product thrust will be product and product configurations of the flexible disk drive technology. These products will utilize removable low cost media which is compatible with the IBM Diskette. Non compatible versions will be available for customers who do not require compatibility.

The initial product thrust will be followed by a new low cost printer technology which will yield a product which will operate in the 150 to 300 line per minute range of performance. The printer will be simplistic in design and operation. Because of this fact, this design will achieve both manufacturing and service costs that will be the lowest in the industry.

The flexible disk and printer technologies will be combined with an advanced microprocessor which will provide a unique approach directed at the functional application areas of key entry, batch communication terminals, word processing, and small business systems. The architecture of the microprocessor is modular and may be extended by the addition of features and microprograms to cover a wide range of functional applications exploiting the advantages of the flexible disk storage drive and the low cost 150 to 300 line per minute printer.

Financial Implications

Implementation of this business plan will require nearly $5 million of capital, and will produce nearly $10 million in net profit through 1977. Revenues and earnings during 1975 should provide the base for a public offering, and net profit in 1976 is projected to be over $4.5 million from revenues of approximately $23 million.

PRODUCT STRATEGY

Introduction

The Shugart Associates product strategy is based on the establishment of three fundamental technologies:

Flexible Disk
Medium Speed Line Printer
Low Cost Microprocessor

The product strategy provides a phased plan utilizing the above technologies directed at two specific OEM market areas and the combination of both technologies with microprogramming in a small systems environment as the basis for exploiting a third large market opportunity. The plan starts with the introduction of the flexible disk technology followed by the 150-300 line per minute (LPM) printer technology leading to the incorporation of both product areas into the Multi Application System (MAS).

The following description of the Shugart Associates product strategy is organized into four parts for each product area:

Introduction
Market Environment
Product Description
Forecast

NATIONAL

23-580

Made in U.S.A.

NATIONAL INSERTABLE-TAB INDEXES ENABLE YOU TO MAKE YOUR OWN SUBJECT ARRANGEMENT, USING PLAIN INSERTS ON WHICH TO WRITE YOUR OWN CAPTIONS.

DISKETTE

DISKETTE STORAGE DRIVE

Introduction

The primary business strategy of Shugart Associates will be to provide important OEM products to suppliers of end-user data processing systems and subsystems. A secondary thrust will be directed at other industries which have product requirements that can be satisfied by derivatives from the basic product line. The launch technology will be in the area of small, low cost direct access devices. These products will have application in a diverse set of end-user products extending from data entry, terminal communications, and minicomputers in the data processing markets to government intelligence and the potentially explosive word processing markets. The products will meet or exceed the well defined requirements of a substantial number of data processing equipment manufacturers and will be catalytic in stimulating new application frontiers and market opportunities in implementing new and innovative techniques for data capture, storage, and processing.

The specific product implementation will be in the form of new products utilizing the recently announced IBM "Diskette." These products will include a compatible media and a number of products and product configurations which will process what has been referred to, prior to the IBM announcement, as the "flexible disk."

To better understand the extraordinary significance of IBM's 3740 Systems announcement, a short review of the evolution of data media will be meaningful. The primary vehicle for data entry, storage, and processing during the past fifty years has been the 80 column punch card. The exhaustive exploitation of this technology represents the basis for IBM's dramatic growth and launch into the computer field where, by its leadership, it introduced a new storage media, one-half inch magnetic tape.

IBM's dominant world wide market position and omnievident financial strength have placed it in a position of being determinative in establishing defacto standards in various product areas. This position has resulted in the 80 column punch card and one-half inch magnetic tape being adopted as world-wide defacto standards without meaningful discriminatory inhibition by any government or standards agency - a remarkable and enviable exemplification of IBM's leadership strength.

Because of its leadership position, IBM may change a standard when it is to its economic advantage to do so. It is the divine coincidence where IBM redefines its economic goals and decides to move the state of the art that has repeatedly in the past inspired significant market growth, not only for itself, but for the industry at large.

It is the awesome fact that IBM has established a new data media which suggests that a truly extraordinary event has taken place as a result of its announcement of the 3740 System and its new "Diskette" flexible disk media.

Why has IBM selected a new media which promises a substantial impact on the punch cards, and, to a lesser extent, impact on the low cost extensions of one-half inch magnetic tape?

Many have speculated on what Dr. Herman Hollerith's reaction would be if he were here today and could see what has evolved from his endeavors to "mechanize" the processing of census data. The timing would be particularly appropriate since he and others could now review the proliferation of functionally competitive means to replace the 80 column punch card and/or to complement its function as a data media.

Further, the timing would be especially significant in view of the recent IBM announcement which seriously appears to be IBM's move to initiate "the beginning of the end" of a dominant technology, the punch card.

Dr. Hollerith would undoubtedly applaud the evident successor technology to the punch card - the flexible disk. He might observe with some cynicism how such a simple answer could have been delayed so long in providing a better answer to data capture and processing. He would probably agree, nevertheless, that it is important that a new media be established and that it is the responsibility of the industry leader to establish the direction. After all, one flexible disk can contain the equivalent of three thousand punched cards or one hundred typewritten pages, and a number of disks can be conveniently carried in a brief case.

If Dr. Hollerith were to make this observation it would be irresponsible not to enhance his perspective as to the real facts which have framed the evolution and announcement of this new media.

The evolution of the flexible disk has not been strategically constrained; its emergence is the result of a dramatic confrontation of many factors and points of view in the quest of determining a new low cost technology with functional virtues surpassing existing and contemplated methods for data storage. The evolution of the flexible disk represents a cumulative empirical experience which has brought to bear the best thinking and knowledge in magnetic recording technology measured in terms of function, cost, and reliability for a low cost media handler. The team representing Shuguart Associates has been prominent in this quest and evolutionary development.

The genesis of the flexible disk program occurred in a nonfunded back room project at the San Jose IBM lab in 1967. The fundamental requirement to be addressed at that time was to build a low cost, very reliable device which would be utilized as a microprogram loader for the IBM System/370 series. The microprograms envisioned would be both microinstructions and diagnostic routines used in the maintenance of the system. Above all, the device had to be extremely reliable because of the necessity to quickly reload volatile memories when a power interruption occurred. The total system was dependent for its restart after failure on this function.

A secondary consideration was cost because, at this time, the thought of extending the flexible disk program universally to other data applications was merely a speculative dream.

The flexible disk was implemented as a read only device on the Model 155 and 165 IBM systems and the control units for the 3330 and 2305 direct access storage drives and announced in June, 1970.

Coincident with these developments, IBM was proceeding with a significant study to resolve how to approach the Data Entry market with its large and vulnerable investment in key punches and verifiers. Incentive to define a new strategy was inspired by the entry and apparent market success of a number of new companies such as Computer Machinery, Mohawk Data Systems, Inforex, and Four Phase Systems - to name a few.

The challenge was to devise a strategy for nonclustered data entry environments which necessitated the answer to a fundamental technical question: what media was to be used? Cards, magnetic tape, magnetic tape cassettes and cartridges, small hard disk files and magnetic strips and cards were all candidates. The selection had to be right!

Although there were many competitive functional alternatives available to answer the requirement, the battle line was soon drawn between the proposed digital cassette and the flexible disk. The parameters of the confrontation were a source of debate among the proponents of each side and permeated the executive levels concerned with the decision. Initially, the proponents of the digital cassette achieved a distinct advantage because of eloquent and well founded arguments that the digital cassette would achieve low costs. The cassette proponents had the emotion of the times on their side: there was much discussion in the industry on the promise of cassettes. And if a cassette standard was to be established, it was very much in IBM's best interest that the standard be IBM's. The antagonists to this position - the advocates of the flexible disk - recommended a more rational approach to a decision, i.e., an auditable specification regarding function, cost and reliability. This resulted in time in a refinement of the debate by compromising emotion with objective data. The end of the confrontation was in sight!

The resulting analysis created a clear cut, irrevocable and decisive victory for the flexible disk, destined to be blessed with a feminine image as IBM's new "Diskette;" 1) digital cassettes would never achieve the reliability of the flexible disk, 2) the flexible disk could be manufactured at costs which would be competitive, if not equal, to digital cassettes, and 3) the random accessibility of data on the flexible disk gave it important advantages in many applications which improved both the operational performance and reliability.

So the decision was made - a new media would be introduced by IBM. A new defacto standard was to be established for the world. And the new media promised to present new approaches to data entry,

media handling, data processing, and word processing in the explosive potential markets of the 1970's.

The founders of Shugart Associates have viewed the evolution of the flexible disk since its inception. The project was initiated by Mr. Shugart at IBM. The nucleus of the team of Shugart Associates has gone through four complete design and release cycles of the flexible disk media and drive; two at IBM and two at Memorex. This team is now designing the fifth version which will be the lowest cost and most reliable product in a market which has a world wide potential of millions.

Market Environment

The introduction of the minicomputer in the 1960's created a need for low cost magnetic media storage. This requirement led to the introduction of low cost reel to reel tape devices. By 1967 the price for these devices reached a level of $3,000 per unit. Despite this improvement, the key to cassette systems, point of sale application requirements, and remote data terminals, created a requirement for a much lower cost magnetic storage device. This requirement has produced a proliferation of digital cassette and cartridge drive manufacturers to supply this large and growing market.

The cassette drives are based on the Philips Cassette, which was designed originally for audio applications. These manufacturers have taken the basic Philips Cassette and devised different ways of moving and recording data on the tape media within the cassette. The cartridge devices are functionally equivalent to the cassettes but do not use the Philips standard cassette. The reason for deviation from this standard is to improve reliability over a device designed primarily for audio applications (Philips cassette designed for 1 7/8" IPS) and provide more advanced tape movement techniques. These improvements allow greater data storage, higher data rates and lower access times required for many data applications.

Functional Characteristics

The following chart represents a cross section of cassette and cartridge drive functional characteristics:

	CASSETTE	CARTRIDGE
Capacity/Bits	5 million	20 million
Recording Density/Bits per inch	800/1600 BPI	1600 BPI
Data Transfer Rate K bits/sec	12-30	30-60
Error Rate - Bits Read	1x10/6-1x10/7	1x10/7
Average Access (M Sec.)	25,000	20,000

Prices for cassette drives with intimate electronics range from $300-$500 in quantity. Cartridge drives from $400-$600 in quantity with intimate electronics.

Standards

At this time there are no industry standards for digital cassette/cartridge drives or media. The closest thing to being a standard is the Philips Cassette, but not the method of recording data on the cassette. The cartridge issue is even more confusing. The method of recording and the media itself are not standard among manufacturers. In the absence of any enforceable standard by ANSI or ECMA, the confusion continues. The only hope for standardization would be for IBM to set a defacto standard. IBM did propose a one-quarter inch tape standard to the American National Standards Institute (ANSI) which caused a great stir among cassette/cartridge manufacturers. With the recent announcement of the IBM 3740 and the Diskette media, IBM has set a defacto stan-

dard for digital data storage in the market served by digital cassette/ cartridge drives.

Market Applications

The major market applications for digital cassette/cartridge drives are as follow:

1) Key Entry - The conversion of data into machine readable format has been dominated by the IBM keypunch. Mohawk Systems introduced a key to tape system in 1966. Since then there have been many entries in the key entry market: key to tape, key to disk, and key to cassette. In 1969, IBM introduced the IBM Type 50 which was a key to cassette data recorder. This led to the introduction of key to cassette devices by other manufacturers. Data is keyed by the operator and the record recorded on digital cassettes. These cassettes are taken to a converter to be transferred to a 7 or 9 track tape or sent, via communications link, to be pooled on to tape.

2) Point of Sale-Recording System - Corporations such as TRW, Friden, and NCR have introduced point of sale data stations for use in department stores, supermarkets, and discount houses. Many of these devices use digital cassettes to record the transactions as they are entered by the clerk. This data is subsequently converted to disk or tape for further processing.

3) Remote Data Terminals - Hard copy and display terminals use digital cassette storage at the terminal. This terminal may be a simple keyboard to printer with cassette batch storage on an intelligent source recording terminal with a wide range of input/output devices. Data is entered by the operator and displayed. In an intelligent device, the data is edited upon completion of a transaction. The records can be retrieved and updated or transmitted to the central computer. A digital cassette, when used with an incremental drive (character) is used in a wide range of terminals to emulate paper tape.

4) Word Processing - Word processing is a term used to describe equipment and processing used to handle words or text. This equipment is used to increase the productivity of typists during the generation and subsequent reproduction of documents. These products store the keyed data, allow operator editing, copying, and insertion of additional text. IBM has dominated the word processing market with the magnetic tape selectric typewriter and the magnetic card selectric. Other manufacturers have been penetrating this market using digital cassettes as the storage media.

Flexible Disk Competitive Analysis

1) Memorex - The Memorex 651 was announced in December, 1972 as an enhanced version to the 650. The 651 has the highest performance features that are currently being offered. Memorex has shipped to approximately 45 customers for a total of 60-70 units. These units are all 650's which Memorex has agreed to convert to 651's at no charge. The marketing strategy is to have the best cost/performance

product and ship at least 200 units for evaluation. The Memorex limitations are that they have one salesman to cover the entire U.S., very little advertising, lack of corporate commitment, and noncompatibility with IBM 3740 unit. Prices $750-$550.

2) Century Data - The CDS 110 is a product which has been on the market place for about six months and is considered to be the biggest competitor of the Memorex 651. The CDS 110 has approximately 60% of the capacity and 13% the data transfer rate of the Memorex unit at the same price. As of February 1973, Century had delivered approximately 15 units for evaluation and is rumored to have significant technical problems. Century is committed to their Flexible Disk program. They have seven salesmen in the U.S. with sufficient technical support and a $75K advertising budget. Century is quoted as saying the market is between 200-400K units in the next five years. Century's unit spins its media (3M, BASF) at 90 rpm and they have plans to upgrade to a higher speed in the near future. Production units will be available third quarter '73. Prices $750-$450 based on quantity.

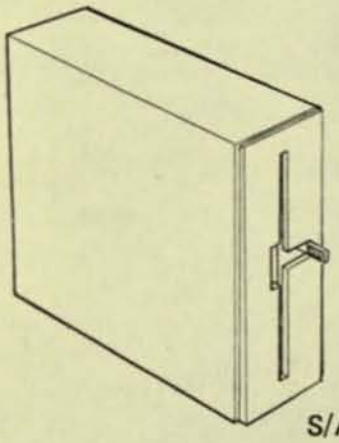
3) Potter Instruments - The Potter unit is a low performance unit which has capacity of 25% of the Memorex unit. It is a copy of the old IBM unit used as an IPL device. Potter had delivered approximately 12 to 15 units as of February 1973 and have experienced media wear problems. Pricing is similar to Memorex and CDS. Potter has been quoting delivery of 90 days plus. They have incorporated their "Flexible Disc" in a terminal. Their marketing effort appears to be minimal at this time.

