MARKETING PLAN

I. EXECUTIVE SUMMARY

II. OBJECTIVES AND GOALS [SALES, MARKETS, PRODUCTS, ORGANIZATION]

III. STRATEGIES AND OPERATIONAL PRIORITIES

IV. MARKETS

- Market Definition
- Market Characteristics
- Business Environment
- Technology Trends and Impacts
- Market Development and Strategies
  - Domestic
  - European
  - Asian

V. PRODUCTS

- Product Line Definition
- Product Evolution
- Competitive Product Evaluation
- Product Strategies

VI. COMPETITIVE STRENGTHS AND WEAKNESSES

VII. ORGANIZATION AND RESOURCES

- Manpower
- Performance
- Organization and Charters
- Strengths and Limitations

SECTION I

MARKETING PLAN

EXECUTIVE SUMMARY

INTRODUCTION

The Marketing Department Plan has been developed in concert with both the long range (LRF) and 1973 Division Business Plans. A bottoms up business approach, this plan and its major objectives and goals establish requisite marketing operations and Marketing Department strategies for 1973.

The basic Marketing Department objectives of the 1973 Plan include:

- Continue introduction of the Sentry test equipment product line and its enhancements.
- Selectively introduce new products into markets which were penetrated in 1972, with particular emphasis on PCB, linear and memory test products.
- Improve upon operational programs and business system initiated in 1972 which control cost and lead to improvement of productivity and efficiency of all marketing operations.
- Strengthen product and systems planning functions with particular emphasis in the timely definition of future product concepts.
- Extend product planning functions to achieve better sales visibility of existing products and enhancements.

- Expand application program coverage, library and capability.
- Improve planning proficiency and establish market research data in new markets which offer the Division an opportunity to either increase penetration in 1973 targeted markets or add new markets not currently served.
- Continue to strengthen International marketing organizations.
- Improve data gathering functions to provide more effective short and long term sales forecasting.
- Develop operational and personnel hiring guidelines to buffer impact of future business fluctuations.

In the following sections of this report, specific opportunities are quantified and strategies and goals are recommended to achieve the broad objectives outlined above. The business plan provides a basic approach for improving the Division's posture in the current served markets and extending penetration into several new markets for which the Division's products are suitable, i.e., PCB/subassembly testing, memory testing and selected areas of linear testing.

Through implementation of the proposed plan, the 1973 net effect for the Division will be sales and profit improvements over 1972, e.g., from a before-tax-profit of $1.5 million dollars to a profit of $1.8 million, coupled with a 29% increase in sales.

These improvements will be achieved by continuing the actions initiated in 1972 to improve cost control; to continue introduction of the Sentry product line and its enhancements; to increase penetration of the ATE market; and to increase Fairchild System's share of the International market.

SECTION II

MARKETING DEPARTMENT - 1973 OBJECTIVES AND GOALS

GENERAL

The major objectives and goals for the Marketing department include:

- o $16.3 million sales goals for semiconductor test markets
- o $3.7 million sales goal for Government ATE market
- o Sentry product line and enhancement introduction
- o Control of operating expenses in accordance with Division Business Plan
- o Strengthen Product Marketing and Product/Business Planning Functions
- o Initiate 4th generation Product Line Plans
- o Increase International Marketing Sales Activities
- o Provide "fail soft" buffer to manage department expenses for fluctuations in division business

Each of the above objectives and goals will be discussed in this section of the report. Strategies to satisfy these requirements will also be the subject of this section.

1973 OBJECTIVE -- SALES GOALS

DIVISION GOAL

- CTS Sales: $6.3M
- CTS Booking: $19.5M

DIRECTORATE OBJECTIVES

- Establish market quotas

North American

$13.4M $11.358M

Europe

$3.48M $3.20M

Far East

$2.62M $1.75M

DEPARTMENTAL OBJECTIVES

- 1973 Area Quotas

	Bookings		Sales
West	$4.8 M		$4.05M
East	$4.3 M		$3.63M
Central	$2.6 M		$2.24M
Interdiv.	$1.7 M		$1.43M
Europe	$3.48M	$3.20M	~~$3.86M~~
Japan	$2.44M	$1.65M	~~$2.00M~~
Asia	$ .18M	$ .10M	~~$ .18M~~
	~~$19.5~~ M 18.7 M		$16.3 M

- Gov't ATE Sales: $3.7M

Gov't ATE Bookings:

$4.8M

- Establish market quotas

- 1973 ATE quotas

	Bookings	Sales
	$4.8 M	$3.7M
TOTAL	~~$24.3~~ $22.5 M	$20.0M

OBJECTIVE -- MANAGE BUSINESS FOR FLUCTUATIONS

DIVISION OBJECTIVE

- Manage business for ± 20% variations, i.e., "build a failsoft operation"

DIRECTORATE OBJECTIVES

- Review and approve fundings for outside services rather than build up Marketing Department personnel to meet 100% of business requirements

DEPARTMENTAL OBJECTIVES

Sales Department

- Augment direct sales force with representative organizations for selected International and Domestic sales areas.

Planning Department

- Subcontract selected, market studies to qualified consultants.
- Subcontract development of miscellaneous marketing sales and support tools.
- Improve planning proficiency by developing various computerized planning tools.

Marketing Services

- Field out mailing and dissemination of advertising materials.
- Subcontract selected advertising, art and technology tasks.

Training

- Build up visual library -- use outside service to prepare training materials.

Applications

OBJECTIVE -- INCREASE INTERNATIONAL MARKETING/SALES ACTIVITIES

DIVISION OBJECTIVES	DIRECTORATE OBJECTIVES	DEPARTMENTAL OBJECTIVES
• Increase International Sales	• Continue augmentation of European marketing and sales forces • Expand sales offices (share corporate facilities where possible) • Establish marketing manager to serve as liaison between sales area and headquarters.	• International marketing manager to coordinate European and Far East sales and support.

OBJECTIVE -- INITIATE FUTURE PRODUCT LINE PLANS

DIVISION OBJECTIVES

- Initiate 4th genera- product line formulation

DIRECTORATE OBJECTIVES

- Review and approve 4th generation product and market plans.
- Provide direction in future product line strategies

DEPARTMENTAL OBJECTIVES

Product/Business Planning

- Define long range technology, trends, and future market requirements
- Establish product requirements to meet long range market needs.
- Define magnitude of business opportunities for identified future test requirements
- Prioritize and select future product application areas.
- Develop plan to phase in 4th generation and phase out 3rd generation products
- Define product requirements and specifications.

OBJECTIVE - INTRODUCE SENTRY PRODUCT LINE & ENHANCEMENTS

Division Objectives

Introduce products & enhancements

Directorate Objectives

- Initiate and approve product & enhancement specifications
- Initiate and approve product training program
- Initiate and approve product advertisements
- Initiate and approve product marketing strategies
- Establish quantity purchasing policies
- Review and establish trade in policies
- Review feedback and recommend and approve strategy modifications

Departmental Objectives

Product Business Planning

- Gather competitive information
- Coordinate all aspects of product introduction and pricing
- Prepare product and enhancement specifications and establish priorities
- Prepare marketing strategies
- Review and contribute to advertising program
- Contribute to training sessions
- Review field feedback information and adjust strategies
- Provide long term product support
- Participate in training programs
- Provide product application support
- Prepare mid long term product forecasts

Marketing Support

- Prepare customer mailing lists
- Prepare advertisement material
- Coordinate key trade shows and exhibitions

Area Sales

- Attend training sessions
- Execute marketing strategies
- Submit sales forecasts
- Submit area mailing lists
- Feedback sales impact for marketing strategies to directorate and product planning
- Prepare proposals

Applications

- Prepare test plan library
- Prepare application notes
- Prepare computer aided Test Plan generation capability

Training

- Document product implementation and utilization
- Prepare training programs (Customer, Field Service, Sales personnel, etc.)

Contract Administration

- Participate in pricing strategies
- Advise in quantity shipment policies
- Advise on trade in policies
- Participate in proposal generation

Exhibit II-8

OBJECTIVE - PROFITABILITY

Division Objectives

- Implement programs to control cost; improve productivity and profitability to achieve pretax profit level of $1.8M in 1973

Directorate Objectives

- Approve budgets based on division business plan
- Monitor and control spend rate
- Establish marketing organization commensurate with sales objectives

Departmental Objectives

All Departments

- Control spending within allocated budget
- Submit budgets for approval

Contracts Administration

- Monitor and control departmental spend rates

Product Planning

- Initiate product & enhancement introduction plans

Applications

- Initiate method for reducing test plan generation cost
- Establish test plan/fixture library
- Develop standardized system test demonstrations.

Exhibit II-9

OBJECTIVE - IMPROVE PLANNING

Division Objectives

- Initiate product and business planning functions
- Improve planning proficiency, establish market data bank, and provide direction for greater market penetration or new market entry

Directorate Objectives

- Establish product and business planning organizations
- Define responsibilities
- Institute hiring of personnel
- Prepare operating budgets for all planning functions

Departmental Objectives

Product Planning

- Review products and institute strategies in concern with market strategies developed below
- Review market requirements and develop new product specifications (Memory/Dynamic/Linear/PCB testing)
- Study and formulate plans for 4th generation product line
- Formulate and carry out product introduction plan

Business Planning

- Develop division business plan
- Identify new market opportunities
- Develop, institute, and monitor marketing strategies
- Develop marketing data base
- Develop long range forecast model

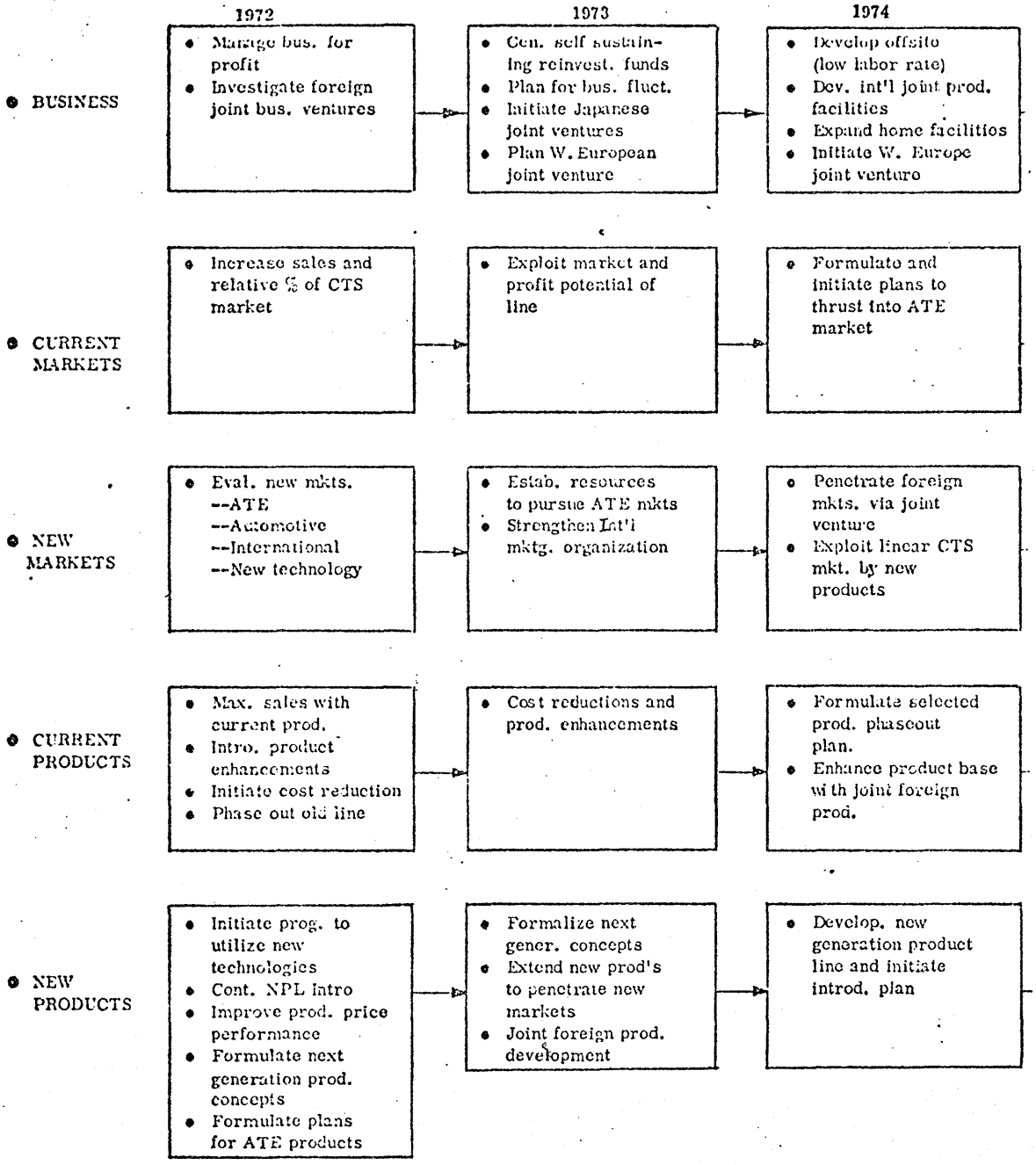
SECTION III

STRATEGIES AND OPERATIONAL PRIORITIES

Major strategies to achieve the goals and objectives defined in the previous section are presented as a roadmap in Exhibit III-1. These are further defined as product and market strategies in Sections IV and V. Department Operational Priorities which address the strategies as concise task assignments, personnel responsibility and task completion date will be found in Exhibit III-2.