4) Iomec - The Iomec MOD 20 Floppy Disc is a much higher priced unit than Memorex, CDS and Potter. Because of its performance and price the Iomec unit does not present a competitive threat to the other three. It is also not physically compatible with the IBM Diskette.

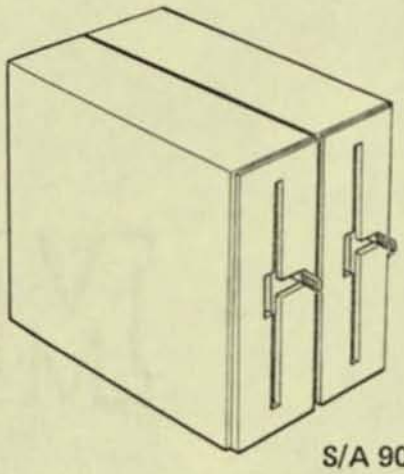
It is to be expected that within six months to a year there will be at least six other companies in the Flexible Disk market. A significant factor for success is to get to the market place with an IBM compatible unit as soon as possible. Shugart Associates has the technical expertise to accomplish this goal; prototype units will be available June 1, 1973. Production will start October 1, 1973.

ROUGH COMPARISON OF VARIOUS FLOPPY DISC FILES

	Memorex 651	CDS 110	Potter DD 480	SA900
Capacity (M/Bits)	2.5	1.4	.6	3.1
Data Transfer Rate (K/Bits Sec)	250	33.8	33.3	248
Access Time (Track/Track)	20	40	80	16
Tracks	64	64	32	77
Sectors	32	8	8	Variable
Tracks/Inch	48	64	32	48
Rotation Speed (RPM)	375	90	90	360
Bit Density (Bits/Inch)	3100	1765	1600	3200
Cost/Drive (Quantity)	750	750	735	750
Cost/Media (Quantity)	6.50	7.00	5.00	6.00
Cost K/Bits Stored (Drives Only)	.30	.54	1.15	.24



S/A 900



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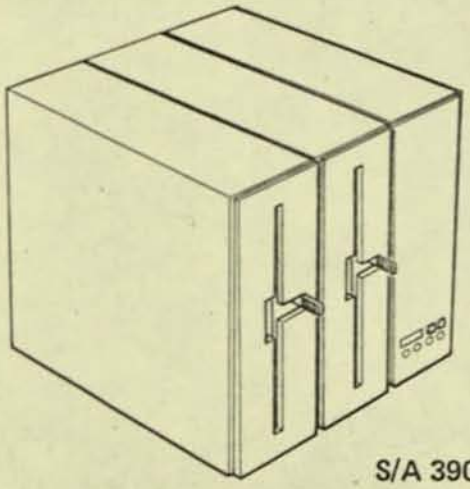


S/A 3900 Facility

Product Description

There will be four basic products in the initial product plan:

Single Diskette Storage Drive
Double Diskette Storage Drive
Control and Power Module
Power Module

The four basic products will provide twelve product extensions and four Diskette drive facility modules with thirty-two announced configurations:

1) By providing separate modules which will allow the packaging of the four basic products in any combination.
2) By providing IBM compatible and non-IBM compatible Diskette Storage Drives.
3) By addition of automatic stackers which will allow the loading and unloading of a number of Diskettes in a Diskette Data Module (DDM).

The basic products and product configurations will be announced as follows:

TYPE NUMBER	PRODUCT DESCRIPTION
SA 900	Single Diskette Storage Drive - IBM Compatible
SA 902	Double Diskette Storage Drive - IBM Compatible
SA 901	Single Universal Diskette Storage Drive
SA 903	Double Universal Diskette Storage Drive
SA 910	Control Module with Power
SA 912	Power Module
SA 960	2 Unit Facility Module
SA 961	3 Unit Facility Module
SA 962	4 Unit Facility Module
SA 963	6 Unit Facility Module
SA 940	Single Station DDM Drive - IBM Compatible
SA 942	Dual Station DDM Drive - IBM Compatible
SA 944	Double Station DDM Drive - IBM Compatible
SA 941	Single Station DDM Drive - Universal
SA 943	Dual Station DDM Drive - Universal
SA 945	Double Station DDM Drive - Universal

The 940 Series of read/write stations will utilize a unique loading and storage device called the Diskette Data Module (DDM). The DDM will hold up to 40 Diskettes. The Diskettes may be sequentially or randomly selected from the DDM on any one of six DDM drives. The DDM holds ap-

proximately ten million bytes of data.

The SA 940 and SA 941 will have one Diskette Storage Drive combined with a stacker select station which will hold one DDM. The SA 942 and SA 943 utilize a dual drive which allows a non overlapped reading and writing of two Diskettes selected from the DDM. The SA 944 and SA 945 have two Diskette Storage Drives which allows simultaneous reading and writing of data from two diskettes.

Forecast Assumptions - Flexible Disk Drive

The following assumptions were used to develop the market forecast for Flexible Disk Drive.

Overall Assumptions:

1) Unit shipments by year in Figure 1 were taken from various studies and industry experience with the exception of the word processing market segment.

2) The word processing market was derived by using the current market dollar volumes (800,000,000) and dividing by the average Unit Price of $4,000 per Unit. This market will grow at an annual rate of 25% from 1973 to 1977.

Market Segment Assumptions:

1) Key Entry

   a. The total key entry potential will be penetrated by non-IBM vendors at the following rate:

73	74	75	76	77
20	22	25	27	30

   b. The use of flexible disk drive will occur at the following rate:

73	74	75	76	77
10	20	35	55	75

2) Source Data Entry

   a. Non-IBM penetration of this market was assumed to be 50% from 1973 to 1977.

   b. Flexible disk drive use will occur at the following rate:

73	74	75	76	77
10	20	35	45	60

   c. The use of flexible disk drives was assumed to be 1.5 times the number of units.

3) Terminals

a. This market contains the following subsegments:

Small and large batch terminals
Interactive terminals
Special function terminals

b. Non-IBM penetration is assumed to be 60% from 1973 - 1977.

c. Flexible disk drive usage will occur at the following rate:

73	74	75	76	77
5	10	25	30	35

d. 1.0 drives per unit is assumed.

4) Minicomputers

a. Initial Program Load Device

Flexible disk drive usage as an IPL Device in minicomputers is as follows:

73	74	75	76	77
10	20	30	40	50

b. Diskette Storage Facility

Flexible disk drive usage on minicomputers by year:

73	74	75	76	77
5	10	20	20	20

Average number of drives per facility is three.
Average number of controllers per system is 1.1

5) Word Processing

a. Non-IBM penetration of the word processing market is assumed to be 30% from 1973 - 1977.

b. Flexible disk drive usage is assumed at the following rate:

73	74	75	76	77
5	15	30	40	50

DOMESTIC SHIPMENTS (000 UNITS)

	1973	1974	1975	1976	1977
DATA ENTRY					
KEY ENTRY	68	79	70	60	56
SOURCE DATA ENTRY	39	65	65	84	103
SUBTOTAL	107	133	135	144	159
TERMINALS					
BATCH	34	45	61	84	108
INTERACTIVE	56	65	77	80	84
SPECIAL FUNCTION	61	84	101	127	158
SUBTOTAL	151	194	239	291	350
MINICOMPUTERS	19	22	26	29	32
WORD PROCESSING	50	63	78	98	122
T O T A L	327	412	478	562	633

FIGURE 1

FLEXIBLE DISK DRIVE
MARKET POTENTIAL - (000)

	1973	1974	1975	1976	1977
DATA ENTRY					
KEY ENTRY	1.4	3.5	6.1	8.9	12.6
SOURCE DATA ENTRY	3.0	8.1	17.1	28.4	46.4
TERMINALS	4.5	11.6	35.9	52.4	73.5
MINICOMPUTER					
INITIAL PROGRAM LOAD	1.9	4.4	7.8	11.6	16.0
DATA STORE	3.1	7.3	17.2	19.1	21.1
WORD PROCESSING	.8	2.8	7.0	11.8	18.3
T O T A L	14.7	37.7	91.1	132.2	187.9
CONTROLLERS	1.0	2.4	5.7	6.4	7.0

SHUGART ASSOCIATES FORECAST (UNITS)

YEAR	1973	1974	1975	1976	1977
DISK DRIVE SHIPMENTS	75	6900	9000	9000	9000
STORAGE FACILITY CONTROLLERS		432	570	570	570
DISKETTE STACKER READER		100	400	400	400

Forecast Assumptions - Flexible Disk Media

The forecast for media are determined by using a 10:1 ratio for shipments occurring during the forecast year. A ratio of 20:1 is used for the units shipped in all previous years.

FORECAST

(Units x 000)

73	74	75	76	77	TOTAL
2.8	72.5	229.5	409.5	589.5	1,303.8

PRINTER

al, al's secretary & Otis
looking @ Printer
Printer developed by AL c hoc(?)
Don Mazzaro (Design engineer)
in background

PRINTER

Introduction

The second product thrust of Shugart Associates will be the development, manufacture, and marketing of a medium speed line printer which will operate at 150 and 300 lines per minute. This printer will be designated as the SA 300 and SA 302. The SA 300 is a fully buffered printer with intimate supporting electronics. The SA 302 will be a configuration of the printing unit without electronics.

The printer product strategy is to establish a plan to exploit a basic proprietary technology which will provide a reliable and functionally simplistic design with many of the features found only in large, high speed printers. The technology will yield a product base that will have the lowest manufacturing cost of any medium speed line printer currently available. These costs will provide a basis for a pricing policy which will be 25% to 30% below that of competitive products possessing equivalent functions that are marketed today. Further, the SA 300 and SA 302 will possess reliability characteristics and operational features which will provide Shugart Associates' customers, the suppliers of data processing systems and subsystems, important price savings and service cost economies compared to printer products available in today's market. The print quality of the SA 300 and SA 302 will be superior to any printer of comparable cost and performance.

Market Environment

With the advent of the computer it became apparent that higher speed printers were required. As with all products in the data processing field, the independent criteria of performance, reliability, and cost became paramount in determining a printer's success. However, another factor was added which pertained exclusively to printers: print quality. But the sad tale of the computer era was that many high speed printers were introduced which became marginal performers, inherently unreliable, and, consequently, predictably costly and unprofitable. This explains, in part, the original thrust designed at high performance, high cost printers. To obtain good print quality and reliable operation at high speeds required a lot of iron designed to run fast - from 600 LPM up. The notable success, the IBM 1403, was an optimum design whose technical base has allowed significant derivatives - but all directed at higher performance products! Obviously, it was uneconomical to extend the technology downward since lower printing speeds would have to be accommodated by lower prices.

Performance, reliability, and cost - a set of sober criteria that has precluded significant new entries in the low performance range of line printers. Nevertheless, the problem of providing this function again seizes a unique and outstanding opportunity. The problem demands an answer which allows a realistic product implementation which optimizes the best standards of this criteria and, at the same instance, provides 1403 equivalent print quality.

The product answer must be based on a technology that not only provides a significant low cost, but also provides inherent reliability which will yield further cost reductions in servicing with the coincident improvements in customer satisfaction.

These difficult challenges will be met and surpassed by the SA 300 and SA 302 Line Printers.

Low to Medium Speed Printer Competitive Analysis

1) Iomec-Digitronics - Model No. 202 has a 250 LPM print speed with good print quality, five copy capability, clutch and brake feed; reliability is poor. The printing method utilizes a full complement of magnetic hammers with a mechanical restore and a unique metallic print belt. The 202 has an attractive and compact design providing ease of operator use as exemplified by its easy forms loading characteristic. Nevertheless, it is doubtful that a low cost will be achieved without a significant reduction of the complexity of the basic design. The present design requires 132 print hammers which is functionally equivalent to high cost, high speed printers. Although three years in existence, this product may have continued technical problems which occasioned its withdrawal from customers in 1971.

2) CDC - Model No. 9320 has a 200/300 LPM print speed with good print quality, five copy capability, magnetic clutch and brake form feed, and fair reliability. The printing method for the CDC 9320 is a derivative of the 900 LPM Printer with one-third the number of hammers and drum characters. Full line printing is accomplished by shuttling the paper form in the three horizontal print positions. The lower product costs of the CDC 9320 were achieved by a reduction of the print hammers and hammer drivers. To offset this reduction in function, additional mechanisms were required to shuttle the paper forms in a horizontal direction. A net reduction in cost was achieved, but with a sacrifice in reliability and serviceability because of the additional mechanical complexity imposed by the hammer/hammer driver and shuttle mechanism trade off. Since the 9320 is derived from the 900 LPM Printer, its design reflects a heritage of a higher cost design.

3) Data Products - Model No. 2230 has a 300 LPM print speed with good print quality, five copy capability, printed circuit motor form feed, and good reliability. The printing method for the 2230 is derived from the high speed 2470 drum printer which operates at 1200 LPM. The 2230 has one half the number of hammers and a hammer shifting mechanism. Data Products possesses a basic technology with their unique voice coil hammer, which has yielded a superior product. Nevertheless, it is questionable whether a substantially lower manufacturing cost can be derived by a two to one reduction in hammers and hammer drivers and by adding a hammer unit shifting device. All of the basic printer components of the 2230, such as the print drum, drum gate and forms feed, are derived from the 2470 which was designed for high performance and not low cost.

4) Data Printer - The Model 236/306 has a 200/300 LPM print speed with poor print quality, five copy capability, clutch and brake forms feed, and fair reliability. The printing method employs print hammers which are basically IBM 1403 Model 3 type. The hammer drivers are multiplexed for 2 or 3 drum revolutions per print line. The 236/306 Printers utilize a drum technology. The basic unit has a full complement of print hammers. Although economics are derived by multiplexing of hammer drivers, it is doubtful that true low cost can be attained by this technique. The excessive wavy print lines are attributed to the single tractor design.

5) Centronics - Model No. 102A has a 125 LPM print speed with poor print quality, four copy capability, mechanical forms feed and fair reliability. The printing method is a 7x9 dot matrix formed by 2 print heads spaced 66 characters apart. Matrix printers have inherently poor print quality and excessively high print head wear problems when used in a line printer environment. This technology is best applied in low speed applications where letter quality printing is not required. Low cost is achieved by not having a type unit with its multiple of hammers and hammer drivers. This cost trade off is offset by the need to increment the print head across the page with a commensurate increase in reliability and serviceability problems with high line speeds.

6) Odec - the Model 1323 has a 250 LPM print speed with poor print quality, five copy capability, a stepping motor forms feed, and reliability which is rumored to be poor. The printing method is a print belt with operator replaceable character slugs. The product has consistently exhibited poor print quality in trade shows, and sales have been poor over the three years this product has been in production.

7) Tally - The Model 2000 has a 200 LPM print speed, poor print quality, five copy capability, and a stepping motor forms feed. The printing method utilizes a 7x5 dot matrix formed by a vibrating reed in each print position. The Tally 2000 printing is accomplished by scanning each character in the horizontal and vertical position for the 35 dot positions. This method is accomplished by moving the hammer unit and paper form sequentially. The 2000 is believed to be inherently unreliable as the result of its evident complexity.

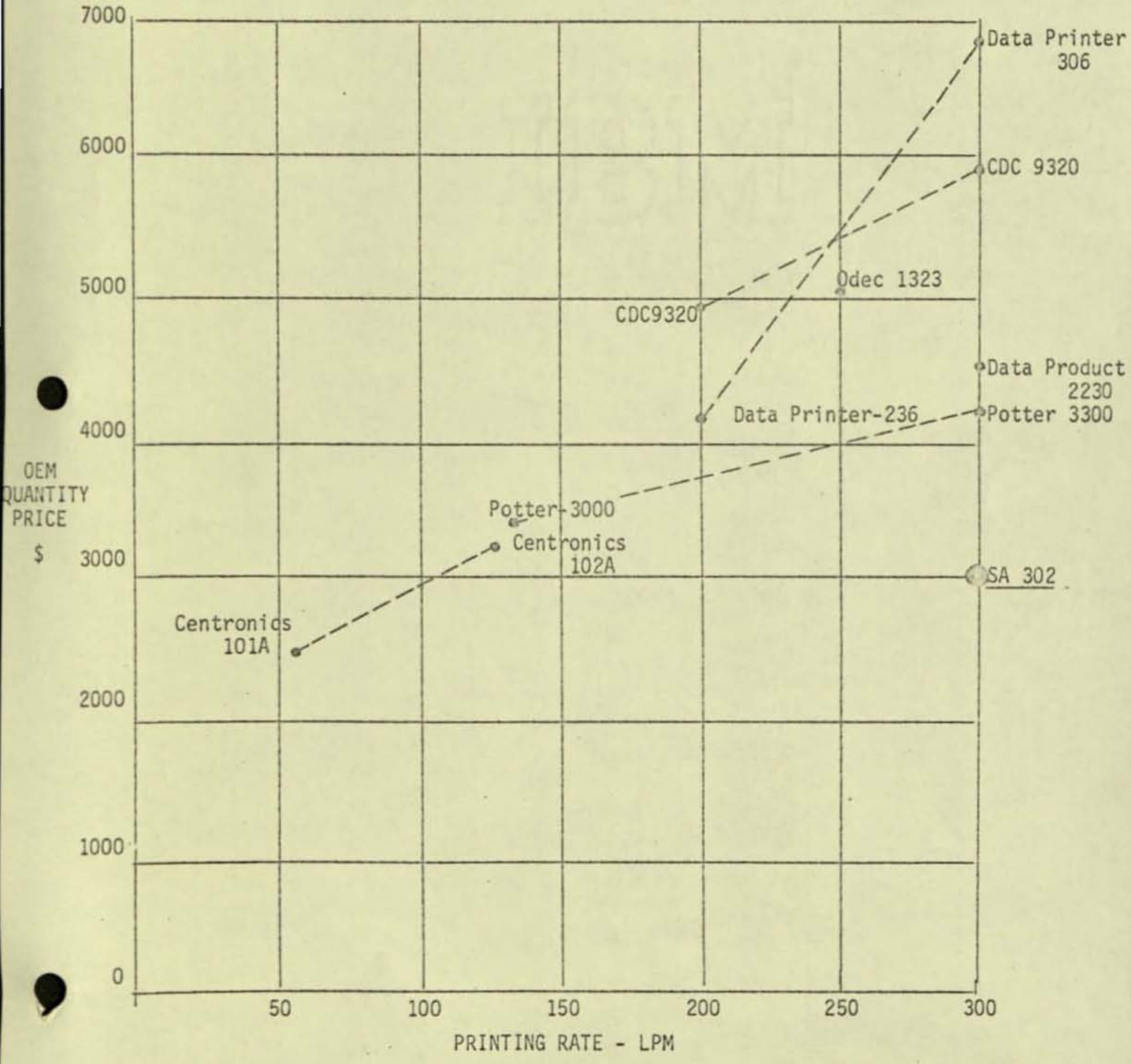
8) Potter - The Potter LP3000, LP3300 has a 135/300 print speed, very poor print quality, two copy capability, a stepping motor forms feed, and fair to poor reliability. The printing method employs a 7x5 dot matrix formed by a voice coil driven hammer and helical wheel. This printer has exhibited very poor print quality. The third copy is almost unreadable which functionally disqualifies this product from the great majority of the data processing line printer markets. The major technical factor causing this problem is the hammer travel which is limited due to the high hammer cycle rate. This results in a very critical forms thickness adjustment.

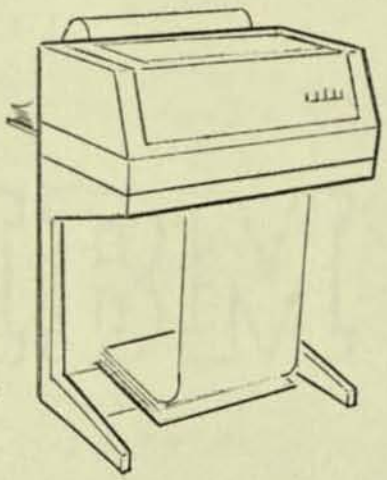
9) Pertec - The model number is unknown, however, this unit has a 300 LPM print speed, good print quality, five copy capability, and good reliability. The forms feed method is unknown. The printing method utilizes a stored energy hammer with a reduction in print hammers. The reduction is believed to be 3 to 1. Although very few details are now known about this product, first shipments are to begin in May, 1973. The printing will use a method which will provide for back printing which provides less quality than front printing. The character set will be placed on a steel belt. The engineering group responsible for this product came to Pertec from Data Products.

PRINTING RATE	TYPICAL APPLICATIONS	PRINTER APPLICATIONS			FORMS FEEDING			POTENTIAL SPEED WITH EXISTING TECHNOLOGY
		MANUFACTURER	SPEED	PRINTING METHOD	PRIMARY MOVER	SINGLE SPACE TIME	SLEW CAPABILITY	
8 - 165 cps	-Communications Terminal -I/O Terminals -Serial Line Printers	Teletype	8cps	Mechanical impact-serial printing-character stick	Mechanical ratchet			Same
		IBM Selectric	15cps	Mechanical impact-serial printing-character ball	Mechanical ratchet			Same
		Diablo	30cps	Mechanical impact-serial printing-character disc	Stepper Motor			Same
		IBM 3713	40cps	Mechanical impact-serial printing-dot matrix	Mechanical ratchet			88cps
		Centronics-101	165cps	Mechanical impact-serial printing-dot matrix	Mechanical ratchet	45 ms	Yes	Same
100-300 LPM	-Minicomputer -Batch Terminals -Computer Output	Centronics-102	125LPM (330cps)	Mechanical impact-serial printing-2 dot matrix heads	Mechanical ratchet	45 ms	Yes	Same
		SA 302	300LPM	Mechanical impact-character belt and shared hammer and drivers (Stationary hammers)	Stepper Motor	25 ms	Yes	Same
		IBM 5203	100/300	Mechanical impact-character train and shared hammer and drivers (Oscillating hammers)	Mechanical clutches		Yes	Same
		CDC 9320	200/300	Mechanical impact-character drum and shared hammer and drivers (Paper shuttle)	Magnetic clutches and brake		Yes	Same
		Data Product 2230	300	Mechanical impact-character drum and shared hammer and drivers (Hammer unit shuttle)	Printed circuit motor		Yes	400-600 LPM
600 to 2000 LPM	-Computer Output	CDC 9340	600	Mechanical impact-character drum, one hammer per print position	Magnetic clutch and brake			1200 LPM
		DP 2440	600	Mechanical impact-character drum, one hammer per print position	Printed circuit motor	13 ms	Yes	1200 LPM
		IBM 1403-2 2821	600	Mechanical impact-character chain, one hammer per print position	Hydraulic motor	15 ms	Yes	Same
		CDC 9360	1200	Mechanical impact-character train, one hammer per print position	Printed circuit motor		Yes	Same
		DP 2470	1200	Mechanical impact-character drum, one hammer per print position	Printed circuit motor	13 ms	Yes	Same
		IBM 1403-NI 2821	1100	Mechanical impact-character train, one hammer per print position	Stepper motor		Yes	Same
		IBM 3211,3821	2000	Mechanical impact-character type train, 1 hammer per print position	Printed circuit motor	8 ms	Yes	Same
5000 to 10000 LPM	-Computer Output Special	IBM Jubilee	5000	Non-impact, electrostatic	Continuous			
		Data Print	8000	Non-impact, electrostatic	Continuous			
		Memorex 1603	10000	Non-impact, microfilm	Microfilm			

LOW SPEED PRINTERS

COMPETITIVE SALES PRICE - OEM QUANTITY





SA 300 PRINTER

Product Description

The Shugart Associates printer plan provides a specific technical implementation to meet the demanding objectives of high reliability, low product cost, and expanded function found in the more expensive, large, high speed printers. The SA 300 and SA 302 will meet these objectives by implementing the following important innovations:

1) A proprietary electro-mechanical print hammer technology with a striking hammer wide enough to cause printing in three positions. The hammers will be capable of extremely high recycle rates allowing the printing of a line in one pass of the character set rather than the conventional method of shuttling paper forms to achieve cost reductions with a reduced number of hammers and drivers.

2) As a complement to three wide hammers, a low cost character belt will be designed with type in every three positions. The belt will be operator replaceable and carries timing marks to locate the characters in relation to the hammers. This technique will eliminate errors due to conventional pulley slippage and gear backlashes.

3) By eliminating the preponderance of the mechanical complexity of the traditional line printer, the resulting design will be simplistic, yielding a printer technology that offers inherent reliability, ease of service, and operator use.

The SA 300 and SA 302 will print 132 characters to the line with an option of 120 characters. The character spacing will be ten to the inch. The basic character set provides for 48 alphanumeric characters which may be expanded to 64 or 96 as an option. The line spacing will be 6 lines per inch with 8 lines per inch and vertical forms control optional.

Forecast Assumptions - 100-300 LPM Printer

The following assumptions were used to develop the market forecast for the 100-300 LPM printer:

1) Unit Shipments by year in Figure 1 were taken from various studies and industry experience.

Market Segment Assumptions

1) Key Entry
   a. 10% of the keyboards will be on clustered systems.
   b. 8 keyboards per cluster.
   c. 100% of these clustered systems will be non-IBM.
   d. 80% will use 100-300 LPM printers supplied.

2) Source Data Entry
   a. 30% will use 100-300 LPM printers
   b. 50% of shipments will be non-IBM

3) Batch Terminals

a. 70% will use 100-300 LPM printers
b. 40% of shipments will be non-IBM

4) Special Function Terminals

a. 20% of the stations will be clustered
b. 16 stations average per cluster
c. 50% of shipments will be non-IBM
d. 80% will use 100-300 LPM printers

5) Minicomputers

a. 30% will use 100-300 LPM printers
b. 100% will be non-IBM

6) Other CPU

a. IBM Model 20/System 3 class system and below inventory was used to develop potential
b. Shipments by year in thousands

	74	75	76	77
IBM	18	25	31	39
non IBM	8	10	13	16

c. 10% of non-IBM systems will be manufactured by firms with no in-house printer capability.
d. 70% will use 100-300 LPM printers.

DOMESTIC SHIPMENTS (000 UNITS)

	1973	1974	1975	1976	1977
DATA ENTRY					
KEY ENTRY	68	79	70	60	56
SOURCE DATA ENTRY	39	65	65	84	103
SUBTOTAL	107	133	135	144	159
TERMINALS					
BATCH	34	45	61	84	108
INTERACTIVE	56	65	77	80	84
SPECIAL FUNCTION	61	84	101	127	158
SUBTOTAL	151	194	239	291	350
MINICOMPUTERS	19	22	26	29	32
WORD PROCESSING	50	63	78	98	122
T O T A L	327	412	478	562	633

FIGURE 1

100-300 LPM PRINTER MARKET POTENTIAL (000 UNITS)

	74	75	76	77
DATA ENTRY				
KEY ENTRY	.8	.7	.6	.6
SOURCE DATA ENTRY	8.1	9.8	12.6	15.5
TERMINALS				
BATCH	12.6	17.1	23.5	30.2
SPECIAL FUNCTION	.4	.5	.7	.8
MINICOMPUTERS	6.6	7.8	8.7	9.6
OTHER CPU's	.6	.7	.9	1.1
TOTAL	29.1	36.6	47.0	57.8

SHUGART ASSOCIATES

Forecast (Units)

	74	75	76	77
BUFFERED UNITS	15	967	960	960
MECHANISM ONLY		348	960	960
TOTAL	15	1315	1920	1920

MASS PLAN

MULTI APPLICATION SYSTEM

Introduction

The initial product thrust of Shugart Associates will be based on products and product configurations derived from the flexible disk technology. Considering the importance of the new defacto standard of the IBM Diskette - and the logical extension of this new technology by the industry leader - Shugart Associates will provide a number of derivative products which will be based on the many functional applications of the new Diskette media.

The first and most obvious application of the low cost advantages of the Diskette is in the functional application area of key data entry. A logical extension from this area is into that of buffered and batch communication terminals. A third extension relates to the use of the Diskette in stand alone word processing applications. The word processing application is not a part of the initial market thrust of the MAS System. It may be planned as a future product depending upon the availability of a low cost, very reliable typewriter which has IBM Selectric typing quality. A fourth area of application - an application area of truly large potential - pertains to the emerging minicomputer and/or small business systems markets where the Diskette will be used as a very low cost, very reliable media for data storage.