EXHIBIT III-1

ROADMAP OF FST STRATEGIES



Information
to be Submitted

DEPARTMENTAL STRATEGIES

STRATEGIES -- DOMESTIC SALES (Jack Harris)

- SALES/BOOKINGS BY AREA
- SALES/BOOKINGS BY PRODUCT
- PERSONNEL REQUIREMENTS
- FACILITIES REQUIREMENTS
- MAJOR STRATEGIES/TACTICS TO ACHIEVE SALES OBJECTIVES
  - -- PRODUCT STRATEGIES
  - -- MARKET STRATEGIES
    - TRADESHOWS
    - ADVERTISING
    - DEMO
    - POLICIES

STRATEGIES -- INTERNATIONAL SALES

EUROPEAN (George Stoeppel)

- SALES/BOOKINGS BY AREA
- SALES/BOOKINGS BY PRODUCT
- PERSONNEL REQUIREMENTS
- FACILITIES REQUIREMENTS
- MAJOR STRATEGIES/TACTICS TO ACHIEVE SALES OBJECTIVES
  - -- PRODUCT STRATEGIES
  - -- MARKET STRATEGIES
    - TRADESHOWS
    - ADVERTISING
    - DEMO
    - POLICIES
    - JOINT VENTURE

ASIAN (Al Perry)

- SALES/BOOKINGS BY AREA
- SALES/BOOKINGS BY PRODUCT
- PERSONNEL REQUIREMENTS
- FACILITIES REQUIREMENTS
- MAJOR STRATEGIES/TACTICS TO ACHIEVE SALES OBJECTIVES
    - -- PRODUCT STRATEGIES
    - -- MARKET STRATEGIES
        - TRADESHOWS
        - ADVERTISING
        - DEMO
        - POLICIES
        - JOINT VENTURE

R O W

- SALES/BOOKINGS BY AREA
- SALES/BOOKINGS BY PRODUCT
- PERSONNEL REQUIREMENTS
- FACILITIES REQUIREMENTS
- MAJOR STRATEGIES/TACTICS TO ACHIEVE SALES OBJECTIVES
    - -- PRODUCT STRATEGIES
    - -- MARKET STRATEGIES
        - TRADESHOWS
        - ADVERTISING
        - DEMO
        - POLICIES

STRATEGIES - PLANNING (V. Scarich)

- MAJOR PRODUCT PLANNING ACTIVITIES

  NEW PRODUCTS

  PRODUCT ENHANCEMENTS

- MAJOR BUSINESS PLANNING ACTIVITIES
- PRODUCT SUPPORT ACTIVITIES
- DEBT BUDGET CONTROL

STRATEGIES - MARKETING SERVICES (G. Daggy)

- ADVERTISING PROGRAM
- TRADESHOWS
- PERSONNEL
- LITERATURE

✓ STRATEGIES - APPLICATIONS (R. Huston)

- SALES SUPPORT
- DEMO
- PERSONNEL
- OTHER

TRAINING (G. Daggy)

- PROGRAM
- TECHNIQUES
- PERSONNEL
- OTHER

APPLICATIONS DEPT. OBJECTIVES 1973

- Sales Support

  Obtain new equipment such as the Time Option and 1 Nanosecond Option for demonstrations and development of applications software.

  Develop a seminar program for in-house and customer presentations.

- Field Support

  Continue recruiting and training of regional Applications engineers for national and international support of systems.

- Applications of Current Equipment

  Develop data management capability for systems such as wafer maps, RAM displays, histograms, curve plotting, etc. Use new software techniques for binning strategies, time measurements, pin deskewing, auto calibration, etc.

  Training of Applications personnel in Fault Isolation and Fairsim software for P.C. board testing.

- Data Conversion and Generation

  Develop software for user data format conversion. This does not mean complete automatic conversion of test programs from one system to another, but includes statement conversion. Also, investigate and apply procedures for reduction of test program generation efforts through facilities like ROMPAT, RAMPAT, etc., especially for calculator or communications type logic.

  Investigate software for parallel testing techniques for small pin count devices on large pin count test needs.

- New Products or Product Enhancements.

  Work with Product Marketing and Engineering to implement system enhancement ideas and new product definitions

  Training of Applications personnel on new equipment such as Linear, Time and Memory Test machines.

SECTION IV

MARKET AND BUSINESS ANALYSIS

1. Market Definition

2. Market Characteristics

   Size

   Share

   Growth

3. Business Environment

   Domestic

   Japan

   Europe

4. Test Equipment Market Development and Strategies

   - Domestic
   - European
   - Asian

SECTION IV MARKET/BUSINESS ENVIRONMENT FOR FAIRCHILD SYSTEMS PRODUCTS

4.0 THE MARKET

Fairchild Systems products serve a number of market segments within the overall automatic test equipment market. An overview of this market will be found in Exhibit IV-1. Those general business areas pursued by Fairchild include:

- Industrial
- Government
- Service

Within these major business areas are two broad sub-categories:

- Semiconductor Manufacturers
- Semiconductor Users

Although the industrial segment is composed of both users and manufacturers, the government and services markets are composed entirely of users. As shown in Exhibit IV-1 users can be further categorized by two categories; i.e., component and PCB/module (ATE) testing.

SEMICONDUCTOR MANUFACTURERS

COMPONENT TEST SYSTEMS

- FINAL TEST
- PRODUCTION CONTROL
- R and D ENGINEERING
- QA/HI RELIABILITY

SEMICONDUCTOR USERS

COMPONENT TEST SYSTEMS

- INCOMING INSPECTION

AUTOMATIC TEST EQUIPMENT

- PCB TEST - HYBRID (NOT PRESENTLY SERVED)

- PCB TEST - DIGITAL
- PCB TEST - ANALOG (NOT PRESENTLY SERVED)
- BACKPLANE TESTING (NOT SERVED)
- SUB-ASSEMBLY SYSTEMS TESTING (NOT SERVED)

Historically, about 75% of Fairchild Systems' sales have been to Semiconductor Manufacturers and 25% to Semiconductor Users. Within the user category, most sales have been made to the larger electronic companies such as computer manufacturers and large systems houses. The size of the world-wide Semiconductor test market currently exceeds 56 million dollars (65 million dollars if market includes linear, hybrid and laser trim products) and growing at an average annual rate of 13%. See Exhibit IV-2. The estimate for the total available market for ATE is approximately $159 million for government segment and $18.5 million for Industrial segment. These numbers are substantiated in Exhibit IV-3 and IV-4.

4.1 MARKET CHARACTERISTICS

4.1.1 Size -- The current served market, which includes Semiconductor Manufacturers and selected Semiconductor Users, has been sized by extracting sales information from annual reports published by each of the competitive test equipment manufacturers. Exhibit IV-2 relates the sales volumes for 1967-72; and relative share of the served market for each of the competitors.

4.1.2 Market Share -- The 1971-1972 world-wide Semiconductor Component Test Equipment Market share is ranked by competitors as follows:

	1971	1972	± Δ Share of Market
Teradyne	30%	24.6%	-3.6%
FSTD	20.6%	23.2%	+2.6%
Macrodata	7.0%	8.3%	+1.3%
Microdyne	4.0%	3.0%	-1.0%
E-H	12.5%	10.0%	-2.5%
Datatron	5.2%	4.1%	-1.1%
Lorlin	2.5%	4.1%	+1.6%
Adar	1.2%	1.6%	+ .4%
Others	17%	18.3%	+1.3%

Teradyne and Fairchild have a combined share of approximately 50% of the total world-wide market. The combined FSTD/Teradyne 1973 share will continue to drop slightly because of increased competition from manufacturers of small benchtop products and MOS testers. However, Fairchild's relative position should continue to improve in 1973. This improvement is expected from the impact of the Sentry product line and its extensions, and also from more aggressive international sales.

4.1.3 ATE Market - This market is composed of "users" who employ products to test PC boards, circuit modules, sub-assembly and assemblies. The market is split into two submarkets which are unique to customer; viz., government and industrial. The respective market size and growth information will be found in Exhibits IV-3 and IV-4.

EXH IV-1

OVERALL TEST EQUIPMENT MARKET

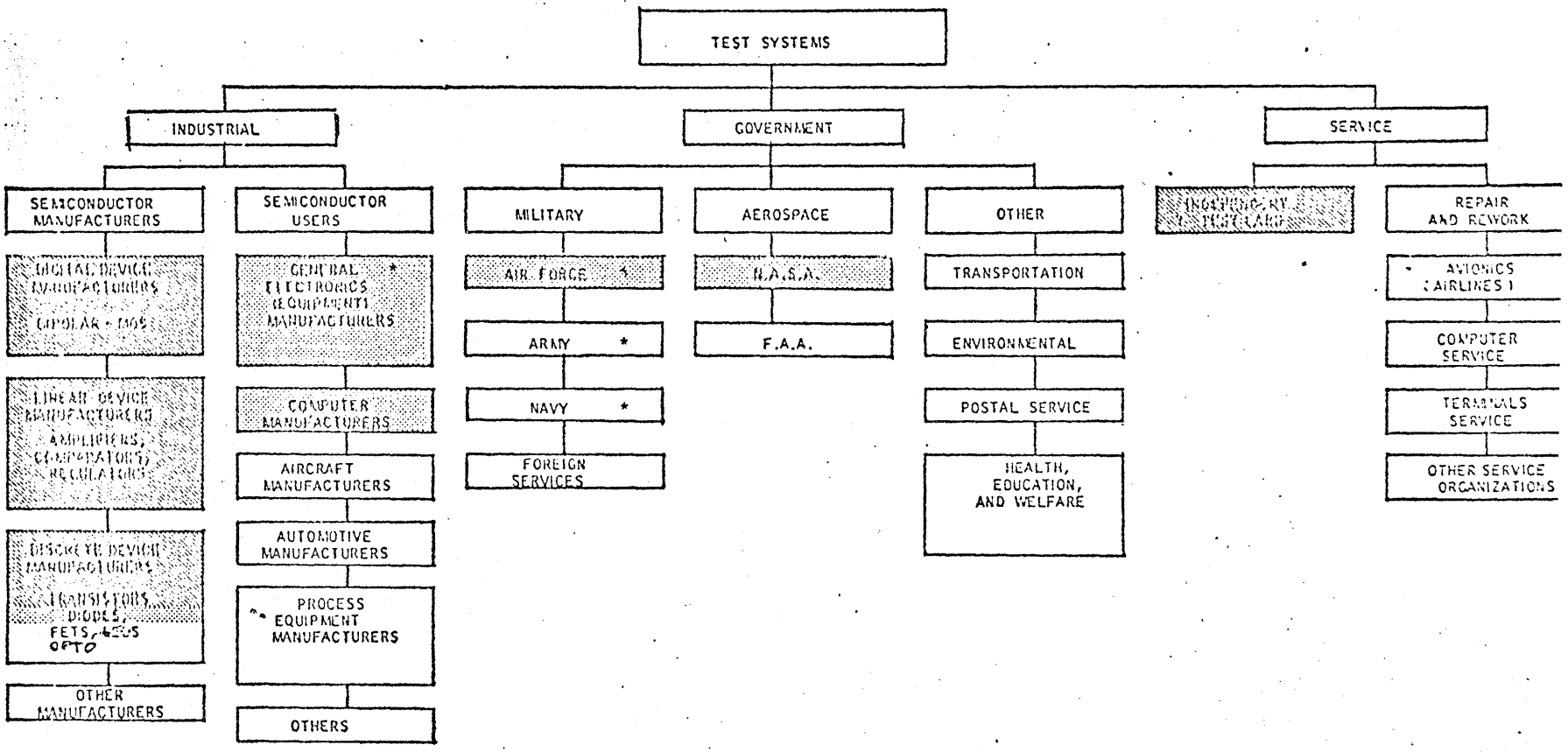
TEST BUSINESS AREA BY INDUSTRY CLASSIFICATION

I. PRODUCT BASE

II. BUSINESS AREA

III. INDUSTRY

IV. INDUSTRY - SPECIFIC



High Market Penetration

Little Market Penetration

No Market Penetration

* Denotes new or increased marketing activities

SEMICONDUCTOR TEST SYSTEM MARKET
SALES VOLUME BY TEST EQUIPMENT MANUFACTURERS

	1966	1967	1968	1969	1970	1971	1972 est.
[illegible]TD	[10.5M]	[10.7M]	[9.55M]	16.4M [12.75M]	12.42M [10.42M]	8.3M [8.3]	15.5M [14.0]
Teradyne	3,81M [1.9M]	5.51M [3.5M]	9.11M [7.75M]	15.38M [13.0M]	18.17M [16.3M]	13.0M [12.0]	18.3M [13.0]
Microdyne/ Computest	5.23M -	5.88M -	6.08M [.25M]	7.74M [1.0M]	9.17M [1.8M]	4.2M [1.6M]	4.8M [1.8]
Datatron	- -	.73M -	2.179M -	4.77M -	5.21M [.90M]	4.2M [2.1]	4.6M [3.0]
Macrodata	-	-	-	-	[.08M]	[2.8M]	[5.0M]
Research	1.8 -	2.1 [.5M]	2.7 [.8M]	3.8 [1.0M]	5.0M [2.0M]	10M [5.0]	15M [6M]
Adar	-	-	[.1M]	[.2M]	[.3M]	[.50M]	[1.0M]
Lorlin	-	-	[.8M]	[1.2M]	[.9M]	[1.0M]	[2.5M]
Others	[3.0M]	[5.0M]	[10.0M]	[14.0M]	[17.0M]	[15.5M]	[18.7M]
Total Semiconductor Test Systems Business[1]	16.0M	22.9M	32.6M	47.0M	54.5M	49.3M	65 M

[1]Note: [$M] Indicates sales to worldwide served market: where served market includes testing of all Semiconductor components but does not include PCB/module test products.