Market Environment

Many industry observers have reasoned as to why IBM achieved so much with the IBM 360 series of data processing systems. The System 360 possesses many architectural advantages over its predecessor systems in the IBM product line. A standardized instruction set, a standardized channel architecture and interface, and a set of standardized interruptable operating systems supported with appropriate instructions in hardware were a few of the outstanding advances which, when combined with IBM's superior resources in marketing and finance, made the 360 the success it was during the period of 1964 through 1970. Of all the advances, the most fundamental factor affecting the success of the 360 was IBM's announcement of the 2314 Disk Storage in early 1965. The reason for the catalytic effect of the 2314 in spurring sales of the 360 line of systems was the combined cost per byte, price performance, and outstanding reliability characteristics of the 2314 compared to the line of direct access storage products then available on the market. The analogy between the catalytic benefits of the 2314 and the System 360 and the promised catalytic benefits of the Diskette technology in the low cost data processing area is appropriately to the point in establishing a parallel in projecting the tremendous potential impact of this vital and new approach to low cost data storage.

So that a better perspective may be gained on the significance of the introduction of the Diskette, a brief review is appropriate as to the functional application areas where the Diskette technology promises new approaches:

1) Buffered Communication Terminals - Communication terminals have evolved from basic cable connected inquiry stations, in the low end range of the function, to communication connected conversation mode terminals. The term "conversation mode" has evolved from the nature of the application where the terminal user is conversing with a host computer by use of the terminal keyboard. The significant point here is the fact that while the user is "conversing" through the keyboard, the terminal, its communication lines, and the host computer are utilized while the keystrokes are generated by the terminal operator. This use of the terminal proves to be costly in that the communication lines have a relatively low utilization compared to their economic potential, and the host computer bears the burden of not only being responsive to the message being transmitted, but also performing time consuming message dependent editing algorithms. The Diskette allows a different approach in the conversation mode application area. In this case the operator generates the message and the message is edited and stored in the Diskette until the user, by visual inspection of the typewritten data or display, determines that the message is correct and is ready for submission. The stored message is then submitted directly from the temporary buffer to the Diskette media, greatly enhancing the utilization of the communication line and relieving the processing burden of the host computer. The advantages of the Diskette over other functional means of storing data is its combined inherent reliability and low cost of servicing.

2) Key Data Entry - Data Entry spans a diverse number of functional means of entering data directly or indirectly into a data processing system. These means include MICR (Magnetic Inscribed Character Recognition) and OCR (Optical Character Recognition) readers of various speeds, function, and performance. Other means include the use of punch cards, paper tape, magnetic tape, magnetic disks, and communication terminals - all sharing a fundamental discipline of utilizing the keyboard as the source of data entry. The Diskette provides a superior means for the capture of data because of its reliability, large storage capacity, and random accessibility of data.

3) Interactive, Batch Communication Terminals - The interactive terminal application is, to a large degree, accomplished by the Buffered Communication Terminal. The distinction between a buffered terminal and an interactive terminal may be based on the amount of intelligence required to perform the application task. The delineation of interactive terminals and batch terminals becomes well defined as additional input/output units are added and the terminal becomes more intelligent as a result of the use of more powerful microprocessor and expanded memory. The Batch Communication Terminal application is generally characterized as transmitting large volumes of data which requires a card unit or storage unit, in a minimum configuration, to the addition of a line printer in a larger configuration. The Diskette Storage Drive allows the functional replacement of inherently unreliable cassette drives,

high cost magnetic tape units, and card equipments for input/output. The 300 LPM printer provides a low cost, highly reliable line printer which may be functionally priced to cover an application range from 300 LPM down to 150 LPM.

4) Minicomputers and/or Small Business Systems - The use of the Diskette as a replacement for the punch card in "unit record" accounting applications represents a large potential - a market that will exceed one million Diskette Storage Drives over the next decade. Unit record applications have historically entailed the use of the punch card as storage media for the processing of data. Both transactions and master record information is kept on cards. Data is keyed into cards. The cards are sorted in appropriate sequence, and, in the typical application, collated with master balance forward cards and processed through a line printing accounting machine. As the cards are processed corresponding reports or documents are printed. The Diskette replaces the cards in this example with the net result that the same operations are performed faster with a lesser number of operators and with a vastly superior application of product functions allowing the implementation of customer uses that go far beyond those which could be realized with punch cards. A typical configuration of a small unit record replacement system would include a small processor, a low speed line printer from 100 to 300 LPM, a key entry station located at the processor, either a small display or console typewriter,and four Diskette Storage Drives. One drive would be dedicated to program loading, one to transaction input, one to old master record input, and the fourth drive would be dedicated to writing the new updated master resulting from updating the old master with the transactions. This system would have a performance capability that would surpass the power of the original systems entries in the data processing markets: the Univac I and the IBM 705!

The line of derivative products utilizing the Diskette technology that will address these functional application areas is called the Multi Application System (MAS). Although the Diskette technology is a key factor in determining a strategic entry in the markets represented by these functional application areas, there are a number of other factors which shape the definition of the opportunity - not the least of which is the market for the 150 to 300 LPM printer.

Historically, the market in each of the functional application areas of communication terminals, key entry, word processing, and small unit record systems has evolved separately. This separation of evolution has been true in terms of the applications and technical disciplines required for the product implementation.

The thrust in the IBM Company has been traditionally decentralized in applying product solutions to its market requirements. The mission for display systems is located with the Kingston Lab in Kingston, N.Y. The word processing products have evolved from the line of very successful

typewriter devices developed and manufactured by the Office Products Division at Lexington, Kentucky. Key Entry products are now the mission of the Rochester, Minn. plant whose product scope is best exemplified by the recent 3740 System announcement. This announcement was closely monitored by the Raleigh, N.C. facility which has the mission for communication products.

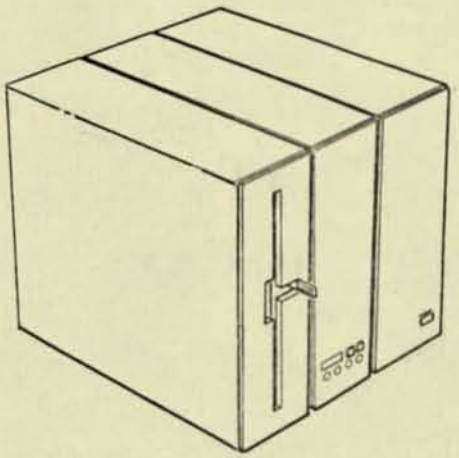
Why the monitoring of the 3740 System announcement by the Raleigh group? It all started when the Lexington Lab started adding communications capabilities to their line of word processing products. The concern was heightened by the introduction of communications capabilities on the 3740 Data Entry System. After all, the announcement of communications capabilities on IBM word processing and key entry products does suggest a commonality of market requirements and product solutions. When does a word processing station stop being a word processor and become a communication terminal? When does a key entry station stop being a key entry device and become, like the word processor, a device for communications? This Jekyll and Hyde phenomenon regarding the functional transparency of affecting communication functions on key entry and word processing products has many ramifications for IBM - and the industry!

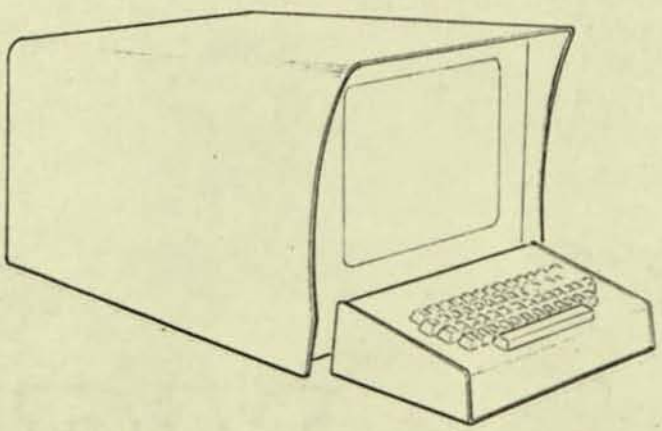
The reason for the importance of these ramifications is the continuing convergence of technologies whereby the product function in Key Entry, Word Processing,and Communication Terminals can be satisfied by common technology and manufacturing techniques. This fact has significant implications for IBM and all companies which have major investments in the development and manufacturing of these products. Where this strategic dichotomy creates a dilemma for many, it represents a significant opportunity for Shugart Associates. IT IS NOW POSSIBLE TO IMPLEMENT A COMMON LINE OF PRODUCTS WITH A STANDARD ARCHITECTURE -- USING COMMON COMPONENTS AND PARTS -- USING THE FLEXIBLE DISK TECHNOLOGY -- A 150 to 300 LPM PRINTER -- AND MICROPROGRAMMING TECHNIQUES -- TO IMPLEMENT A DIVERSITY OF FUNCTIONAL APPLICATIONS.

The Diskette is the catalyst in this plan. The Diskette Storage Drive presents a low cost, very reliable storage device which practically revolutionizes the many approaches used to date where a low cost storage device was required. The addition of the 150-300 LPM printer not only allows penetration into significant new OEM markets, but it also allows the low cost implementation of Remote Job Entry applications and the penetration of new markets in the Unit Record area which have previously been the domain of the punch card.

Product Description

The Multi Application System strategy provides what appears to be a complex plan to meet a diverse set of objectives represented by the functional requirements of key entry, word processing, batch terminals, and small business systems. Because of the coincident convergence of a number of key technologies, an architectural implementation may be devised which greatly simplifies an apparent demanding task - providing Shugart





S/A 6000 Single Station

Associates an opportunity for a truly unique and remarkable approach in serving the needs of its customers, the suppliers of end user data processing systems and subsystems.

The key areas where significant technological advances allow the implementation of the MAS strategy include:

Memory technology
Microprogramming technology
The flexible disk technology
The 300 LPM printer technology

Of these four areas, the flexible disk and 300 LPM printer are discussed in other sections and will not be addressed as a part of the product description of the Multi Application System.

Significant advances have taken place in the last few years in memory technology. Questions of density and cost have been resolved to a point where low cost systems can now be devised by utilizing a number of reliable and available sources of supply. The combination of this fact with the major advances in microprogramming allows a flexible and modular approach to systems design which promise economy, flexibility, and balanced performance in implementing a diversity of functional requirements.

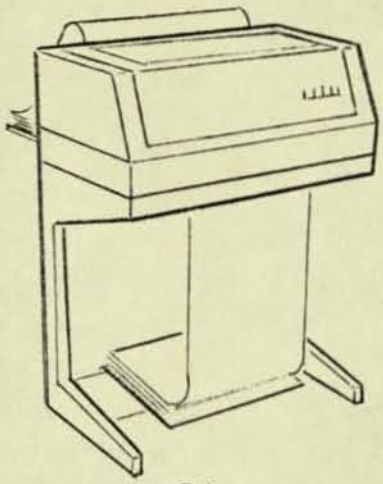
The Multi Application System plan provides a specific implementation as follows:

1) The provision for a standard microprogramming architecture designed to meet the commonality of functional requirements in key entry, word processing, batch terminals, and small business systems.
2) The use of a proprietary microprogramming compilation and documentation system which will be utilized by Shugart Associates to meet the varied microprogramming tasks in implementing the MAS strategy.
3) The implementation of a building block approach which will allow the customer a number of configuration and packaging alternatives.
4) A standardized manufacturing approach which minimizes the number of parts and components needed to meet a number of diverse product requirements.

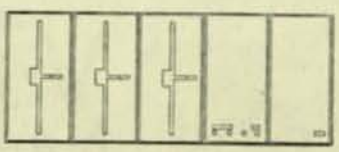
The initial MAS plan provides three systems with four processors. These processors will have a number of additional features which may be added to meet additional requirements of the end user.

The Multi Application System includes the following three basic systems:

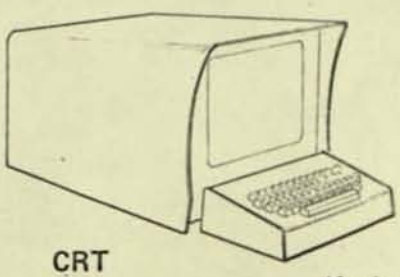
The SA 6000 Key Entry System
The SA 6200 Batch Terminal System
The SA 6400 Small Business System



Printer
S/A 300



S/A 6400



CRT

Keyboard

The three basic systems may be made up of a number of system components manufactured by Shugart Associates including the SA 900 series of flexible disk storage drives, the SA 300 line printer, and a single modular microprocessor. The microprocessor will have a modular architecture that will be extended by features and microprograms to allow the implementation of the functional application areas addressed by the three basic systems. By adding features and microprograms, the single microprocessor will be initially marketed as one of four different product types. Each product type may be field modified by the addition of features, and/or microprograms so that it may perform the functions of another product type. This modularity of design allows an extremely versatile approach in implementing what has been to date a diversity of architecturally different product lines designed to meet different functional applications. The four product types of the SA 600 series processor line are as follow:

The SA 600 Single Key Entry Processor
The SA 602 Dual Key Entry Processor
The SA 620 Batch Terminal Processor
The SA 640 Small Business Processor

The modularity and resulting flexibility of configuration of the MAS product line provides the system designer a number of alternatives in packaging and selling the MAS processors with the other Shugart Associates products. The basic building block philosophy of the flexible disk product line has been extended to the MAS processors. A single MAS processor requires the exact amount of space as the SA 902 Dual Diskette Drive. The customer may elect to incorporate the components of a MAS system within his own design, or he may choose to rack mount the components. A third alternative is desk top mounting for which Shugart Associates will provide the SA 960 series of attractively designed modules.