EXHIBIT IV-3

DIGITAL/HYBRID PCB TEST MARKET
(INDUSTRIAL ATE MARKET SEGMENT)

DIGITAL TEST	1968	1969	1970	1971	1972	1973
FSTD	--	.05	.3	.4	.3	
Teradyne	--	.30	.25	.3	.9	
Datatron		--	.3	.4	.5	
General Radio		.5	1.0	1.5	2.5	
Digital General		.05	.3	.5	.7	
H.P.		.4	.2	--	--	
Others		.5	.6	1.0	2.0	
Subtotal		1.8M	2.95M	4.1M	6.9M	8.6M est.
HYBRID TEST						
Collins		.3	2.0	.5	--	
Bendix		5.0	4.0	2.5	6.0	
AVCO		.5	.5	3.0	2.0	
Ind. Eng.		--	--	2.0	3.0	
Honeywell		1.0	.8	.8	4.0	
H.P.		.7	.7	1.0	1.5	
Others		.5	.9	1.0	2.0	
Subtotal		8.0M	8.9M	10.8M	18.5M	23.4M
TOTAL		$9.8M	$11.85M	$14.9M	$25.5M	$32M est.

EXHIBIT IV-4

DIGITAL/HYBRID PCB-MODULE TEST MARKET

(GOVERNMENT MARKET SEGMENT)

	1968	1969	1970	1971	1972	1973
PRD	16	60	75	100	85	80
Emerson	35	40	25	8.5	3	1
Bendix	--	--	--	2	2	18
HP	--	10	5	15	20	25
RCA	20	15	15	12	8	10
AVCO	--	--	1	5	1.0	2
AAI	--	2	2	13	18	20
Fairchild Systems	--	--	--	--	1.5	2.5
Others	7	10	28	36	53.5	57.5
Est. Total Gov't Market	$78M	$137M	$150M	$187M	$212M	$216M
Served Gov't ATE Market[1]	--	$40M	$48M	$65M	$76M	$78M est.

4.2 BUSINESS ENVIRONMENTS

4.2.1 BUSINESS ENVIRONMENT - Domestic

Analyses charts which define pertinent internal and external influences on test equipment sales, and therefore dictate strategic planning considerations, are illustrated in Exhibits IV-6 and IV-7.

Gross national product, government spending, electrical machinery orders, and semiconductor sales forecast charts are illustrated in Exhibit IV-7. Government electronic equipment spending is also included because it has historically been a major impact on the semiconductor industry, i.e., over 50% of the semiconductor sales have been made directly or indirectly to government agencies, however, this is expected to decline in the near future.

An overview of U. S. economy and business expectations for 1973 have been compiled from various sources (i.e., G. E., Fairchild C & I and EIA).

1973 -- FIRST HALF

- Real GNP will be up at a 5.4 percent annual rate. This is down from 6.4 percent in 1972.
- Tax refunds and higher social security payments will boost the federal deficit to $36 billion (NIA Basis) -- spendable income will rise at 13 percent rate.
- In real terms, business fixed investment will accelerate at 8.6 percent rate while producers' durables will rise at 10.3 percent rate.
- Unemployment rate will drop to 5.4 percent from 5.7%.
- Income growth and confidence will support spending on appliances and furnishings in spite of housing starting to decline.
- Money supply growth will decelerate as federal deficits mount and inflation begins to impact real growth.

1973 -- SECOND HALF

- Real GNP annual growth rate will be 4.6 percent -- this reflects continued weakness in housing, emerging slowdown in consumer durable outlays.
- In the wake of tax refund -- rate of growth of spendable income will drop to 6.8 percent.
- Unemployment rate will drop to 5.2 percent -- but consumer discomfort will rise with price inflation.
- Long term interest rates will climb more rapidly -- monetary tightness increases to counter high deficits -- prices accelerate.
- Business fixed investment and producers' durable equipment will remain strong while nonresidential construction improves.
- Industrial production will plateau as weakness develops in consumer durable goods markets.

SUMMARY

- No important tax rate increases likely in 1973.
- Wage and price controls continued at least through first half 1973.
- FED will lift reserve requirements and discount rate.
- Credit ... sufficient to sustain economic growth.
- International trade

  Trade deficit corrected in 1973

  Little near term probability of further dollar devaluation
- Inflation to be only major concern in 1973
- Economic recovery to continue in 1973
- General domestic business environment to be very good

RELATIONSHIP OF TEST SYSTEMS BUSINESS TO SEMICONDUCTOR SALES

Although the test systems business is influenced by the various environmental barometers defined above, the strongest and most immediate influence is semiconductor sales (i.e., this in turn is directly influenced by the various leading economic indicators). A plot of 1965-74 semiconductor vs. test systems annual sales growth rate will be found in Exhibit IV-5 . Note the strong correlation of these two graphs. From the growth rate charts it is concluded that:

- Rises in test system business growth are delayed by at least 6 months from that of semiconductor sales.
- Drops in test system business growth occur concurrent with drops in semiconductor business.

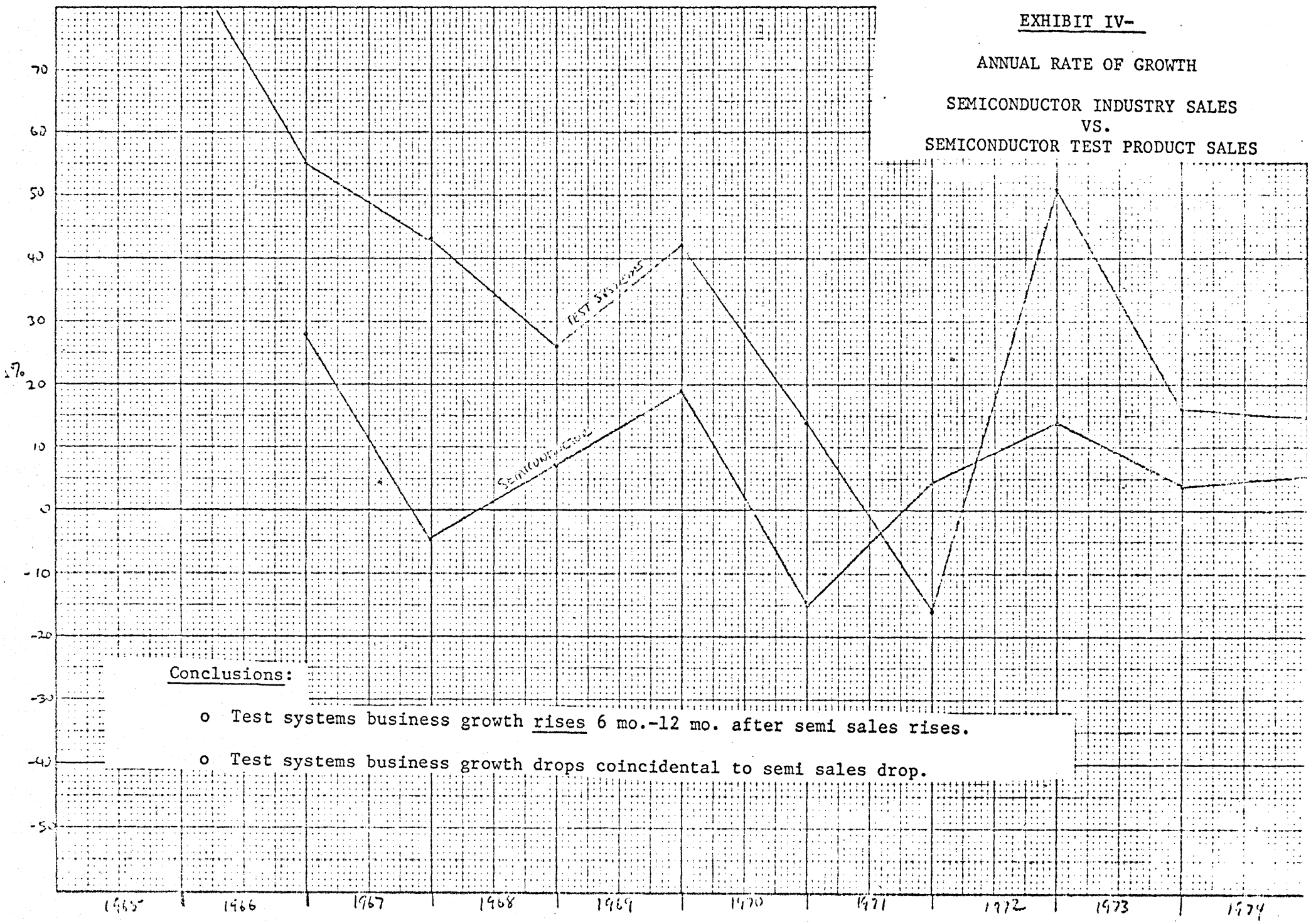
This implies that market psychology for capital equipment spending is restrained until confidence is built up; while decisions to curtail spending is more abrupt.

Extensive investigations will be made early in 1973 by the Product Planning Department to establish significant indicators that influence, and hence signal changes for test systems business. This is in keeping with the Division objective to manage for "failsoft" operations.

EXHIBIT IV-

ANNUAL RATE OF GROWTH

SEMICONDUCTOR INDUSTRY SALES VS. SEMICONDUCTOR TEST PRODUCT SALES

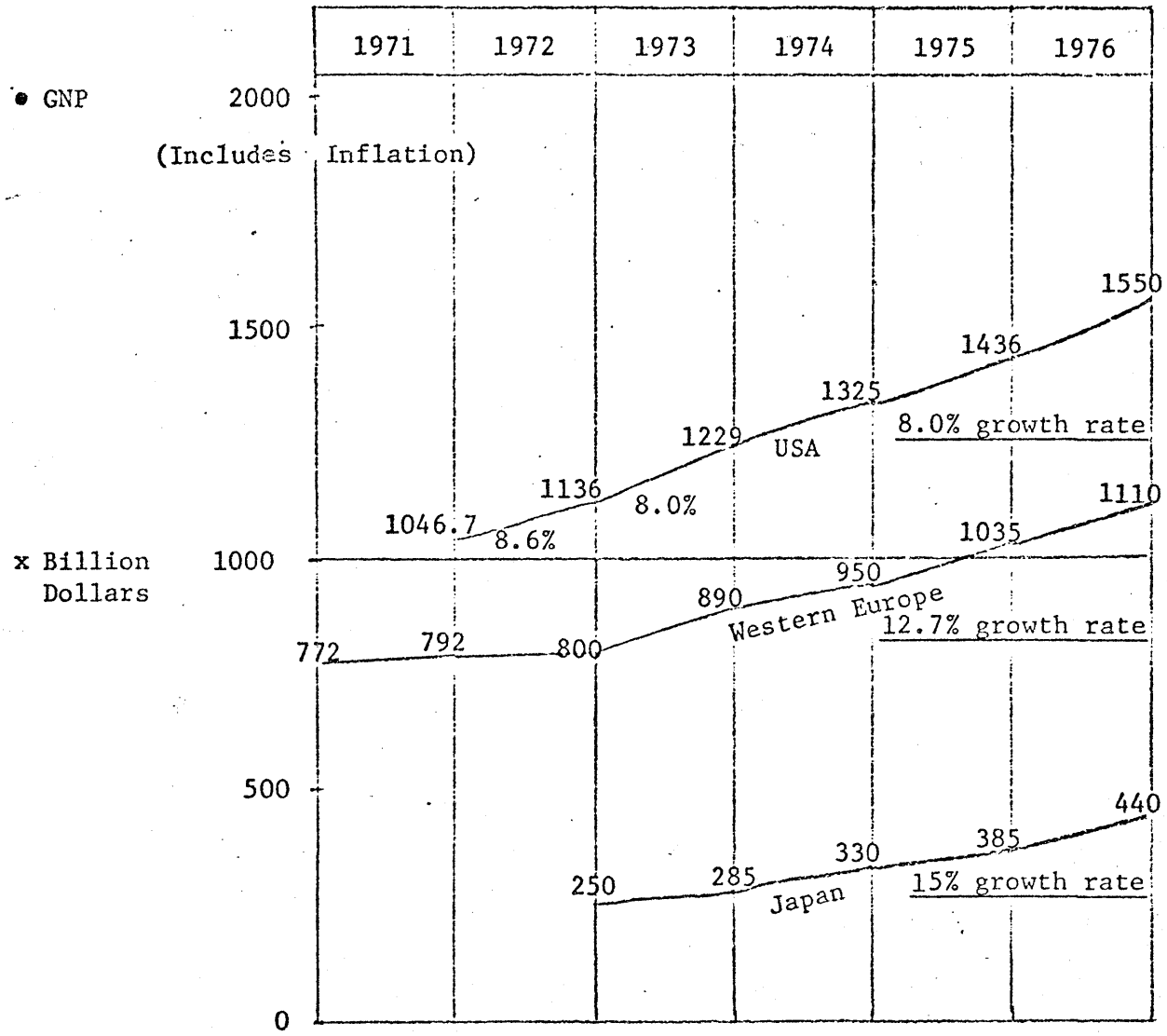


Conclusions:

- Test systems business growth rises 6 mo.-12 mo. after semi sales rises.
- Test systems business growth drops coincidental to semi sales drop.