Typical configurations of the Multi Application System are as follow:

1) SA 6000 Key Entry System

   a. SA 340 Keyboard
   b. SA 341 240 Character Keyboard Display
   c. SA 600 Single Key Entry Processor
   d. SA 900 Diskette Storage Drive
   e. SA 961 3 Unit Module

   Features:

   BSCA
   300 LPM Printer
   Additional Memory
   Additional Diskette Drives

2) SA 6000 Key Entry System

   a. SA 340 Keyboard
   b. SA 341 240 Character Keyboard Display
   c. SA 602 MAS Dual Key Entry Processor
   d. SA 902 Dual Diskette Storage Drive
   e. SA 962 4 Unit Module

3) SA 6200 Batch Terminal System

a. SA 342 960 Character Keyboard Display
b. SA 620 MAS Small Batch Terminal Processor
c. SA 902 Dual Diskette Storage Drive
d. SA 962 4 Unit Module

Features:

300 LPM Printer
Additional Memory
Additional Diskette Drives

4) SA 6400 Small Business System

a. SA 340 240 Character Keyboard Display
b. SA 640 MAS Small Business Processor
c. SA 300 300 LPM Printer
d. Two SA 902 Dual Diskette Storage Drives (total of four drives)
e. SA 963 6 Unit Module

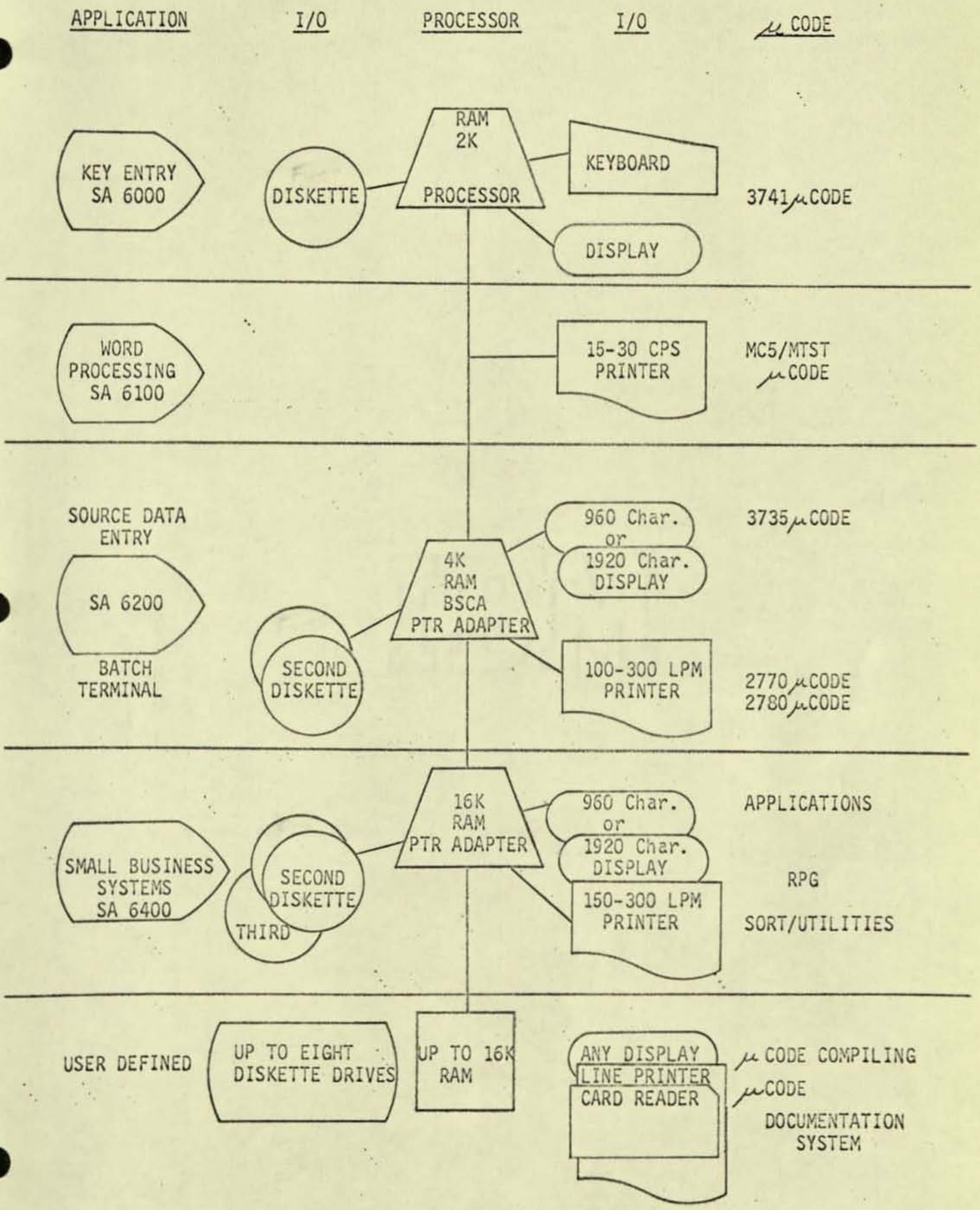
Features:

BSCA
Additional Memory
Additional Diskette Drives
Use of Diskette Data Module Storage

4) Small Business Systems

a. Industry sources indicate that 16,000 non-IBM small business systems were installed in 1971.

b. This population is assumed to grow at a compound rate of 25% per year.


APPLICATION
I/O
PROCESSOR
I/O
μ CODE
KEY ENTRY SA 6000
DISKETTE
RAM 2K
PROCESSOR
KEYBOARD
DISPLAY
3741 μCODE
WORD PROCESSING SA 6100
15-30 CPS PRINTER
MC5/MTST μCODE
SOURCE DATA ENTRY
SA 6200
BATCH TERMINAL
SECOND DISKETTE
4K RAM BSCA PTR ADAPTER
960 Char. or 1920 Char. DISPLAY
100-300 LPM PRINTER
3735 μCODE
2770 μCODE
2780 μCODE
SMALL BUSINESS SYSTEMS SA 6400
SECOND DISKETTE
THIRD
16K RAM PTR ADAPTER
960 Char. or 1920 Char. DISPLAY
150-300 LPM PRINTER
APPLICATIONS
RPG
SORT/UTILITIES
USER DEFINED
UP TO EIGHT DISKETTE DRIVES
UP TO 16K RAM
ANY DISPLAY
LINE PRINTER
CARD READER
μ CODE COMPILING
μCODE
DOCUMENTATION SYSTEM

Forecast Assumptions - Multi Application System

The major market for the MAS product line will be one or more large suppliers of data processing systems and subsystems. The prospective customer will desire entry into the key entry, communication terminal, and small business system markets. A number of large prospective customers exists in this area. A few of these prospective customers have had a limited disclosure of the MAS concept and have expressed a definite interest in viewing the total plan. Because of this factor, a major assumption is the availability of a large source to market the MAS line of products.

The next series of assumptions is based upon various studies and industry experience as to what should be conservatively expected to be the requirements of a major company. The following discrete assumptions were used to develop the market forecast for the Multi Application System:

1) Unit shipments by year in Figure I were derived from various studies and industry experience

2) Key Entry

With the introduction of the MAS Key Entry products, the Key Entry potential market will be penetrated by non-IBM vendors at the following rate:

74	75	76	77
27%	30%	32%	35%

As the result of the market entry of the MAS Key Entry products, the use of flexible disk drive products will occur at the following rates:

74	75	76	77
30%	45%	65%	85%

3) Source Data and Batch Terminals

a. Source Data non-IBM penetration will be 50%. Flexible disk drive versions of this product will occur at the following rates:

74	75	76	77
20%	33%	45%	60%

b. Batch Terminal penetration will be 40%. Batch devices will use flexible disk drives at the following rates:

74	75	76	77
15%	30%	40%	40%

DOMESTIC SHIPMENTS (000 UNITS)

	1973	1974	1975	1976	1977
DATA ENTRY					
KEY ENTRY	68	79	70	60	56
SOURCE DATA ENTRY	39	65	65	84	103
SUBTOTAL	107	133	135	144	159
TERMINALS					
BATCH	34	45	61	84	108
INTERACTIVE	56	65	77	80	84
SPECIAL FUNCTION	61	84	101	127	158
SUBTOTAL	151	194	239	291	350
MINICOMPUTERS	19	22	26	29	32
WORD PROCESSING	50	63	78	98	122
T O T A L	327	412	478	562	633

FIGURE 1

MAS MARKET POTENTIAL

	73	74	75	76	77
DATA ENTRY	3400	6300	9500	12400	11000
BATCH TERMINALS					
SOURCE DATA		4600	9700	16100	26300
BATCH		2700	7300	13400	17300
T O T A L		7300	17000	29500	43600
SMALL BUSINESS		6300	7800	9700	12200

SHUGART ASSOCIATES FORECAST

	74	75	76	77
DATA ENTRY				
SINGLE	40	195	320	340
DUAL	160	860	1360	1560
% Share of Available Potential	6%	20%	25%	30+%
BATCH TERMINALS		920	2000	2200
% Share of Available Potential		5%	8%	5%
SMALL BUSINESS		400	700	700
% Share of Available Potential		5%	7%	6%

MKTG PLAN

MARKETING PLAN

Table of Contents

MARKETING PLAN

Introduction

"This is the right team, with the right product, at the right time." The quote is the lead sentence in an article on Shugart Associates in the February 26, 1973 edition of Peninsula Electronic News. This article, and other national publicity, combined with the attendant announcement of the IBM 3740 System and the new Diskette media presented the basis for the initiation of the Shugart Associates marketing plan. The parade of uninvited visitors to the humble Shugart offices located in Sunnyvale consists of a major segment of the world's leading suppliers of data processing systems and subsystems. Univac, Computer Machinery, Xerox, Fujitsu, Digital Equipment Corporation, Siemens, Hitachi, National Semiconductor, Pertec, Sycor, and Four Phase Systems have taken the initiative to visit the Sunnyvale location and hear the Shugart team's story. Phone calls and letters have been received from Burroughs, Addressograph Multigraph, Honeywell, Pitney Bowes, Nixdorf, Inforex, Mohawk Data Sciences, Olivetti, Litton, and a number of smaller, growing enterprises in the data processing industry.

These events - the original thrust of the Shugart Associates marketing plan - were inspired by the tremendous news of IBM's decision to proceed with the Diskette media in its announcement of the 3740 Key Entry System. The industry knows that this announcement by IBM is only the first step in exploiting a fundamentally reliable and low cost approach to data storage for low cost systems in key entry, source data recording, terminal communications, and small computer/small business systems applications. These events have taken place over the first four business weeks of the existence of Shugart Associates. In one sense, the continuous requirement of discussing the Shugart plan has encumbered the completion of the formal business plan. But no one would deny that the opportunity afforded by these discussions has presented a greater perspective of the larger opportunity which lies ahead by implementing the Shugart plan.

In every situation the reception to the presentation of the Shugart team, its product plan, and the team's planned implementation - as exemplified by this business plan - has been outstanding! The enthusiastic response is directly attributed to the fact that every aspect of the Shugart story is outstanding: the team, the initial products based upon flexible disk technology, the 300 line per minute printer program, and the MAS (Multi Application System) strategy.

The following description of the Shugart Associates marketing plan outlines the objectives, events, and resources for the initial thrust and continuing market effort that will establish this company as one of the outstanding performers during the 1970's.

STRATEGIC PLAN

Introduction

The Shugart Associates marketing plan is directed at selling important OEM products to the suppliers of data processing systems and subsystems. The initial product thrust will be products based upon the flexible disk technology followed by the important new 300 line per minute printer and the revolutionary Multi Application Systems. The specific marketing plan implementation to sell these products will meet a number of initial strategic objectives.

Marketing Concept

The objective of the marketing concept is to provide a broad line of products and product configurations which meet the user requirements of the suppliers of data processing systems and subsystems in the low end range of price and function. Shugart Associates products will be either total systems, subsystems, or systems components in systems products with end user prices yielding a typical rental range of $100 to $800 per month. These products will have an inherent propensity for high function/performance, low manufacturing cost, and low maintenance servicing and associated support costs, compared to competitive products available on the market. The objectives of the marketing concept will allow the establishment of prices which will allow a supplier to have an early financial return upon the marketing of his products to the end user.

Product Marketing

The objective of the initial product marketing strategy is to optimize the number of products and product configurations of the three basic product technologies - flexible disk drives, 300 line per minute printer, and the MAS processor - based upon the known requirements of the end user customers of the suppliers of data processing systems and subsystems. The optimization of the number of products will create an interdependence between products and product configurations in each product family by the utilization of common parts and servicing techniques. This strategic objective is fundamental in an OEM marketing environment in achieving a plan of manufacturing low cost products which are inherently reliable. This strategic platform leads to a position of tactical versatility whereby the specifications of the basic product line may be easily adapted to meet special market requirements without major impositions on product costs, administration, or lead time in being responsive to market conditions.

Pricing Strategy

The implementation of a plan to meet the objectives of the marketing concept and product marketing strategy provides a basis for a strategy of pricing interdependence based upon product interdependence. The availability of a significant number of products, product configurations, and a number of packaging techniques (enclosure, rack mount, or table top) provides the end user and the supplier to the end user a large number of attractive alternatives. These alternatives will tend to lessen pos-

sible pricing erosions by minimizing the "commodity effect" which can result from having a single product.

Implementation

The plan to meet the above objectives requires the implementation of a product plan which allows the marketing of a large number of products and product configurations from a few basic products. The three basic products - the flexible disk drive, the 300 LPM printer, and the MAS processor - will yield an initial product line of over 20 announced products with innumerable features! This plan provides a product interdependence which will establish manufacturing and administrative economies; a product marketing posture of making available a large number of product alternatives; and a pricing strategy which will tend to minimize pricing erosion.

To further enhance the marketability of the product line, Shugart Associates will establish an excellent, technically oriented sales group. This group will enhance the basic knowledge and understanding of the market requirements of the suppliers of data processing systems and subsystems and the end user applications of the products to be provided by Shugart Associates. This group will provide technical counseling, sales service support, documentation support, and response to special market requirements and sales situations.

The pricing plan will be to establish prices which will induce large quantity purchases. The prices will be pegged at customer planning levels as compared to sliding scale discounts with a provision for bill back if the annual quantity is less than the planned amount.

MARKETING EVENTS

The Initial Sell

The formal marketing plan was initiated during the first week of business; a letter announcing the formation of Shugart Associates was sent to over 200 prospective customers. The letter outlined the business and product thrust of Shugart Associates and the plan to announce the SA 900 Single Diskette Storage Drive. A second letter will be mailed to these prospective customers on April 16, 1973. This letter will formally announce the SA 900. The letter will be attended by prices and functional specifications and an invitation to see the SA 900 at the 1973 National Computer Conference and Exposition to be held in New York City during the period June 4 through June 8.

The demonstration of the SA 900 at the New York National Computer Conference and Exposition represents the initiation of the formal sales campaign. This campaign is directed at selling a majority of the 1974 production plan by year end. A suite will be reserved at the New York Hilton so that personalized demonstrations may be conducted away from the exposition floor. Besides direct invitations sent in the SA 900 announcement letter, personal invitations will be delivered at the various exhibits at the conference.

An advertising campaign will be initiated in May leading to the New York Conference with a special emphasis on Shugart Associates, the SA 900, the significance of the new Diskette media, and the importance of reliability in a low cost data storage drive.

Coincident with the demonstration of the SA 900 at the New York Hilton, the SA 902 Dual Diskette Storage Drive will be announced. The announcement of the SA 902 will be accompanied by appropriate prices and functional specifications and a special advertisement coinciding with the New York Conference.

Sales Plan

The initial sales activity will be conducted by three individuals during the period June through August. Al Shugart, Dave Scott, and Otis Page will provide direct coverage of major potential customers who have immediate and large requirements.

The second phase of the build up in the selling activity will be to bring on board two additional technical sales support people in September. This schedule may be improved, depending upon the response indicated at the National Computer Conference. These two individuals will be the basis for the Technical Support function which will provide both customer and direct sales assistance in applying the Diskette product line to the functional application requirements of prospective customers.

As a result of the contacts made at the New York Conference and the results of the selling activity through July, a number of SA 900 evalua-

tion units will be provided to prospective customers by July 16, 1973. The plan is to build ten evaluation units. These units will be loaned to selected prospects for a period not to exceed a month. This plan will allow the placement of evaluation units with up to forty prospective customers in the period July through November.

The SA 3900 Storage Facility will be announced on October 5, 1973. The SA 3900 announcement will include the SA 960 series of Diskette Storage Drive Modules and the SA 910 and SA 912 Control and Power Units. The announcement will be accompanied by appropriate functional specifications and prices, and a personal letter to individuals on the prospective customer list. This schedule may be improved, depending upon the knowledge gained about selected prospective customer requirements during the third quarter.

The third phase of the build up of sales activity will be to establish direct sales coverage by adding three salesmen who will cover three geographical areas: The East, the Midwest, and the Western United States. The Eastern area will be comprised of the Boston area - which consists of Massachusetts and New Hampshire, the general New York City area including Connecticut and New Jersey, the general Philadelphia, Baltimore, Washington area, and Florida. The Midwestern area will be comprised of the general areas represented by Chicago, Minneapolis, Detroit and Texas. The Western area will consist of Seattle/Portland, the San Francisco Bay Area, the general Los Angeles/San Diego area and Denver/Phoenix.

The fourth phase of the sales plan is oriented toward support of the SA 900 and the introduction of five new products in 1974. These products include the SA 940 series of Diskette Data Module Stations and the SA 300 and SA 302 three hundred line per minute printers. The SA 940 Series will be announced on January 7, 1974. The SA 300 and SA 302 will be announced on April 1, 1974. Each announcement will be supported by appropriate documentation including functional specifications, prices, and brochures.

There will be an announced capability on the SA 6000 Single and Dual Key Entry Systems on April 16, 1974. An equal capability will exist on July 1, 1974 for the SA 6200 Terminal Communications System and on October 1, 1974 for the SA 6400 Small Business Systems. The SA 6000, SA 6200, and SA 6400 Series systems programs assume the availability of one or more large sources who will determine the announcement strategy of these systems.

MARKETING SCHEDULE

FUNCTION	73				74				75			
	1	2	3	4	1	2	3	4	1	2	3	4
Announce/FCS												
SA 900 and 901 DRIVE		4-16 A		10-1 S								
SA 900 Evaluation Units			7-15 S									
SA 902 and 903 DRIVE		6-4 A			1-4 S							
SA 910 and 912 CONTROLLER/POWER				10-5 A		3-1 S						
SA 3900 FACILITY				10-5 A		3-1 S						
SA 94X STACKER					1-7 A		7-1 S					
SA 300/302 PRINTER						4-1 A		11-1 S				
SA 6000 KEY ENTRY SYSTEM						4-16 AC	9-6 S					
SA 6200 BATCH TERMINAL SYSTEM							7-1 AC		1-3 S			
SA 6400 SMALL BUSINESS SYSTEM								10-1 AC		3-3 S		
Manpower Additions												
MARKETING	2											
SALES		1		1 1								
TECHNICAL SUPPORT		1		1 1	2							

Legend: A - Announce, AC - Announce Capability, S - Ship

PRODUCT SUMMARY

SA 900 Series

SA 900 - Single Diskette Storage Drive - IBM Compatible
SA 902 - Dual Diskette Storage Drive - IBM Compatible
SA 901 - Single Diskette Storage Drive - Universal
SA 903 - Dual Diskette Storage Drive - Universal
SA 910 - Diskette Storage Drive Control and Power
SA 912 - Diskette Storage Drive Power

SA 960 Series

SA 960 - 2 Unit Diskette Storage Drive Module
SA 961 - 3 Unit Diskette Storage Drive Module
SA 962 - 4 Unit Diskette Storage Drive Module
SA 963 - 6 Unit Diskette Storage Drive Module

SA 940 Series

SA 940 - Single Drive Diskette Data Module Station - IBM Compatible
SA 941 - Single Drive Diskette Data Module Station - Universal
SA 942 - Two Drive Diskette Data Module Station - IBM Compatible
SA 943 - Two Drive Diskette Data Module Station - Universal
SA 944 - Dual Drive Diskette Data Module Station - IBM Compatible
SA 945 - Dual Drive Diskette Data Module Station - Universal

SA 300 Series

SA 300 - Buffered 300 LPM Printer
SA 302 - Unbuffered 300 LPM Printer
SA 340 - Keyboard
SA 341 - 240 Character Display
SA 342 - 960 Character Display
SA 344 - 1920 Character Display

SA 600 Series

SA 600 - Single Key Entry Processor
SA 602 - Dual Key Entry Processor
SA 620 - Communication Terminal Processor
SA 640 - Small Business Processor

SA 3900 - Diskette Drive Storage Facility

Includes SA 900 Series and SA 960 Series

SA 6000 Series - Small Processing Systems

SA 6000 - Key Entry System
SA 6200 - Communication Terminal System
SA 6400 - Small Business System

Includes SA 900, SA 960, SA 600, and SA 300 Series

SHUGART ASSOCIATES

OEM PRICE LIST
Diskette Products
Series 900

Annual Quantity	SA 900	SA 901	SA 902	SA 903	SA 910	SA 912
1-49	750	800	1325	1400	1200	225
50-99	650	695	1150	1215	1050	195
100-249	600	640	1050	1110	960	180
250-499	575	610	1025	1080	920	170
500-999	550	580	975	1020	880	160
1000 -	Special Bid					

Series 960

Annual Quantity	SA 960	SA 961	SA 962	SA 963
1-4	50	60	70	90
5-9	45	52	60	78
10-24	40	48	55	72
25 -	Special Bid			

Series 940

Annual Quantity	SA 940	SA 941	SA 942	SA 943	SA 944	SA 945
1-4	3500	3600	4200	4300	4400	4500
5-9	3050	3150	3750	3850	3950	4050
10-24	2800	2900	3500	3600	3700	3800
25 -	Special Bid					

Printer Products

Annual Quantity	SA 300	SA 302
1-4	4000	3550
5-9	3800	3350
10-24	3600	3150
25-99	3500	3050
100-	Special Bid	

FLEXIBLE DISK FILES

ESTIMATE OF PROGRAM REQUIREMENTS

POTENTIAL CUSTOMER	LOW ESTIMATE	HIGH ESTIMATE
Addressograph-Multigraph	5000	10000
Basic/Four	5000	10000
Beehive Terminals	5000	10000
Burroughs	10000	20000
Computek	5000	10000
Computer Automation	5000	10000
Computer Machinery	10000	20000
Courier	5000	10000
Data General	10000	15000
Diebold	5000	10000
DEC	15000	25000
Entrex	5000	10000
Four Phase	10000	15000
General Automation	5000	10000
Harris Display Terminals	3000	5000
Hazeltine	3000	5000
Hewlett Packard	5000	10000
Honeywell	10000	15000
Incoterm	5000	10000
Inforex	10000	15000
ITT	5000	10000
Litton ABS	3000	5000
Lockheed	3000	5000
Mohawk	5000	10000
National Cash	15000	25000
Olivetti	10000	20000
Philips	10000	15000
Pitney-Bowes	10000	15000
Prime Computer	3000	5000
Q1	3000	5000
RCA	3000	5000
Sanders	3000	5000
Singer	10000	15000
Sycor	10000	20000
Tektronix	5000	10000
Teletype	10000	15000
Texas Instruments	3000	5000
Univac	20000	30000
Western Union	10000	15000

Siemens
CII
Nixdorf
ICL
Honeywell

CONSOLIDATED FORECAST

Shipments and Revenue

	73	74	75	76	77
DISKETTE STORAGE DRIVE					
Units Shipped	75	6934	9000	9000	9000
A.U.P.	$750	$570	$475	$450	$400
Revenue (000)	56	3957	4275	4050	3600
300 LPM PRINTER					
Units Shipped	-	15	1315	1920	1920
A.U.P.	-	$3500	$3100	$2700	$2525
Revenue (000)	-	53	4061	5184	4848
MAS					
Units Shipped	-	200	2375	4380	4800
A.U.P.	-	$2310	$3325	$3300	$3200
Revenue (000)	-	462	7901	14424	15446
TOTAL REVENUE ($000)	56	4472	16237	23658	23894

MARKETING OPERATING PLAN
($000's)

	1Q	2Q	3Q	4Q	1973	1Q	2Q	3Q	4Q	1974	1975	1976	1977
Salary and Benefits	9	26	37	59	131	68	68	68	68	272	292	309	334
Expenses:													
Travel	1	15	21	21	58	21	21	21	21	84	84	84	84
Demo Units	-	30	-	-	30	-	-	-	-	-	-	-	-
Advertising	2	13	15	15	45	15	15	15	15	60	60	60	60
Brochures	-	3	3	-	6	-	-	-	-	-	-	-	-
Entertainment	-	3	3	3	9	3	3	3	3	12	12	12	12
Telephone	1	2	2	2	7	3	3	3	3	12	12	12	12
Supplies	-	1	-	-	1	1	-	1	-	2	2	2	2
Furniture		3	3	4	10	-	-	-	-	-	-	-	-
SUBTOTAL	13	96	84	104	297	111	110	111	110	442	462	479	504
Printer	-	-	-	-	-	15	15	15	15	60	30	20	10
MAS	-	-	-	-	-	46	46	46	46	184	193	143	153
TOTAL	13	96	84	104	297	172	171	172	171	686	685	642	667

DOCUMENTATION PLAN

ASSUMPTIONS

SA900, SA910/912, SA940 and SA300

DOCUMENTATION:

- 30 days to write
- 30 days to print

ADVERTISING:

- 15 days to write
- 30 days to print
- programmed thru June 1974

PRESS RELEASE:

- 1 week to write
- 3 days to release

MAS

DOCUMENTATION:

- 60 days to write preliminary
- preliminary at announce
- complete documentation at ship
- one set of dates used for complete documentation package

ADVERTISING PROGRAM

	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER
INITIATE:	4/11	4/18	5/14	6/18	7/23	8/20	9/24
COMPLETE:	4/26	5/7	6/4	7/9	8/6	9/3	10/8
PRINT:	5/25	6/4	7/2	8/6	9/3	10/1	11/5
THEME:	SHUGART SA 900 DISKETTE RELIABILITY	~~ANN 902~~ SHUGART DISKETTE SA 900 RELIABILITY	SHUGART 900/902 DISKETTE	SHUGART 900/902 DISKETTE	SHUGART 900/902 DISKETTE	3900 910/912 900/902 SHUGART	3900 910/912 900/902 SHUGART

	DEC.	JAN.	FEB.	MARCH	APRIL	MAY	JUNE
INITIATE:	10/22	11/26	12/24	1/21	2/18	3/25	4/22
COMPLETE:	11/5	12/10	1/7	2/4	3/4	4/8	5/6
PRINT:	12/3	1/7	2/4	3/4	4/1	5/6	6/3
THEME:	900/902 FACILITY 910/912 DISKETTE SHUGART	DDM DDM STATION DISKETTE 2 SHUGART	DDM DDM STATION DISKETTE 2 900/902	900/902 DDM DDM STATION	300 LPM SHUGART 900/902 DDM STATION	300 LPM SHUGART 900/902 DDM STATION	900/902 DDM STATION 300 LPM SHUGART

PRESS RELEASE PROGRAM

	INITIATE	COMPLETE	RELEASE
SA900 ANNOUNCEMENT	4/4	4/11	4/16/73
DLJ ARRANGEMENT	-	-	?
SA902 ANNOUNCEMENT	5/24	5/31	6/4/73
SA3900 ANNOUNCEMENT	9/19	9/26	10/1/73
SA940 ANNOUNCEMENT	12/26	1/3	1/7/74
SA300 ANNOUNCEMENT	3/20	3/27	4/1/74

Miscellaneous Activities:

- Move to new facilities
- Move to new space

DOCUMENTATION PROGRAM

	SA 900			SA 910/912			SA 940 SERIES			PRINTER		
	INIT.	COMP.	PRINT.	INIT.	COMP.	PRINT	INIT.	COMP.	PRINT	INIT.	COMP.	PRINT
BROCHURES	4-11-73	4-26-73	5-23-73	8-15-73	9-3-73	10-1-73	11-16-73	12-7-73	1-7-74	2-1-74	2-25-74	3-25-74
ILL. PARTS CAT.	8-1-73	9-3-73	10-1-73	1-2-74	2-1-74	3-1-4	5-1-74	6-3-74	7-1-74	9-2-74	10-1-74	11-1-74
OEM MANUAL	4-4-73	5-4-73	6-4-73	8-15-73	9-3-73	10-1-73	11-16-73	12-7-73	1-7-74	2-1-74	2-25-74	3-25-74
LOGIC MANUAL	8-1-73	9-3-73	10-1-73	1-2-74	2-1-74	3-1-74	5-1-74	6-3-74	7-1-74	9-2-74	10-1-74	11-1-74
MAINT. MANUAL	8-1-73	9-3-73	10-1-73	1-2-74	2-1-74	3-1-74	5-1-74	6-3-74	7-1-74	9-2-74	10-1-74	11-1-74
IBM COMP. MAN.	4-4-73	5-4-73	6-4-73	8-15-73	9-3-73	10-1-73	11-16-73	12-7-73	1-11-74	-	-	-

DOCUMENTATION PROGRAM

MAS STRATEGY

	Int.	Pre.	Com.
SA600/602	2/18	4/16	9/6

OEM Manual
Logic Manual
Ill. Parts Catalog
Maintenance Manual
3741 Microprogram
3742 Microprogram

SA620	5/1	7/1	1/3

OEM Manual
Logic Manual
Ill. Parts Catalog
Maintenance Manual
3735 Microprogram
2770 Microprogram
2780 Microprogram
Microprogramming Manual

SA640	8/1	10/1	3/3

OEM Manual
Logic Manual
Ill. Parts Catalog
Maintenance Manual
Microprogramming Manual
Small Business Microprogram
RPG. Compiler
Sort
Disk to Disk Utility
Disk to Print Utility

PUBLICATIONS

SCHEDULE OF EVENTS

Status as 5/1, Initiate

APRIL 73

4/4	Initiate	SA900 OEM Manual
4/4	Initiate	SA900 Press Release
4/4	Initiate	IBM Compatibility Manual
4/11	Initiate	SA900 Brochure
4/11	Complete	SA900 Press Release
4/11	Complete	SA900 Advertising for May
4/16	Release	SA900 Press Release
4/18	Complete	SA902 Press Release for June
4/26	Complete	SA900 Brochure Writing
4/26	Complete	SA900 Advertisement for May

MAY 73

5/4	Complete	IBM Compatibility Manual Preliminary by 5/15
5/4	Complete	SA900 OEM Manual Preliminary by 5/15
5/7	Complete	SA902 Advertisement for June
5/14	Initiate	900/902 Advertisement for July
5/23	Print	SA900 Brochure
5/24	Initiate	SA902 Press Release
5/25	Print	SA900 Advertisement for May
5/31	Complete	SA902 Press Release

Mailings May 1

1- OEM Manual

2- SA 900/901 Spec Sheet

3- 902/903 Spec Sheets

4- Ad reprints
Computer World
Elec News.