EXHIBIT IV-6

GNP - WORLD WIDE

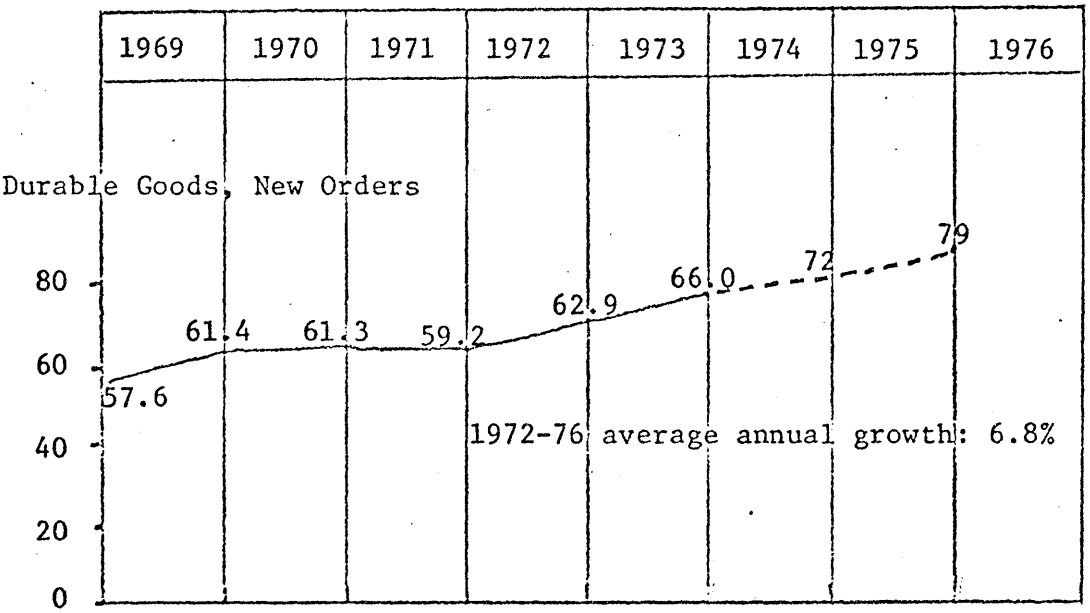


Source: SRI

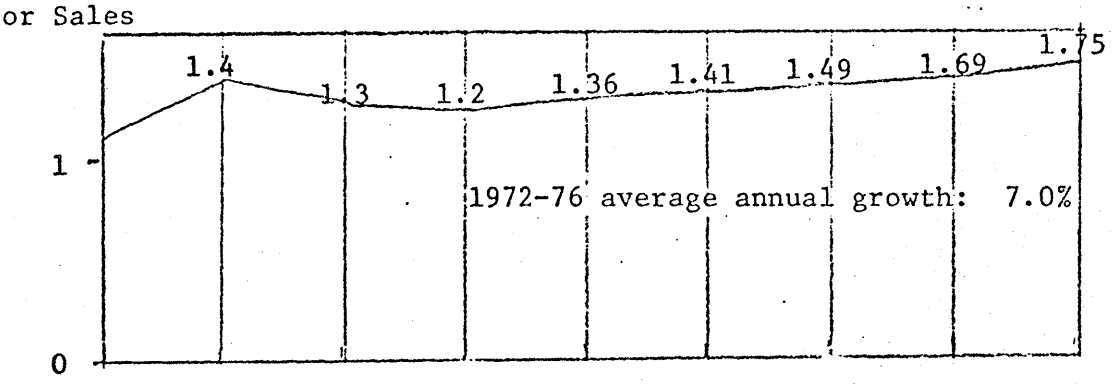
EXHIBIT IV-7

FAIRCHILD SYSTEMS BUSINESS ENVIRONMENT -- U. S.

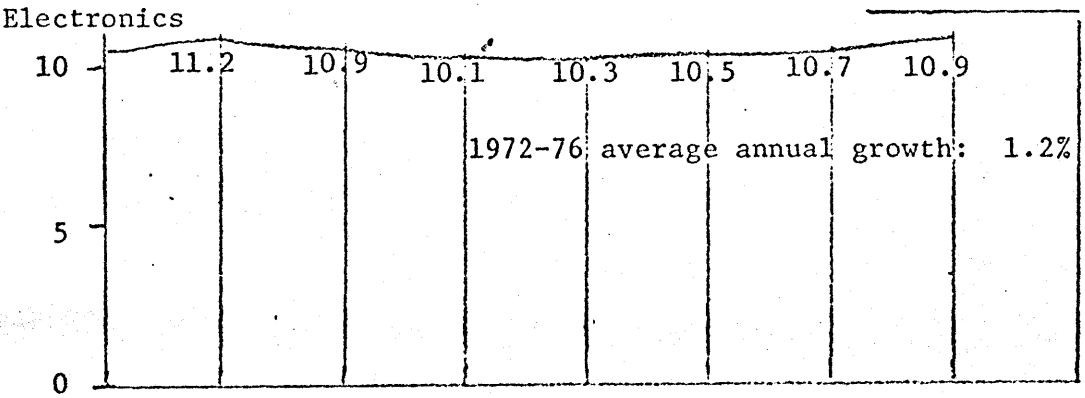
- Machinery, Durable Goods, New Orders



- Semiconductor Sales



- Government Electronics



4.2.2 BUSINESS ENVIRONMENT - JAPAN

Over the past ten years, the Japanese economy has grown at an annual rate of 14.6% in current dollars, and 10.6% in 1965 constant dollars. The Economic Planning Agency, in a recent analysis of this high growth rate, found that technological progress has made the largest contribution to growth, followed by the increase in both capital and labor input.

When the growth of the Japanese economy is viewed in terms of gross national expenditure, the high economic growth has been supported by the increase in personal consumption expenditure, private capital investment, and exports. Personal income is expected to grow at 15.7% yearly in current dollars for the next ten years. In parallel with this, personal consumption expenditure will grow at an annual rate of 14.9% and will account for more than 50% of Japan's gross national product in 1980. The GNP for Japan is charted in Exhibit IV-6.

With respect to fixed asset formation, private capital investment will continue to grow. In addition, government investment in residential and nonresidential construction--particularly in social areas such as roads, sewage systems, and harbors--is likely to grow more rapidly than before to fill the gap caused by the rapid expansion of the economy. Fixed asset formation as a whole is expected to grow at an annual rate of 14.6% for the next ten years.

Over the past few years, the Japanese economy has featured the coexistence of rapid economic growth and a surplus trend in the balance of payments. Exports have grown at 19% yearly for the past five years and amounted to $16 billion in 1969. Although the future environment for overseas markets is not as bright, exports are expected to grow at least at the same growth rate as GNP. Imports in 1969 amounted to $15 billion, and the average annual growth rate of 13.6% occurred during the past five years. In the future, imports are likely to grow a little faster, because of progress in liberalization of trade, increases in personal income, and intensified efforts to control rising consumer prices. Thus, gold and foreign exchange reserves are likely to reach $6 billion within 1971. If the reserves continue to increase in the future, upward revaluation of the yen within five years is a strong possibility.

With the continuing growth in each sector of the Japanese economy, gross national product is estimated to grow at 15.0% yearly in current dollars for 1970-80, and 10.7% in 1965 constant dollars. Gross national product in 1980 in current and 1965 constant dollars will amount to $778 billion and $431 billion, respectively.

Environmental Changes in the Japanese Economy

The problems and the likely environmental changes facing the Japanese economy in the 1970s are as follows.

- International changes
- Labor shortages
- Increased prices
- Increased wages
- Improved productivity
- Shift to a higher density economy
- Environmental pollution.

International Changes

Among the likely international changes in the 1970s, a further expansion in the following two forms of international interchanges is expected:

- Capital investment in Japan by the advanced nations, such as European and American enterprises, and capital investment in Europe and the United States by Japanese enterprises.
- Progress of industrialization in the developing countries and enforcement of the tariff preference system.

The tariff preference system is expected to be enforced in 1971 at the earliest. When it is enforced, Japanese export goods destined for advanced countries, which are likely to compete with exports from the underdeveloping countries, may be hurt. These will include textiles, electronic components, and miscellaneous goods.

4.2.3 BUSINESS ENVIRONMENT - Western Europe

The Western European economy is expected to grow at an annual rate of 12.7% (5.3% real) through 1976. The composite GNP for the major Western European countries is charted in Exhibit IV-6. The European economy was adversely affected by the drop in U. S. economy and monetary changes during 1970-71. The improvement in economy lags behind the U. S. and is expected to fully recover by mid-1973. An indication of real economic (GNP) growth by country is listed below:

Italy	5-6%
Sweden	2-3%
Germany	5%
Netherlands	4%
Belgium	4.2%
France	4.1%
E.E.C.	5.3%

From the above it is noted that the major problem confronting European countries is high inflation. The European Economic Community or Common Market was established in 1958 to promote the economic and social progress of member countries through common action. The U. K. recently joined the founding community which included: France, Italy, Belgium, West Germany, Luxembourg and Netherlands. The major benefit of this community is the easing of trade barriers (i.e., reduction of tariffs). The growing prosperity of the E.E.C. originates from this cooperative venture. With the recent expansion of the E.E.C., its population will surpass the U. S., while its GNP will be 2/3 as large. The tariff benefits within the E.E.C. and the tax incentives given to foreign investors encourages development of joint ventures.

4.3 MARKET DEVELOPMENT AND STRATEGIES

4.3.1 DOMESTIC MARKET

CTS MARKET EVALUATION

- U. S. test equipment market exhibited vigorous rebound in 1972
- Domestic CTS Sales were $14M in 1972 up 100% from 1971.
- Domestic CTS Sales to continue average annual growth of 11%.
- Greatest growth in FSTD -- product sales to be in LSI, MOS-memory, and linear testers in that order.

OBJECTIVES & GOALS FOR 1973

- 1973 CTS Sales goal $16.3M up 17% from 1972.

ATE MARKET EVALUATION

GOVERNMENT

- ATE market growth approximately 12% annually.
- Total ATE market to grow from $216M to $355M by 1976. However served market to grow from $78M to $130M.
- Government ATE market segments include depot level and field level avionics test.
- FST awarded A-7 Contract -- a successful penetration of depot level avionics test market.
- FST developing capabilities to market to Government segments.
- ATE Software/Hardware ratio approximately 50%.
- Avionics test market is predominantly a hybrid test market.

INDUSTRIAL

- Industrial ATE market segment growth to exceed 30% annually through 1976.
- PCB testing require predominantly hybrid test capabilities.

ATE MARKET -- OBJECTIVES AND GOALS

- To capture a minimum of 4.5% of the total ATE market, or 14% of served ATE market by 1976.
- 1973 ATE Sales goal to be $3.7M

ATE MARKET STRATEGIES

- GOVERNMENT
  - -- Use A-7 Contract as vehicle for marketing to Government.
  - -- Sell Sentry products to government market.
  - -- Develop marketing and program management organization to accommodate government ATE market
  - -- Develop product enhancements (Hybrid Test), to facilitate further penetration of marketing.
- INDUSTRIAL
  - -- From Sentry product base, develop enhancements and cost reductions to provide a more competitive posture.
  - -- Develop Hybrid Test capabilities.
  - -- Increase interdivision synergism to strengthen Company image in related markets.
  - -- Greater emphasis on Corporate Fairchild C & I team bidding.