5- Price Sheet

6- Press Release.

JUNE 73

6/4	Print	SA900 OEM Manual
6/4	Release	SA902 Press Release
6/4	Print	IBM Compatibility Manual
6/4	Complete	900/902 Advertisement for July
6/4	Print	902 Advertisement for June
6/18	Initiate	Advertisement for August

JULY 73

7/2	Print	900/902 Advertisement for July
7/9	Complete	Advertisement for August
7/23	Initiate	Advertisement for September

AUGUST 73

8/1	Initiate	SA900 Illustrative Parts Catalog
8/1	Initiate	SA900 Logic Manual
8/1	Initiate	SA900 Maintenance Manual
8/6	Print	Advertisement for August
8/6	Complete	Advertisement for September
8/15	Initiate	SA910/912-SA3900 Brochure
8/15	Initiate	SA910/912-SA3900 OEM Manual
8/20	Initiate	Advertisement for October, SA3900 System

SEPTEMBER 73

9/3	Print	Advertisement for September
9/3	Complete	SA900 Illustrative Parts Catalog
9/3	Complete	SA900 Maintenance Manual
9/3	Complete	SA900 Logic Manual
9/3	Complete	SA910/912-SA3900 Brochure
9/3	Complete	SA910/912-SA3900 OEM Manual
9/3	Complete	SA910/912-SA3900 IBM Compatibility Manual
9/3	Complete	Advertisement for October, SA3900 System
9/19	Initiate	SA3900 Press Release
9/24	Initiate	Advertisement for November
9/26	Complete	SA3900 Press Release

OCTOBER 73

10/1	Print	SA900 Illustrative Parts Catalog
10/1	Release	SA3900 Press Release
10/1	Print	SA900 Logic Manual
10/1	Print	SA900 Maintenance Manual
10/1	Print	SA910/912-SA3900 Brochures
10/1	Print	SA910/912-SA3900 OEM Manual
10/1	Print	SA910/912-SA3900 IBM Compatibility Manual
10/1	Print	SA910/912-SA3900 Advertisement
10/8	Complete	Advertisement for November
10/22	Initiate	Advertisement for December

NOVEMBER 73

11/5	Print	Advertisement for November
11/5	Complete	Advertisement for December
11/16	Initiate	SA940 Brochures
11/16	Initiate	SA940 OEM Manual
11/16	Initiate	SA940 IBM Compatibility Manual
11/26	Initiate	Advertisement for January

DECEMBER 73

12/3	Print	Advertisement for December
12/7	Complete	SA940 Brochure
12/7	Complete	SA940 OEM Manual
12/7	Complete	SA940 IBM Compatibility Manual
12/10	Complete	Advertisement for January
12/24	Initiate	Advertisement for February
12/26	Initiate	SA940 Press Release

JANUARY 1974

1/2	Initiate	SA910/912-SA3900 Illustrative Parts Catalog
1/2	Initiate	SA910/912-SA3900 Logic Manual
1/2	Initiate	SA910/912-SA3900 Maintenance Manual
1/3	Complete	SA620 Documentation
1/3	Complete	SA940 Press Release
1/7	Print	Advertisement for January
1/7	Complete	Advertisement for February
1/7	Print	SA940 Brochures
1/7	Print	SA940 OEM Manual
1/7	Print	SA940 IBM Compatibility Manual
1/21	Initiate	Advertisement for March

FEBRUARY 1974

2/1	Complete	SA910/912-SA3900 Illustrative Parts Catalog
2/1	Complete	SA910/912-SA3900 Logic Manual
2/1	Complete	SA910/912-SA3900 Maintenance Manual
2/1	Initiate	SA300 Brochure
2/1	Initiate	SA300 OEM Manual
2/4	Print	Advertisement for February
2/4	Complete	Advertisement for March
2/18	Initiate	Advertisement for April
2/18	Initiate	SA600/602 Documentation
2/25	Complete	SA300 Brochure
2/25	Complete	SA300 OEM Manual

MARCH 1974

3/1	Print	SA910/912-SA3900 Illustrative Parts Catalog
3/1	Print	SA910/912-SA3900 Logic Manual
3/1	Print	SA910/912-SA3900 Maintenance Manual
3/4	Print	Advertisement for March
3/4	Complete	Advertisement for April
3/20	Initiate	SA300 Press Release
3/25	Initiate	SA300 Press Release for May
3/25	Print	SA300 Brochure
3/25	Print	SA300 OEM Manual

APRIL 1974

4/1	Print	Advertisement for April
4/8	Complete	Advertisement for May
4/12	Initiate	Advertisement for June
4/16	Prelim.	SA600/602 Documentation

MAY 1974

5/1	Initiate	SA940 Illustrative Parts Catalog
5/1	Initiate	SA940 Logic Manual
5/1	Initiate	SA940 Maintenance Manual
5/1	Initiate	SA620 Documentation
5/6	Print	Advertisement for May
5/6	Complete	Advertisement for June

JUNE 1974

6/3	Print	Advertisement for June
6/3	Complete	SA940 Illustrative Parts Catalog
6/3	Complete	SA940 Logic Manual
6/3	Complete	SA940 Maintenance Manual

JULY 1974

7/1	Print	SA940 Illustrative Parts Catalog
7/1	Print	SA940 Logic Manual
7/1	Print	SA940 Maintenance Manual
7/1	Prelim.	SA620 Documentation

SEPTEMBER 1974

9/2	Initiate	SA300 Illustrative Parts Catalog
9/2	Initiate	SA300 Logic Manual
9/2	Initiate	SA300 Maintenance Manual
9/6	Complete	SA600/602 Documentation

OCTOBER 1974

10/1	Complete	SA300 Illustrative Parts Catalog
10/1	Complete	SA300 Logic Manual
10/1	Complete	SA300 Maintenance Manual
10/1	Prelim.	SA640 Documentation

NOVEMBER 1974

11/1	Print	SA300 Illustrative Parts Catalog
11/1	Print	SA300 Logic Manual
11/1	Print	SA300 Maintenance Manual

OPERATING
Plan

OPERATIONS PLAN OUTLINE

Section 0.0 Introduction

Section 1.0 Product Descriptions

Section 2.0 Schedules

Section 3.0 Product Cost Analysis

- Section 3.1 Drive Program
- Section 3.2 Printer Program
- Section 3.3 Processor Program
- Section 3.4 MAS Program

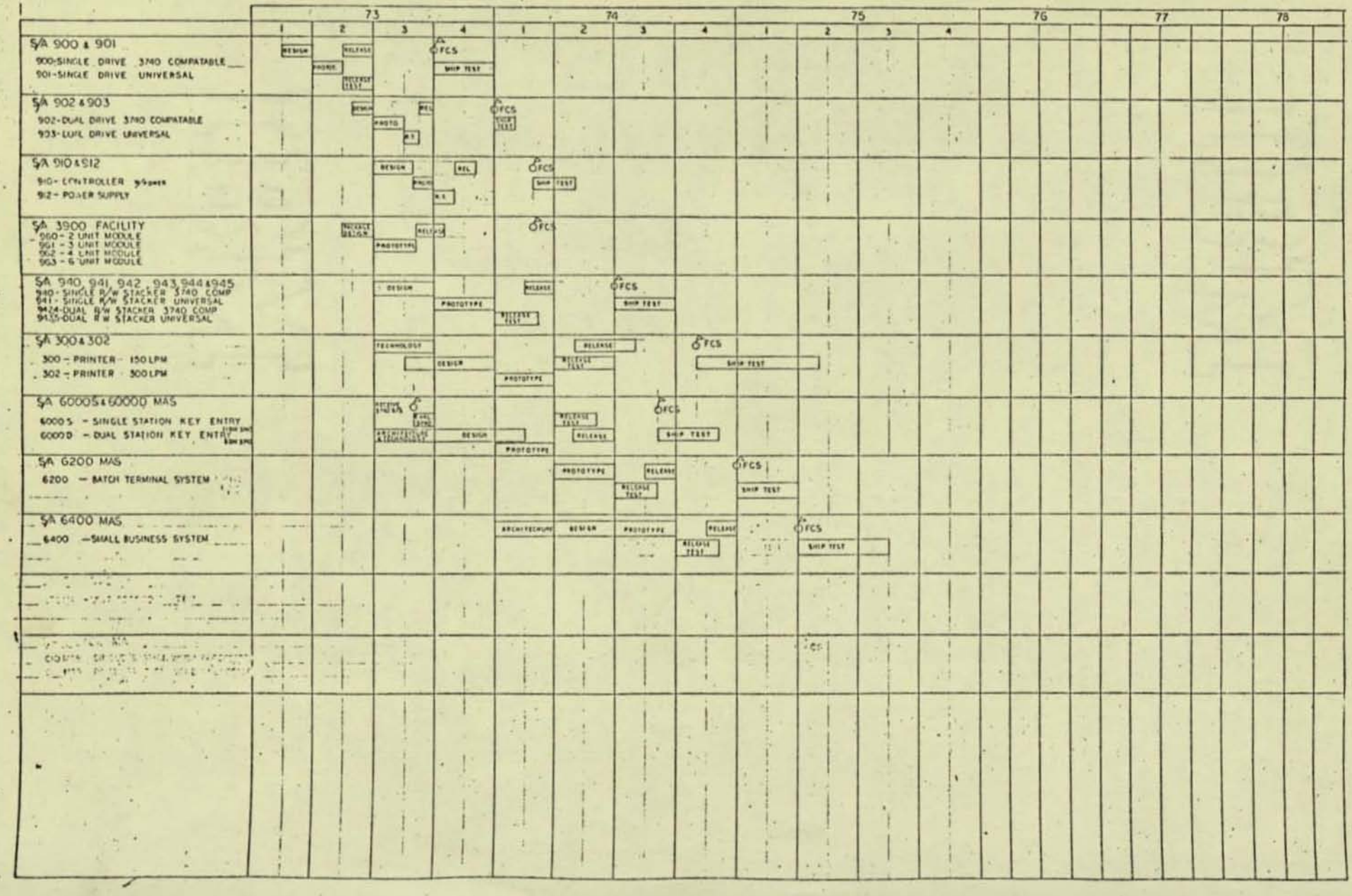
Section 4.0 Operations Summary

- Section 4.1 Expenditures
  - 4.1.1 Labor and Material
  - 4.2.2 Capital Equipment
- Section 4.2 Manpower

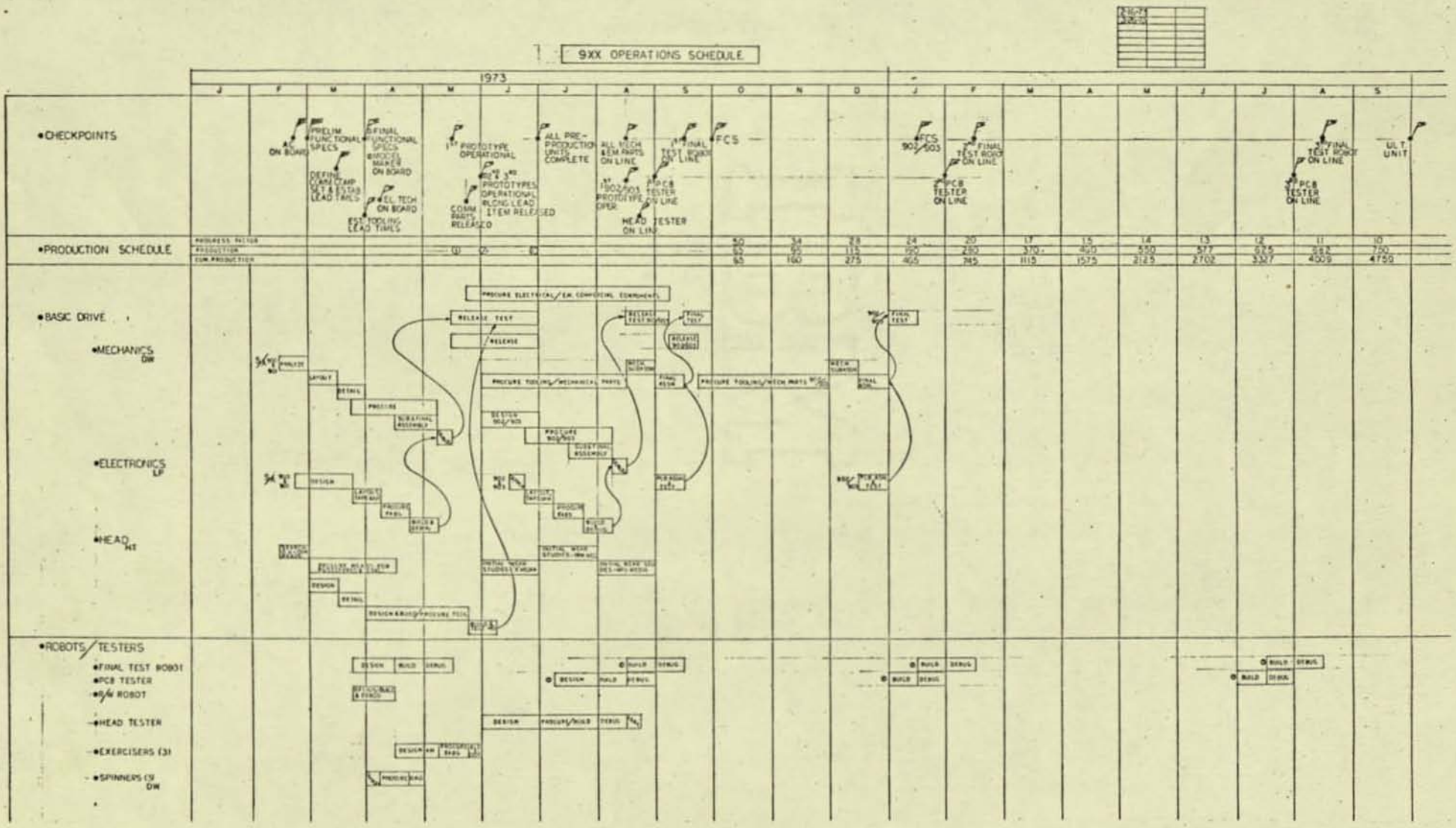
Section 5.0 Facility Requirements

Section 6.0 Risks/Exposures

MASTER SCHEDULE



9XX OPERATIONS SCHEDULE



3.0 PRODUCT COST ANALYSIS

3.0.1 Product Cost Analysis

3.0.1.1 Introduction

The essence of an Operations Plan is the product cost analysis. Most Operations Plans are based upon macro estimates which employ a percentage extrapolation technique to determine major cost components such as manufacturing technical support, warranty, engineering support, material burden, etc. After the extrapolations are established - an algorithmic exercise which in many instances requires extrapolations on extrapolations - a contingency factor (often referred to as an ignorance factor) is applied to justify all approximations. Although the use of macro estimates are appropriate in many situations, it is highly desirable, where possible, to use an approach which provides substantially more detail and consequently a more accurate cost analysis. The approach utilized by Shugart Associates in preparing its product cost analysis is based upon a "micro" analysis technique. A "micro" analysis requires a significant amount of time; the fact that a micro analysis can be performed at all implies a thorough understanding of not only the product, but the entire development, release, manufacturing and support cycles.

3.0.1.2 Algorithm

A micro analysis starts from basic fundamentals such as the ultimate direct labor and material contained in the product. (Ultimate implies that no further cost improvement can be achieved. The unit number at which the ultimate cost is reached is a function of both the time the product has been in production and the cumulative number of units built.) The ultimate material and labor can be analyzed by part number, subassembly, assembly, function, etc. For this analysis, since a "Build Tree" for each product has not been established, the material and labor is analyzed by function. In all instances the estimates are very conservative, as exemplified by the comparision between the projected estimates and the actual quotes received to-date on the Flexible Disk Drive.

Once the labor and material is estimated, the direct labor and material costs as a function of time are calculated from the production schedule and learning curves, with adjustments for the material and labor pipe lines and production efficiency. All assumptions (e.g. labor pipe) and definitions are contained in a section

at the front of each Cost Analysis. For all products a learning curve with a slope of .8 for material and labor is used. This is a typical learning curve for EDP equipment, obtained from past product data. (A learning curve for each product is contained in the appendix of each section of the Cost Analysis. It defines the labor and material cost as a function of unit number normalized to the cost of the ultimate unit cost.)

By definition, direct labor implies all labor employed in the assembly, test, shipping, etc. of the product (i.e. "hands on" labor).

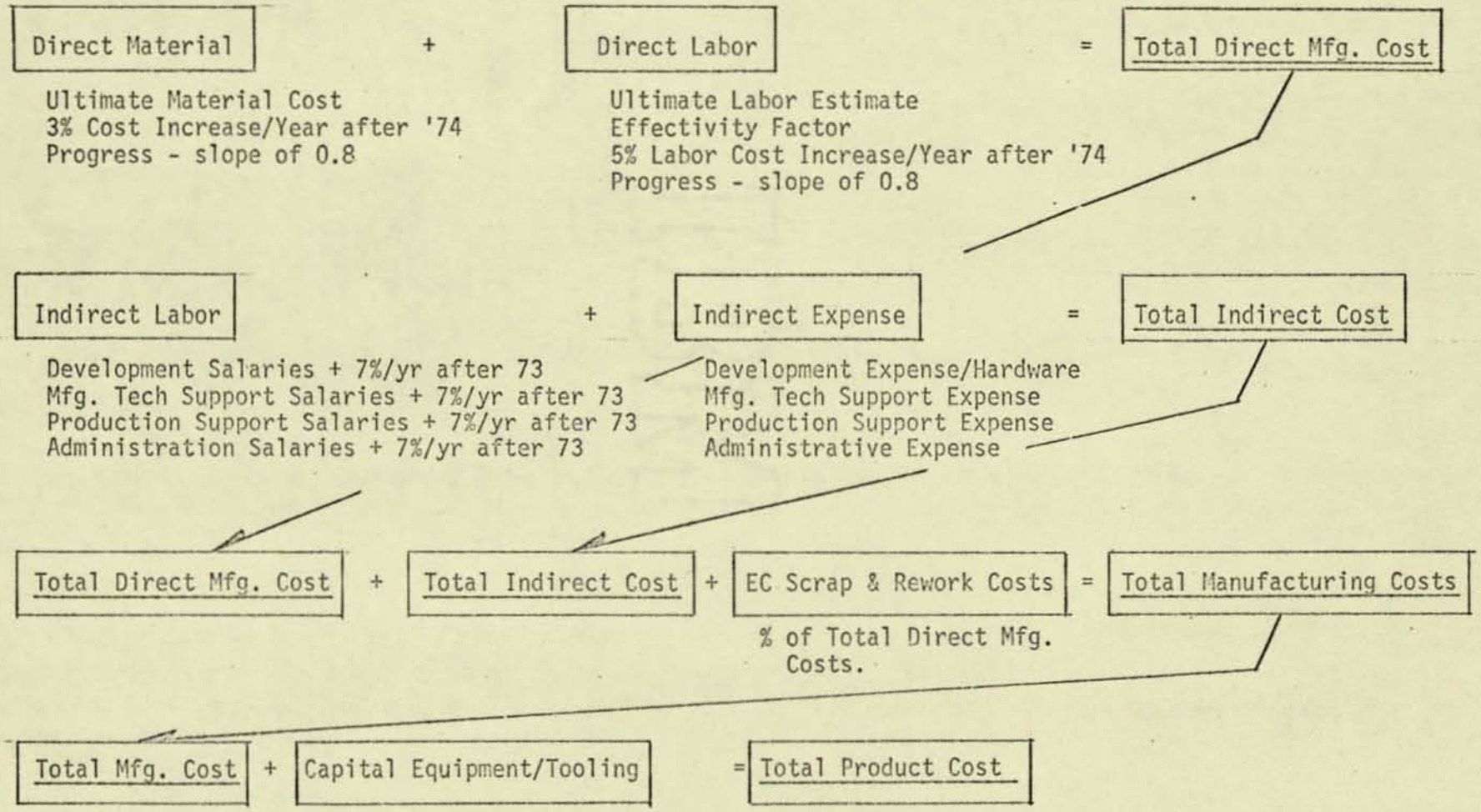
There is also Indirect Labor, such as Engineering, Product Control, Purchasing, Administration, and so forth. With a "macro" analysis, Indirect Costs would be estimated as a percentage of Direct Costs. With the "micro" analysis approach however, the Indirect Costs are calculated by defining by function and within that function, the skills required as a function of time and the cost of that skill (salary).

EC Scrap and Rework, and Capital Equipment are calculated in a like manner, starting with fundamentals such as an EC projection or detailed tooling requirements and working forward to obtain these cost factors in total, and as a function of time.

Warranty Costs are calculated from a UI (Unscheduled Interrupt) rate, which is a function of time, and an estimate of the direct labor and material cost of the replacement parts, adjusted for the learning curve. From the UI rate and direct labor and material costs, the total warranty cost as a function of time is calculated assuming a three-month warranty period and an indirect cost (burden) appropriation.

The following chart illustrates the Cost Analysis procedure employed.

PRODUCT COST ANALYSIS

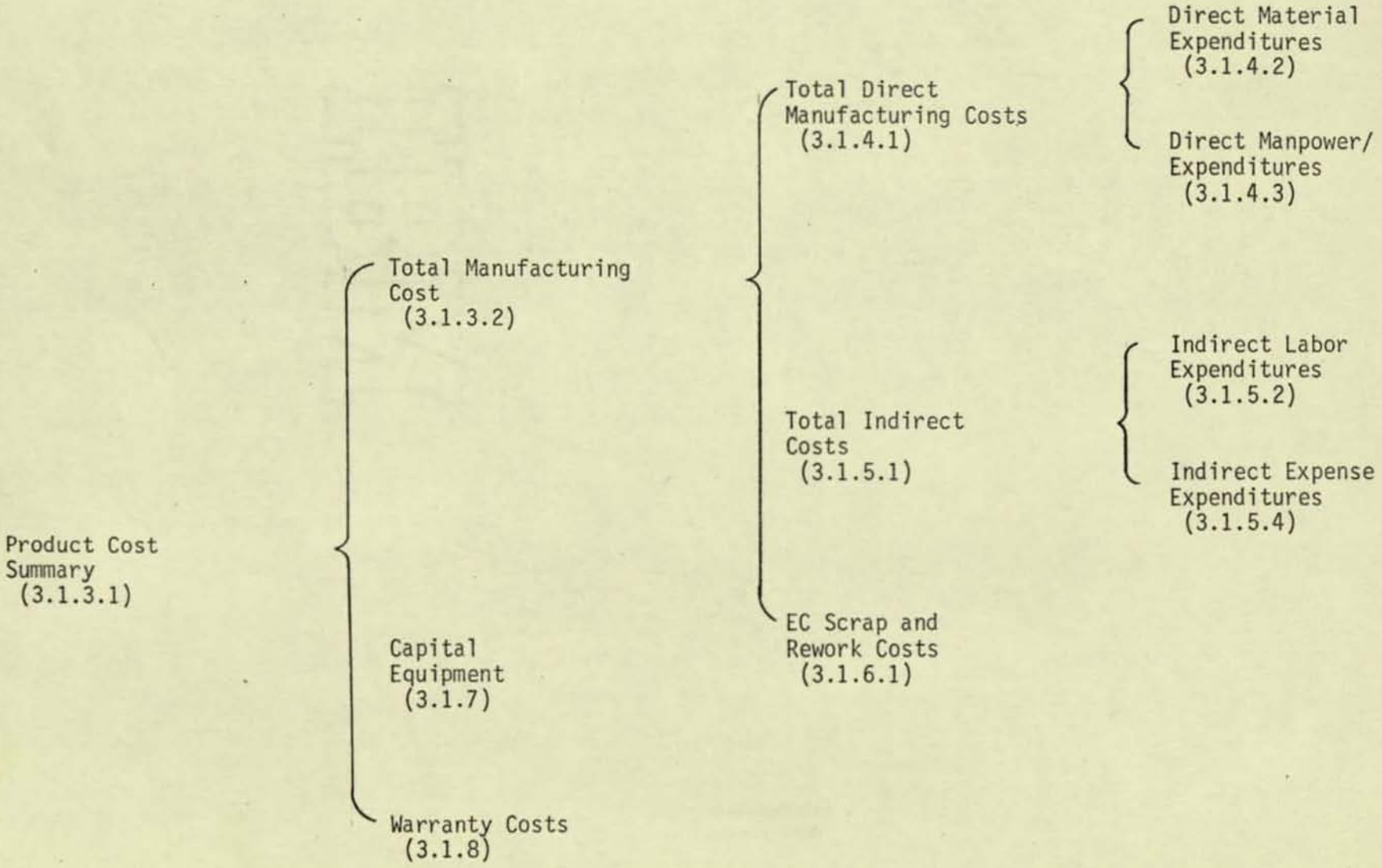


3.0.1.3 Organization of Results

The results are organized in such a manner as to present the summary information for each section first, followed by the data supporting the summary. As an example, the Total Mamufacturing Cost/Expenditure Schedule summarizes all expenditures (except capital equipment and warranty) in total and as a function of time; it includes Direct Costs, Indirect Costs, and EC Scrap and Rework Costs. Each one of these cost components has its own section with a further breakdown showing all the detailed cost components included. For example the section on Direct Costs has a summary and one breakdown for Material Costs and another for Labor Costs; the labor is further broken down showing the requirements in time by function and group.

The following illustrates the cost breakdown for Section 3.1.

Cost Breakdown for Section 3.1



3.0.1.4 Quantity Sensitivity Analysis

An analysis to determine the sensitivity of AUC (Average Unit Cost) with total program quantity was performed on all programs except MAS. In each instance the procedure was the same; the last three years of production were either halved or doubled to determine the effect on AUC.

3.1 PRODUCT COST ANALYSIS

DRIVE PROGRAM

S/A 900

S/A 901

S/A 902

S/A 903

INDEX

Section 3.1

3.1.9 Quantity Sensitivity Analysis

- 3.1.9.1 Product Cost Summary - Low, Base, and High Program Quantities
- 3.1.9.2 Total Manufacturing Cost/Expenditure Schedule - High Program Quantity
- 3.1.9.3 Total Manufacturing Cost/Expenditure Schedule - Low Program Quantity
- 3.1.9.4 Average Unit Cost vs. Program Quantity

3.1.10 Appendix

- 3.1.10.1 Direct Labor Estimate - Ultimate
- 3.1.10.2 Material Cost Estimate - Ultimate
- 3.1.10.3 Learning Curve

3.1.1 ASSUMPTIONS/DEFINITIONS