4.3.2 EUROPEAN MARKET

GENERAL TEST EQUIPMENT MARKET

- European market seriously affected by U. S. recession and import surtax during 1970-71.
- Electronic equipment sales are to renew growth at 12% annually during 1972-76.
- European test equipment market is predominantly a user oriented test market (i.e., computers, communication and consumer products)

- Major European countries have defacto product orientations which dictate test equipment requirements

--	France	Large computers, communication
--	U. K.	Avionics, communications, consumer
--	Germany	Mini computers, consumer
--	Netherlands	Consumer, telecommunication
--	Italy	Calculators/computers, communication
--	Sweden	Avionics, consumer, communication

EUROPEAN MARKET -- OBJECTIVES AND GOALS

- To achieve 30% of market penetration by 1976.
- To capitalize on European market growth.
- To achieve a sales goal of $3.2M in 1973.

GENERAL EUROPEAN MARKET STRATEGIES

- Strengthen and enrich European marketing force.
- Increase application support, seminars, and tradeshows.
- Broaden coverage of RON through representative organizations
- Broaden advertising program throughout Europe
- Investigate joint venture opportunities
- Establish European manufacturing/assembly facility in 1973.
- Develop strategies to minimize impacts of tariffs, duties, monetary fluctuations
- Increase utilization of FSD resources for gathering customer requirements and intelligence.

The following delineates major marketing strategies and tactics required to secure the total share of the European market.

- Communications: The communications gap exists and must be bridged. Frequent visits to Europe and contact with both our own sales organization as well as outside sources are necessary and must be carried out by many members of FST: Management, Product Planning, Product Marketing.
- Advertising: Teradyne has carried an active advertising program. We must let ourselves be known in Europe.
- Seminars: Given during major exhibits (such as the Munich or Paris shows) will greatly enhance our sales posture. Three areas must be selected and timed with product announcements.
    (1) S-500 - memory testing
    (2) Time Machine - BIP (ECL) testing
    (3) S-300 - SAVE Program PCB testing
    (4) New memory product line
    (5) Linear testers (5000L, PAL)
- Application Notes: Greater emphasis on DIC and PCB (diagnostics) and linear testing areas to make an impact on market needs.
- Demo Equipment: At the Paris office we should install an S-200 with a Time Machine. An S-300 should also be considered. SAVE should be introduced to European Sales. Bench top, especially PATT's and 335's should be distributed to local sales offices.
- Training: The complexity of our products requires that European Sales and Application force get trained in Europe, as far as

equipment familiarization. Selling strategies, account penetration and management as well as other sales techniques must be taught by sales rotation to U. S.

- Sales Representatives: Setting up representative organizations in the following countries is suggested only after a careful examination (reps can do harm also) Spain, Portugal, Israel, S. Africa, and Eastern Block countries).

  A sales manager, located in Europe, should visit the reps frequently, update their literature and perform training. Frequently reps can act as "door openers". Their direct effect in sales revenue is minimum with the exception of Bench Top Equipment.

- Operational Strategies: The goal of the operational strategies is not only to secure the sales but to effectively improve the contributed net profit from the European region by managing the resources in presale as well as post sale (shipment, payment service) period.

  Detailed instruction of the operational strategies will not be professed here. Some key points will be amplified dealing mainly with securing the market share:

  Sales Force

  A glance at the competitive analysis will show that Teradyne's salesman contribution is 475K/man/yr. FST is starting an uphill battle to recapture the European market. Our starting efficiency cannot equal Teradyne's. If we accept this, a 75% factor is reasonable (or

$350K/man/yr) to achieve $3.5M sales during 1973. The sales force should consist of 10 men with the following distribution:

Germany	3	
UK/Sweden	3	
France	2	(add sales office)
ROE	1	(office in France)
Manager	1	
Total	10	

This sales force does not include application people, secretarial, accounting and service personnel.

Applications

The European Applications Department at this time consists of G. Michel. No one person, regardless of technical competence, can be an expert in digital, bipolar, MOS and linear circuits from memories to complex logic and audio/video linear circuits.

The Application support must increase to at least 3 men in 1973. With U. S. A. support the location of Application people should be 1 Germany, 1 France , 1 England.

Service Contracts

As the production of memories and complex logic increases, there should be an opportunity to engage actively in service contracts for application, with dual benefit. Locking the customer to our system and a nominal fee. This portion of the Application force should be geographically oriented (France and U.K. in addition to headquarters applications in Munich).

4.3.3 JAPANESE MARKET

GENERAL TEST EQUIPMENT MARKET

- FST share of Japanese market in 1967 was 80%. This share has steadily declined to 42% in 1971 because of increasing U. S. and Japanese (M.I.J.) competition.
- Japanese test equipment manufacturers practice the copying of American made testers (mostly FST) and have built a very competitive M.I.J. tester industry for domestic use.
- M.I.J. testers have grown from virtually zero percent of the Japanese market in 1967 to 20% in 1971.
- Chief competitors for M.I.J. testers include Takeda, Hondo, Iwasaki, Fujitsu, Kokuyo, Kuwano, and Matsushita.
- Installed base for U. S. test products sold to Japanese market during 1964-71:

  -- FST $14.M

  -- Teradyne $ 2M

  -- Macrodata $ .5M

- Japanese market severely depressed in 1970-71. Business influenced by economic recession in U. S. and U. S. surtax on foreign imports.
- Japanese Government protects its industry by imposing heavy taxation on foreign made computer products.
- American made test products have very good image -- represent both quality and state-of-the-art technology to Japanese customer.
- Emphasis of device testing is on MOS and linear (video) components. PCB and incoming inspection markets are small. Greatest emphasis is on production testing.

- 12 companies consume over 75% of all test equipment sold in Japan.
- Growth projection for electronics equipment consumption during 1972-76 is 12.4% annually.

JAPANESE MARKET -- FST OBJECTIVES AND GOALS

- To capture 35% of market by 1976.
- To achieve $1.65M sales in 1973.
- Joint venture

GENERAL JAPANESE MARKET STRATEGIES

- Japanese business policies dictate need for greater joint product ventures (dev/mfgr) in order to further penetrate this market.
- FST product strategies require development of S-500 MOS production testing and linear test family to satisfy Japanese semiconductor manufacturers.
- Joint venture products to include low cost memory and linear testers.
- Demonstration equipment required at TEL center as well as greater application support and technical seminars.

SPECIFIC 1973 MARKETING STRATEGIES AND TACTICS FOR JAPANESE MARKET

- Seminars: Memory, Bipolar and Linear Testing Seminars should be instituted in Japan, periodically as equipment becomes available. FST to supply technical experts; TEL to supply space and customers. This seminar should be preceded by a fully documented technical paper. Target date: As soon as the pattern generator hardware is available.

- Training: To further train TEL sales force on current improvements of the SENTRY line through TEL visits to FST Palo Alto. System hands-on experience very important. Effect of training teams is minimum. Questions arise after customer visit -- difficult to solve.

  TEL to develop software/hardware expertise for solving complex customer problems. Communication and distance barriers currently makes this task difficult to handle with present modus operandi.

- Communications: Alert TEL on latest FST customer news. What customers (particularly large producers) are doing to solve MOS, Bipolar and Linear Testing Problems. Linear Applications of FST's 5000L extremely important; e.g., how does MOT, National Test Linears. Bipolar application of S-600 to BTL and numerous other application news.

  SENTRY and other product line improvements such as Pattern Generator, 1 nsec option, 10 MHz, New Memory Products should be communicated to TEL for customer dissemination.

  The description, specifications, and pricing of the Time Machine, Linear and Memory Products, should be sent to TEL for customer dissemination. An up-to-date benefit analysis and application summary should be sent to TEL; typical customers should include Bipolar (ECL, TTL-S), computer producers such as Fujitsu, Hitachi, OKI, Toshiba.

- Advertising: TEL to advertise SENTRY line in local Electronics media. Information including latest figures on FST's sales posture, booking, and backlog should be printed and distributed. Statements made by competitors (Macrodata, Teradyne, Adar -- currently listed Japanese customers of FST) should be reversed publically.

- Support: Software library for S-600 should be made available to TEL with user instructions. A concise list of what types of Memories and Logic LSI's the S-600 can test as well as applications must be supplied.

- Demo: A PATT demo should be consigned and placed at the TEL exhibit room.

- SAVE program in Japan.

- Permanent Liaison FST/TEL: Factory (FST) response of TEL's needs should be via a permanent representative with authority level to cross boundaries as required and to provide the needed response promptly whether technical, pricing, or other.

SECTION V

PRODUCT PLAN

5.1 PRODUCT LINE DEFINITION

5.2 PRODUCT EVOLUTION

5.3 COMPETITIVE PRODUCTS EVALUATION

5.4 TECHNOLOGY IMPACT ON PRODUCT LINE

5.5 PRODUCT EVALUATION (STRENGTHS AND WEAKNESSES)

5.6 PRODUCT STRATEGIES

ENHANCEMENTS

INTRODUCTIONS

SECTION V -- FSTD PRODUCTS

5.0 GENERAL

Fairchild Systems Division presently markets a family of stand-alone and computer controlled mu i-parameter semiconductor test systems designed for time-shared operation of independent test stations. Each station can be interfaced with device-handling systems, wafer probers, scanners, environmental chambers and other custom hardware options. The computer based systems provide a fully automatic high-speed semiconductor production test capability across a broad spectrum; from discrete components through large-scale integrated arrays, printed circuit modules, and digital subsystems. Software packages provide additional flexibility for product evaluation by engineering and quality control organizations. Peripheral I/O capabilities are provided for various common mediums, such as paper, magnetic tape, disc and computer memory for storage, retrieval and evaluation.

5.1 PRODUCT DEFINITION

Generally, the product base is employed for two device testing categories:

- Component device testing
- Functional array (component) testing

The former, transistors, diodes and some classes of linear circuits; the latter particularly addresses testing of the more complex digital arrays, such as, SSI and MSI Digital I.C. devices, MOS/LSI devices; such as memories and logic; P.C. boards, etc. Fairchild's products may also be viewed by dedicated/computer or benchtop/freestanding configuration.

For the discrete component device test category, the product base includes the 600 and PATT testers. In addition, a number of Bench Top testers and mechanical systems are also available to augment and/or enhance these products.

Products within the functional testing category include the 5000C for Parametric Testing and the Sentry family. These products are described in this section.

5.1.1 DISCRETE COMPONENT TEST SYSTEMS - Product Line Descriptions

The current component test systems product line encompasses test systems ranging from small, portable, low cost bench-top models to larger computer controlled models incorporating several test stations. Included in the discrete tester line are the 600C, PATT, and a bench-top series.

600C - The unit is a discrete component tester which is fully computer controlled. The system is used both in production testing and in Engineering applications. The system may contain as many as four multiplexed test stations, each testing different device types to different test plans. The 600C provides unmatched capability in high current (50 Amps), high voltage (1500V), and current resolution (10 Picoamps). The equipment can be interfaced with a number of different handlers. The 600C is priced from $50K to $75K and is primarily used by semiconductor producers, users and test labs in Production, Engineering and Quality Control. It was introduced into the market place in 1968, and is the successor to the 500 series. There are over one hundred 600 series testers in the field, the majority of which are 600's.

PATT - A bench-top discrete component tester, typically suited for high speed incoming inspection of transistors, diodes, and SCR's. The test program can be manually loaded or entered via cassette tape. Price range is $13K to $25K. The tester was introduced in 1971, and has received good acceptance as a stand-alone, low cost, production tester.

301 - A low cost, semiautomatic, bench-top digital/linear tester, suitable for low volume incoming inspection or lab use. The linear test applications are limited to a restricted class of devices viz. op amps. Price range is $3 to $4K.

321 - A bench-top tester suitable for incoming inspection testing (functional and parametric) of the DIC line such as RTL, DTL, T^2L, ECL, etc. Price range is $5 to $6K.

335 - A bench-top tester suitable for incoming inspection and laboratory testing of most linear circuits (i.e., op amps, regulators, comparators, differential amps, etc.). This unit can be interfaced to handlers, hence providing automatic operation. Price range is $8 to $10K.

100 - An automatic handler capable of sorting DIP's (Dual In-Line Packages) for digital and linear circuits to 4,800 units per hours. The 100 is interfaced to 321 and other digital/linear testers. Price is $8K.

5.1.2 FUNCTIONAL TEST SYSTEM-PRODUCT LINE DESCRIPTION

Functional test system product line is composed of the 5000C and the Sentry family series. A short description of these products follows:

Sentry 100 - This system sells in a price range of $69K to $150K; is a high throughput MSI bipolar production oriented test system and can be applied to semiconductor users (incoming inspection) as well as producers. The operating system features compiler and editor on

an overlay basis, tests up to 60 pin devices, and can multiplex up to four stations. The S-100 performs DC parametric and functional testing. A time measurement option will be available during the 1st qtr of 1973 (see time measurement description).

Sentry 200 - This system sells in the price range of $120K to $270K and is oriented to engineering, Q/A and test center operations where system flexibility is more important than high throughput. The system can test up to 120 pins devices, accommodate up to four MUX stations and provides a large random access storage disk. The S-200 performs DC parametric and functional testing. A time measurement option will also be available for the S-200.

Sentry 300 - This system is directed at the unique requirements of the PCB test and repair market. It is essentially a Sentry 100 or 200 mainframe with extended pin capacity (i.e., up to 240 pins) and features extensive fault isolation software. The system price is dependent upon number of pins and storage media, and ranges from $100K for a 60-pin system to $250K for a 240-pin system.

Sentry 400 - The Sentry 400 is a computer-controlled, functional, and DC parameter test system. A minimum system will perform static and dynamic tests on one 30-pin (terminal) combinatorial or sequential network. Expansion modules of 30-pin increments are available to bring the system capacity to a total of 240 pins at four independently operating stations.

Random logic and memory functional test rates can range up to 286,000 tests per second. Absolute DC parameter measurements, such as input pin leakages and saturation voltages are made at a

rate of 250 tests per second at each test station on a pin-by-pin basis. Forcing and sensing voltage and current ranges encompass both bipolar and MOS semiconductor requirements. The design of the system satisfies the complex testing requirements of large-scale integrated arrays, printed circuit modules, and other digital subsystems.

Sentry 500 - This system sells in the range of $115K to $180K and is a low cost, high throughput version of the Sentry 600. It is primarily directed at the MOS/LSI production test market. The S-500 has similar high speed station characteristics as that of the S-600 but does not utilize a disk for bulk storage.

Sentry 600 - This system sells in the price range of $170K to $450K and is directed primarily toward MOS/LSI Engineering and testing requirements. The system is attractive to producers and large quantity devices as well as to QA/Engineering and test system users.

The Sentry 600 incorporates a high speed test station which performs functional and parametric testing of digital circuits of all technologies and functions. The station generates function patterns on all pins in parallel at a 5 MHz data rate of 20 MHz phase rate with logic levels within a 36 volt amplitude. DC parametric tests of currents in the nanoampere region and voltages up to 100 volts can be performed on any pin; accommodating devices or modules up to 60 pins.

The station can perform all testing to full specifications at either wafer level or package level.

The station contains a local memory designed as a special purpose controller which can store a function pattern of up to 1024 bits for each pin. Any section of the local memory can be reloaded while testing continues out of the remaining section.

TIME MACHINE

The following describes the "dynamic" (time-domain) parametric measurement system. The time measurement system will be an option to the Sentry 100 or 200 and will provide:

- Provides for single insertion device testing of functional, DC parametric, and time measurement in a single pass when interfaced to the S-100/S-200.
- Modular expansion of the number of pin connections to the DUT
- Modular expansion of the dynamic measurement capabilities
- Performance specifications guaranteed at the test head
- All pins designated as I/O, or dedication by selection of pins as inputs or outputs
- Choice of probe cards
- Complete automatic calibration of the measurement system
- Standard capability from 1 to minimum of 4 independently programmable pulse sources with provision for optional expansion to six.
- Standard interface options to manual station, handlers, chambers or probers

The time machine will minimize programming effort and cost by providing:

- Programmable amplitude calibration of measurement system prior to tests or test sequence

- Up to "N" repetitive measurements
- Programmable number of pulse generator pulses
- Programmable number of pulse generator pulses after programmed delay, independently for each channel
- Programmable system measurement on a specific pulse "N"
- Automatic pulse selection for any time measurements
- Automatic slope detection
- Automatic output state detection for input pulse selection for t_{pd} measurements
- Some test results will be indicated not only by data, but "fail condition"
- "Repeat set-up and measurement until proper slope occurs" capability
- Programmable "limit" number for "repeat set-up and measurement until proper slope occurs"
- Programmable outranging of measurement system

The time machine will thereby provide dynamic parametric measurement by simply programming the parameter to be measured (i.e., t_{pd}, etc.), and the number and type of input pulses to the appropriate DUT pin. A Factor language subset will be provided for time measurement oriented statements. The time measurement option will sell for approximately $95K, and will be introduced in 1973.

5.1.3 LINEAR CIRCUIT TEST SYSTEM

The 5000C test system will be maintained in the product line to serve special linear test applications. This product will incorporate "Special" interfaces to satisfy a number of user applications. More

FAIRCHILD SYSTEMS PRODUCT EVOLUTION CHART.

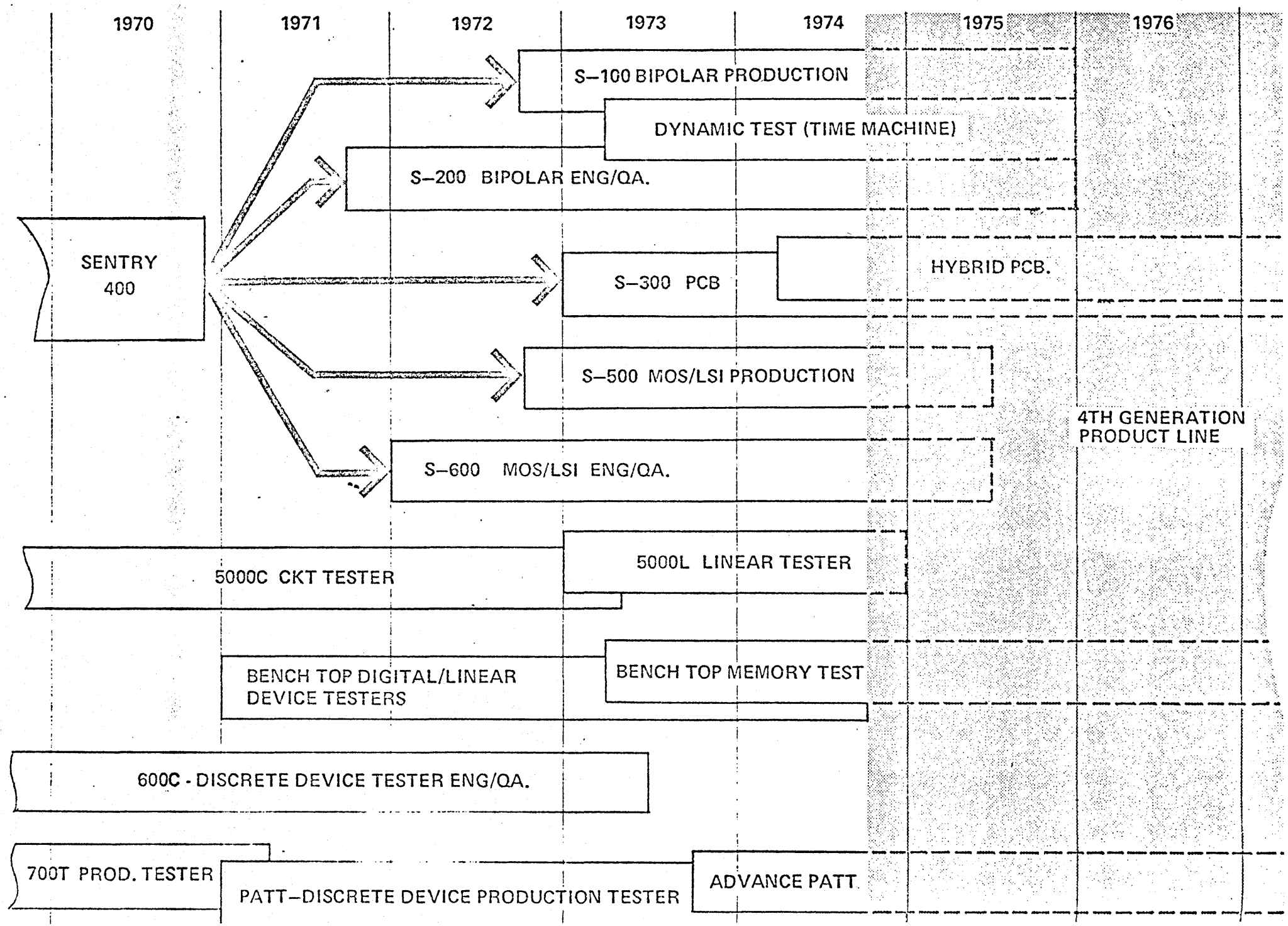
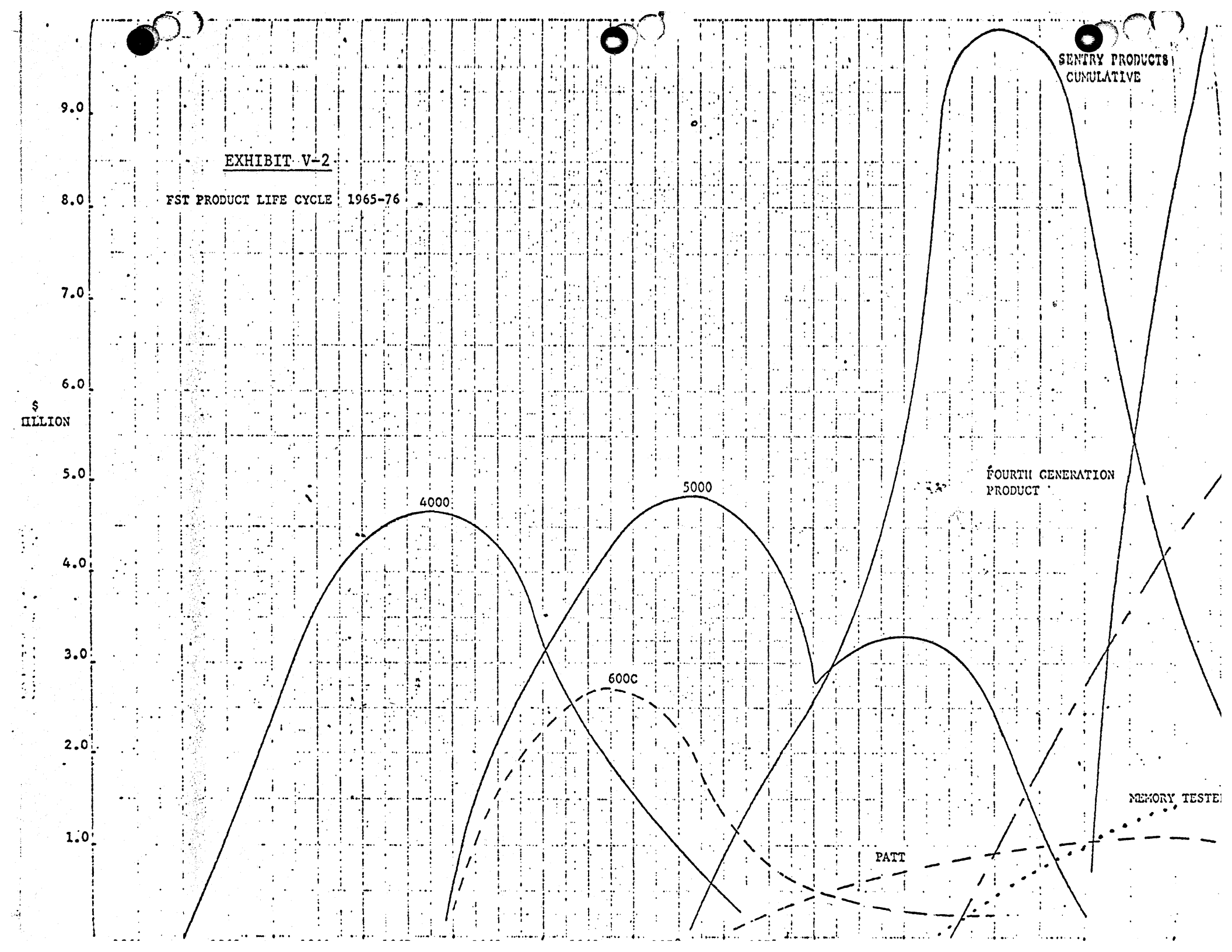


EXHIBIT V-2

FST PRODUCT LIFE CYCLE 1965-76



5.3 COMPETITIVE PRODUCT ANALYSIS

Products which are competitive in Fairchild's served market are compiled by test application in Exhibit V-3. The semiconductor test applications in this product matrix include:

- Discrete devices
- SSI/MSI Bipolar devices
- LSI/MSI devices
- Linear devices
- PCB modules

Each of the products identified in the matrix is compared in more detail to other competitive products serving the same market. The analysis is provided by Exhibits V-4 through V-7 and through the competitive product and marketing strengths and weaknesses information summarized in Exhibits V-8 through V-12.

EXHIBIT V-3

Test Eqpt. Mfgrs.	Discrete	Bipolar SSI/MSI (T)	LSI	Linear	PCB	Other
FAIRCHILD SYSTEMS	600C PATT	S-100 (L, M, T) S-200 (L, M, T) 5000C 221, 201	S-500 (L, M) S-600 (L, M)	PATT (L) 5000 (C, L) 235	S-400 (D) S-300 (D)	
Teradyne	T-241 T-217 T-347	J-283 S-157/257 (T) S-293 (T, L, M)	J-277 (L, M) J-283/H-484 (L, M) S-293 (T, M, L)	J-263	L-100 (D) THS-W153 (H)	P LT
Datatron	--	4400	4500 (M, L)	--	4600 (D)	--
Hewlett Packard	--	--	--	--	9500 (H) 9600 (H)	
Macrodata	--	--	MD100 (M) MD-104 (M) MD-150 (L, M) MD-200 (L, M) MD-500 (L, M)	--	--	--
ADAR (32/64)	--	--	DR-32 (L, M) DR-64 (L, M)	--	--	--
Tektronic	--	S-3120 S-3130 (T) S-3150 S-3160	S-3260 (L, M, T)	--	S-3260 (H)	--
Texas Instru.	--	580; 553 (T)	ATS-960 (L)	553	ATS-960 (H)	--
General Radio	--	--	--	1730	1792 (D) 1793 (D) 2200 (H)	LT
Instrument Eng.	--	--	--	--	S-960 (H)	--
Lorlin	L-24; IMP-100	--	--	--	--	--
Computest		MD-701, 716	Inter I, II, III (M) Venture II (M)	1200		
E. H.	--	--	4500 (L, M, T) 4600 (L, T)	--		
W. Digital	--	--	SP-770 (L, M)	--		

Notation
- D: Digital
- L: Logic
- M: Memory
- T: Time
- H: Hybrid
- LT: Laser Trim
- P: Passive (PLC)

EXHIBIT V-4

MSI/SSI BIPOLAR TESTERS

Company	Model	Pins Max.	Functional Test: Max. Data Rate	Functional Test: Voltage Range (Driver)	Functional Test: Slew Rate (Driver)	Functional Test: Voltage Range (Comp)	Functional Test: Resolution (Comp)	Parametric Test: Test Rate	Parametric Test: Meas. Range	Parametric Test: Accuracy	Max. No. of Stns.	Computer	Storage Max.	Available Peripherals	Price Ranges
Fairchild	S-100	60	286 KHz	± 30 V	30V/usec	±30 V	20 MV	250	±40 V	±.3%	4	FST-1	Core: 16K	TTY MT CRDR LPR	$69K- $145K
	S-200	120 240**	286 KHz	± 30 V	30V/usec	±30 V	20 MV	250	±40 V	±.3%	4	FST-1	Core: 16K Disk: 768K	TTY MT CRDR LPR	$127K- &270K
Teradyne	J-283	120	100 KHz	± 15 V	UNK	±30 V	UNK	200	±30 V	UNK	4	DEC PDP-8I	Core: 8K	TTY HSPTR HSPPP MT LPR	$94K- $180K
Datatron	4400	100	50 KHz	± 10 V ± 15 V	60V/usec	±15 V	10MV @ ±10 100MV @ ±15	50 KHz	±15 V	+ 2%	1	NOVA	Core: 32K max. Disk: UNK	MT HPTR HSPTP	$60K- $150K
E. H.	4500	80	5 MHz	± 15 V	500V/usec	±15 V	1 MV	UNK	±50 V	1 %	1	DEC PDP-11	Core: 32K max.		$114K- $250K (incl. time meas.)
Texas Inst.	580	64	10 KHz	± 8 V	100V/usec	± 8	±60 MV	500	±32 V	±.15%	4	APC 980	Core: 8K to 32K	TTY LPR MT HSPTR NSPTP	UNK
Tektronic	S-3150	16	100	±100 V	UNK	±100V	100MV	100	±100 V	1 %	1	PDP-8/L	Core: 8K Disk:	TTY MT CRT	$120K (incl. time meas.)

EXHIBIT V-5

LSI TESTERS

			Data Driver						Comparison		Parametric	Pattern Memory		Computer				
pany	Model	Pins Max.	Max. Data Rate	Range Voltage	Resolution NSC	Slew Rate V/usec	Skew Nsecs	Timing Phases Max.	Range	Resol.	Test Capab.	Depth Max. Bits	Type	Mfg.	Storage Max.	Peripheral	Pr Ra
rchild	S-600	60 fctn. 240 par.	5 MHz	±30	110	1000 @ 300pf	± 10	8	± 30 V	20 MV	Yes 100 V	1024	RAM	FST 1	Core: 16K	TTY CRDR MT LP	$17 $25
adyne	J-277	24	>5 MHz	±5 to -20 at 10 MA	1	5W	± 5	2	+5 to -16 +5 to -30	10 MV 100 MV	Yes 160V	4096	RAM	TER M-365	Core: 12K	TTY MT LPR	$1 $2
	J-283/ 11484		20 MHz	← H484 to be mktd. in 1973 →								4096	RAM				$1 $2
atron	4500	100 fctn. 256 par.	10 MHz	±15 @ 25 MA max.	UNK	300 @ 50pf.	± 10	4	+15 V	±50 MV	Yes	4096	RAM	Data Gen. Nova 1200	8K Std Core: 116K Disk:	TTY MT HSTR HSTP	$5 $1
rodata	MD 200	64	2 MHz 8 MHz	0 to -25V.	32	1000 @ 200 pf.	UNK	4	0 to 25 Ref 0 to +30 V	100 MV	Yes -100V	1024 -16K	SR	Interdata 4	Core: 16K	TTY HSPTR DISK CRDR LPR	$1 $3
	MD 500	64	10 MHz	← Prelim. data, prod to be marketed 1 qtr 1973 →								4096	RAM	—	—	--	$1 $3
R	DR 64	64	8 MHz	±17.5V	1	1000 @ 100 pf.	±10	7	+5 V ±50 V	2.5 MV 1.0 MV	Yes ± 80V	1024	RAM	DEC PDP-8I	Core 8K std 16K max.	TTY PTR PTP	$9 $15
tronix	S 3260	64	20 MHz	± 30 V	1	1000 @ 100 pf.	UNK	4	±10V ±30	2 MV 12 MV	Yes ±100V	1024	RAM	DEC PDP-11	Core 8K Disk 65K	NSPTR NSPTP MT PRT	t $1
tern ital	Spartan 770	40 fctn 48	8 MHz	0 to -30V	1	1000 @ 100 pf.	UNK	6	0 to 30 V	125 MV	Yes	1024 max.	RAM	DEC PDP-11	Core 8K, 32K max Disk (opt.) 65K	PTP PTR MT LPR	$6 $1
l	4600	24	5 MHz	±15 V +5 to 30V	1	500 @ 40 pf.	UNK	6	±30 V	±1 MV	Yes ± 50V	1024	RAM	DEC PDP-11	Core 32K	PTP MT LPR	$1 $2

PCB TEST SYSTE[illegible]

DIGITAL EXHIBIT V-6

COMPANY/PROD	COST	PINS	TEST CAPABILITY	EXTENT OF TEST	CONTROLLER	DISPLAY	PERIPHERALS	SUPPLY VOLTAGES	COMMENTS
General Radio 1793	$18,500 (Basic)	Input 48 Output 48 Max Fixed Level	• Fctnl. Test-DTL, RTL, TTL (Basic) • Prog. Logic Levels (Opt) Drivers: ±20V(20ma) in 60MV Incr. Comp: ±30V in 60MV Incr.	• Go/No-Go Fctnl. • Lim. Fault Isolation Using Pt. Logic Probe and Prog. Instructions • No parametric testing cap.	• PDP-8 Computer w/4K core (STD) exp. to 16K	• A/N Display Oscilloscope (opt) • Control Panel Indicators	• Typewriter • Logic Probe • DPM (opt) o Cassette (opt) o HSTR (opt)	1) +5V, ±15V (1.25A) Std. 2) Prog. Logic Options ±20V (2A) ±40V (1A)	1) TOL is, for the most part, mnemonic imbedded in F like statements (i.e. DO, IF, GOTO, CALL, Pi DELAY, SYNC, etc.) 2) Device Adapter Required
General Radio (1792) (Intro 1972)	$50,000 (Basic)	60 Pins (Basic) Exp. to 256 in 12 Pin increments	• Fctnl. Test Mixed Logic (Basic) • Param (opt) • Time Meas. (opt) • Word Gen (opt)	• Go/No Go Functional • Fault Isol. Using Probe and Scope	• PDP-8 Computer w/8K core (STD)	• A/N Display Scope • Indicator Panel	• Typewriter • Logic Probe • Paper Punch/Rdr • Dual Cassette Tape • Disk (opt)	+5V, ±15 V(1.25A) Std.	1) Can select (Programs) any of two preset level 2) Interactive testing 3) Language is mnemonic level
Teradyne L-100 (Intro 1972)	$53,800 (Basic) $50,000 Add'l for Parametric	60 Pins (Basic) Exp. to 228 in 6 Pin Incr. (No I/O Restr.)	• Fctnl. Test Fixed Logic (std) • Prog. Drivers (opt) ±16V @ 10mV Incr. ± 5V • Parametric Test (Opt) • Word Gen (Opt) • Time (Opt)	• Go/No Go Functional • Fault Isolation	• Teradyne M365 Computer (8K-32K Core)	• 256 char. A/N Display	• Typewriter • Cartridge Tape	1) ±16V @ 1.6A ± 6V @ 6A ±50V @ .5A	1) Mnemonic level language
Digital Gen. (DC-VII) (1972)	$17,000 (Basic)	64 Pins (STD) Exp. to 255	• Fctnl. Test TTL, DTL, and RTL (Basic) • Fixed TTL Drivers Std o Prog. ±25V (opt). Std. o Fixed Level Drivers o Burst Gen .5 Mhz Opt	• Go/No Go Functional • No Parametric (Prog) only manual DVM • Lim. Fault Isolation • Fixed Margin Testing	• Hardware Controller	• Control Panel Ind.	• Paper Tape Reader • Pt. Probe • Printer (CPT) o DPM (opt)	1) 4 to 6V Adj. in 3 incr.	1) Tape controlled test system tests against punched te program 2) TOL is FORTRAN like, cannot be compiled by syst must prepare test tape offline to TS or remote batch system — contest
Digital Gen DC-VIII	$51,000 (Basic)	32 Pins (Std) Exp. to 254 in 8 pin incr.	• Fctnl. Test TTL, DTL (Basic) • Parametric Test (Opt.) • ±25 V in	• Go/No Go Fctnl. • No Parametric • Lim. Fault Isolation	• NOVA 1200 with 8K memory exp. to 32K	• A/N Display (Opt) • Control Panel Ind.	• Typewriter-ASR • Cassette (Opt) • Hi Speed Rdr • Pc. Probe • DPM (opt)	1) +5V, (1.5A)	1) TOL in English like language— contest 2) Adapter turntable
Datatron 4600	$47,500 (Basic) +$600./Pin +$8,800 if >100 pins	250 Pins Max. (No I/O Restr.)	• Fctnl. Test mixed logic (Basic) • Parametric Testing (Basic) • Word Gen. (Opt.) • Prog. Logic Levels (Basic) ±9.99V in 10mV incr. ±99.9V in 100mV incr.	• Go/No Go Fctnl/Par. • No Fault Isolation	• NOVA 1200 with 8K Memory	• Control Panel Ind.	• Typewriter-ASR(Std) • Cartridge mag tape (Opt) • H.S. Tape Punch/Reader (Opt) • Disk (Opt)	1) +5V DC 1A 2) ±25V DC	1) TOL is at mnemonic level 2) Can MUX up to 8 Stations
Trendar 2000 (Intro 1971)	$24,000 to 45,000	128 Pins(Basic (No I/O Restr.)	• Fctnl. Test:TTL, DTL, RTL • Logic thresh comp(Opt) • Pulse Width Comp (Opt)	• Go/No Go Fctnl. Test by comparison to known ref. • Fixed margin testing • No Prog. Fault Isolation	• Hardware Controller	• Control Panel Ind.	• Pt. Logic Probe	1) 0-6V Adj. Supplies Adj in 3 increments	1) Non-Programmable 2) Req. wiring interconnect block 3) Product Go/No Go test. Tech must find fault through probe and CKT Diagram.
Datatest 4700 (Intro 1971)	$10,750 (Basic) +$9000 for Im. Fault Isolation Capability	40 Input 60 Output I/O Restricted)	• Fctnl Test:TTL, DTL, RTL • MOS and ECL Interfaces (Opts)	• Go/No Go Functional	• Hardware control (incl. operators and counters)	• Control Panel Ind.	• Card Reader/Punch • Logic Probe • Tape Reader (Opt) • Cartridge Tape(Opt) • Printer (Opt)	1) 4.75V-5.25V in 3 increments	1) Testing accomplished issuing test words and countin transactions at each pin.
Texas Instr. ATS960	$50,000 - 150,000	16 pins exp. to 256 pin max	• Fctnl Test-Mixed Logic • Parametric Test • Dynamic Test • Word Gen/4 Clock • Interfaces various analog stim/meas device	• Fault Isolation • Go/No Go Fctnl and Para • AC Testing • Measurement	• TI 960 exp. to 65K word Computer	• CRT display (opt) • Control Panel	• Typewriter • Disc • Mag Tape/Cassette • H. S. Punch/Reader • Clip on Multipin logic probe • LPTR • Crd Rdr	Eight prog. ref. ±15.3 Volts in 248 increments	1) Atlas subset language 2) Up to 4 test stations 3) Can be interfaced to a number of programs. AC stimu and measurement modules, counters, analyzers, et 4) Instrument switch via 4x16 reed relay matrix
PRD 950 - 1972	Unknown	32 pins Expand to 128	• Hybrid Test Capab. • Hispeed Gen. • Fixed Logic (std) • Fctnl Test TTL (std)	• Fctn. Test • Fault Isolation			• TTY std • MT (opt) • HSPTR std • HPTP std (• CRT (opt) • Disk (opt) • LP (opt)		1) FORTRAN like language subset of Atlas - VTRAN- 2) MOS & ECL logic is optional

VARIAN
PRELIMINARY DATA

PCB TEST SYSTEMS - ANALOG AND DIGITAL EXHIBIT V-7

OMPANY/PROD	COST	PINS	TEST CAPABILITY	EXTENT OF TESTING	CONTROLLER	PERIPHERALS	SIGNAL SOURCES	MEASUREMENT EQUIP.	COMMENTS
eneral Radio 2200 Intro 1972)	$75,000 (Incl Anal, Dig, and passive device test stations)	Digital 12 pins (Basic) Exp in 12 pin incr to 256 pins	• Hybrid I.C. • Multilogic test	• Go/No Go Fctnl and Para • Lim Fault Isolation	DEC PDP8E with 8K Memory	• Cassette • Hi Speed Tape Reader • Typewriter • A/N Oscilloscope	• Various Prog. Wave Generator • Various Bias and Power sources	• AC/DC voltage and current • R, L, C, Leakage Currents • Times (rise, fall, delay) • Frequencies	1) Configured in multistation arrangem *2210 Analog test station *2220 Logic Test station *2230 Passive device test static
.P. 9500 Intro 1970)	$50,000 - 250,000	Digital 12 Pins (Basic) Exp to 240 in 12 pin increments Analog Cross Bar Matrix Exp to _____	• Test-Digital levels 5-15V(No mixed logic) • Modular analog capability DC though microwave	• Go/No Go (Fctnl, Par.) • No Fault Isolation	Uses any H.P. Computer i.e. 2114, 2116. 2100, etc.	• Typewriter ASR-35 (Std) • VKT (Opt) • Disk (Opt) • See H.P. Peripheral (Opts)	• Programmable D.C. (Opt.) Voltages ±12V Current ±30 mA • Programmable Fct. Gens. (Opts) • Various Gen. DC-Microwave (Opts)	• Prog. DCV Comparators (Opt) • Various DC and AC Measurement devices - see catalog.	• TOL uses H.P. Basic augmented w test oriented statements.
eradyne - TAS W153 Intro 1971)	$175,000 (Basic)	24 Pins (Std.) Exp. to 48 Pins	• D.C. Parametric • A.C. Measurement	• Go/No Go • No Fault Isolation • System operates diagnostic performance data	PDP8I with 12K words	• Typewriter ASR-33 (Std) • Cartridge Mag Tape	• Programmable DC:±16V (Std) • Prog. A.C. Fctnl. Generator (Std) Freq: 10HZ-1.1 MHz V: 10mV to 16V Ø: 0° to 180° • Various Prog. A.C. Gener. (Opts) • Prog. D.C. ±160V (Opt)	• M359 Measurement System • Fluke DC/AC/2/Res. Meter • H.P. Counter 0-20 MHz • Various AC Meas. (Opts)	1) TOL - Mnemonic Level 2) Up to seven MUX stations
nstrumentation Eng. - System 390 (Intro 1970)	$150,000 - 250,000	40 Pins (Std.) Exp. In 40 Pin Increments	• Analog, Digital or Hybrid • Functional • Parametric • Dynamic • Mixed Logic (Inc. TTL, MOS, etc.)	• Go/No Go (Fctnl, Par, Dyn.) • Fault Isolation to component level	Interdata Model 3 with 32K BYTES memory	• Typewriter-ASR-33 (Std) • A/N display (Opt) • H.S. Rdr. and Punch (Opt) • Disk (Opt) • Mag Tape Cassette (Opt)	• Prog DC voltage and currents • Prog. AC signal sources • Prog. Pulse Gen (Opt) • Prog. multi Ø clocks (Opt) • Prog. Fctn Gen (Opt) • Prog. Noise Gen (Opt) • Prog. Digital Word Gen (Opt)	• Digital multimeter (Std) • Counter (Std) • Prog. Z bridge (Opt) • Prog. Dist. Analyzer (Opt) • Prog. Wave Analyzer (Opt) • Prog. Scope (Opt) • Prog. Pulse Anal. (Opt) • Other options	1) TOL - Uses ATLAS language 2) Self Test 3) MUX Stations optional 4) System is modularly configured to r requirements
AVCO - 3200 (Intro)		320 Output 160 Input	• Analog and Digital Testing • Parametric • Dynamic	• Go/No Go • Gen. Testing - Not Fault Isolation	CLARY 404 with 4K Store Exp to 64K	• Typewriter (Std) • CRD Display (Std) • Mag Tape Cassettes (Std) • Disc (Std) • H.S. Printer (Std) • H.S. Tape Rdr. (Std)	• Prog. DC sources Prog. voltage-10mV to 300V DC Prog.Current-Custom 1200 • Digital Wave form gen. Prog. 64 steps/per • Logic gen. Prog. Dig. Message Gen. Prog. clock (10MHz) Prog. pulse generator	• A-D Converter • Prog. Timing Measurement • Prog. Res. Meas. • AC volt and current meas. (to 10 MHz) • AC and DC differential • Ø meas.	1) TOL - ? 2) Software permits simultaneous proc programming and time sharing for m station operation 3) Places greater reliance on compute synthesis of waveforms 4) Power supply (4 Ampere maximum)
Zehntel (Intro 1970)	$25,000 Base + cost of Stim and measurement modules.		• Analog and Digital	• Go/No Go • No Fault Isolation • General Testing	Hardware controller driven by paper tape	• Typewriter (Std) • Tape Rdr (Std)	• Var. Prog. Fctn. Gen. (Opts • Prog. Pulse Gen. (Opt) • D.C. sources	• DVM (Opt) • Counter/Timer (Opt) • Wave Analyzer (Opt)	1) TOL - Machine language level 2) System configured to user's requir

PRELIMINARY DATA

specifically, Special customer specified linear program source interfaces will provide means for testing:

- Op Amps
- Regulators
- Comparators
- T.V. circuits
- RF/IF circuits

These interfaces provide AC signal sources, AC to DC conversion, programmable power sources, digital to analog conversion, etc.

5.2 PRODUCT EVOLUTION

Fairchild Systems is currently marketing its third generation semiconductor test products. A product evolution chart describing the introduction and proposed phase out of 3rd generation products will be found in Exhibit V-1. A second chart which depicts product life cycle in terms of product dollar volume vs. time will be found in Exhibit V-2. These diagrams collectively define past and present products, and future product phase in-phase out plans as well as product sales impact.

New test products that are to be introduced in 1973 include:

- Dynamic test system option
- S-300 PCB test system
- Bench top memory tester
- Advanced PATT and PATT options

These are discussed in Section 5.6.

Products to be defined in 1973 for introduction in late 1974 and early 1975 include the fourth generation product line. The latter will constitute a prime task for the marketing department's product planning organization.

S-100 COMPETITIVE PROFILE -- See Exhibit V-7

Production bipolar SSI/MSI tester

MAJOR COMPETITORS

- Teradyne J 283/S257
- Datatron 4500

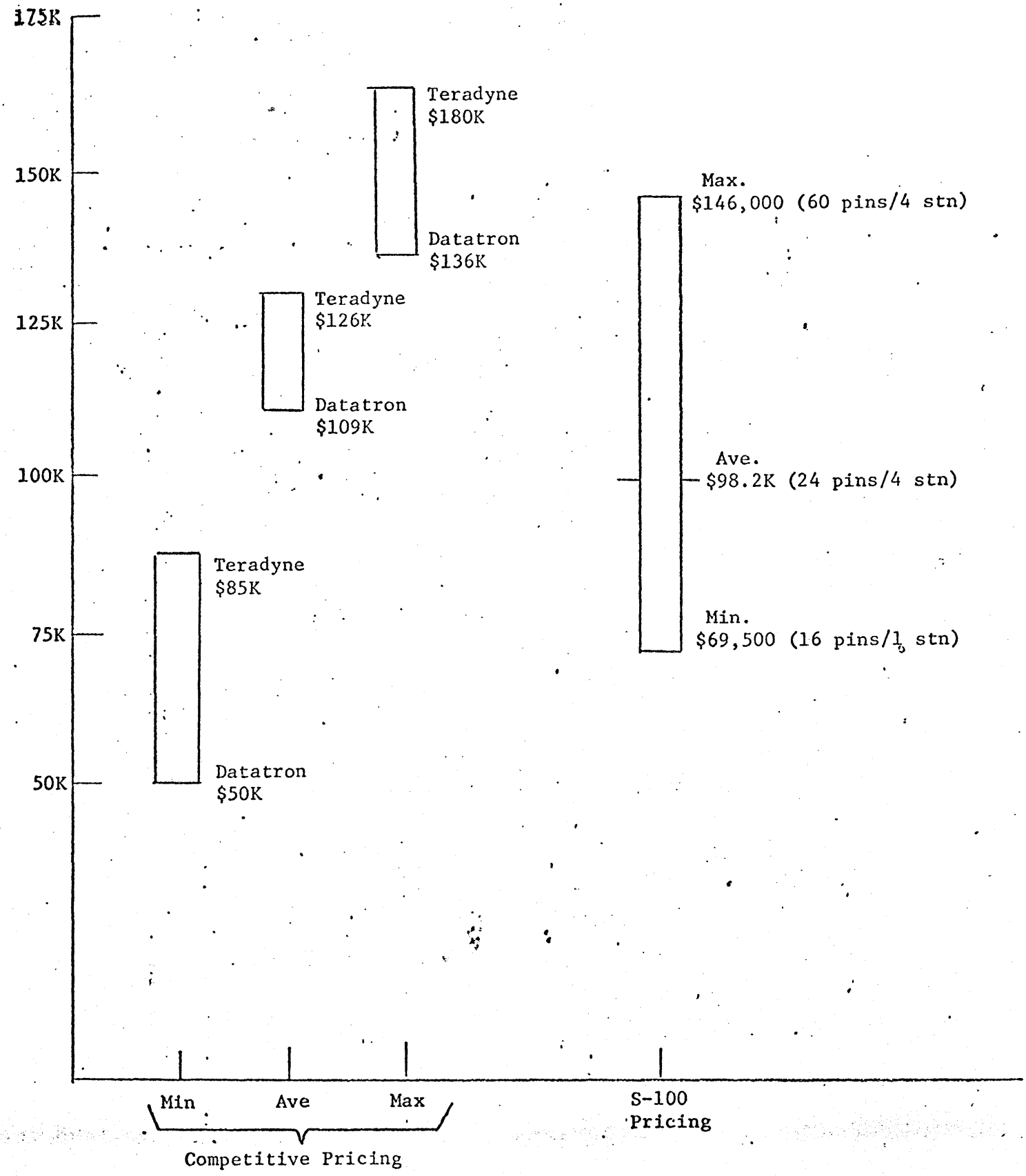
TERADYNE STRENGTHS AND STRATEGIES

- Pricing is competitive with entire S-100 line ($85K, $126K, $160K) but most effective in average and maximum price range.
- Submits marginal capability, low priced systems to win low price image.
- Uses consignment policy liberally.
- Offers 10 year warranty
- Large customer base -- particularly among semi manufacturers

DATATRON STRENGTHS AND STRATEGIES

- Lowest price system, and major competitor in the minimum system range ($50K to $150K)
- Very flexible on specials
- Emphasizes "New Testing Concept"
- Emphasizes "No Relays"
- Simple programming

EXHIBIT V-8



S-100 COMPETITIVE PRICING ANALYSIS

S-200 COMPETITIVE PROFILE -- See Exhibit V-9

Eng/QA Bipolar SSI/MSI tester

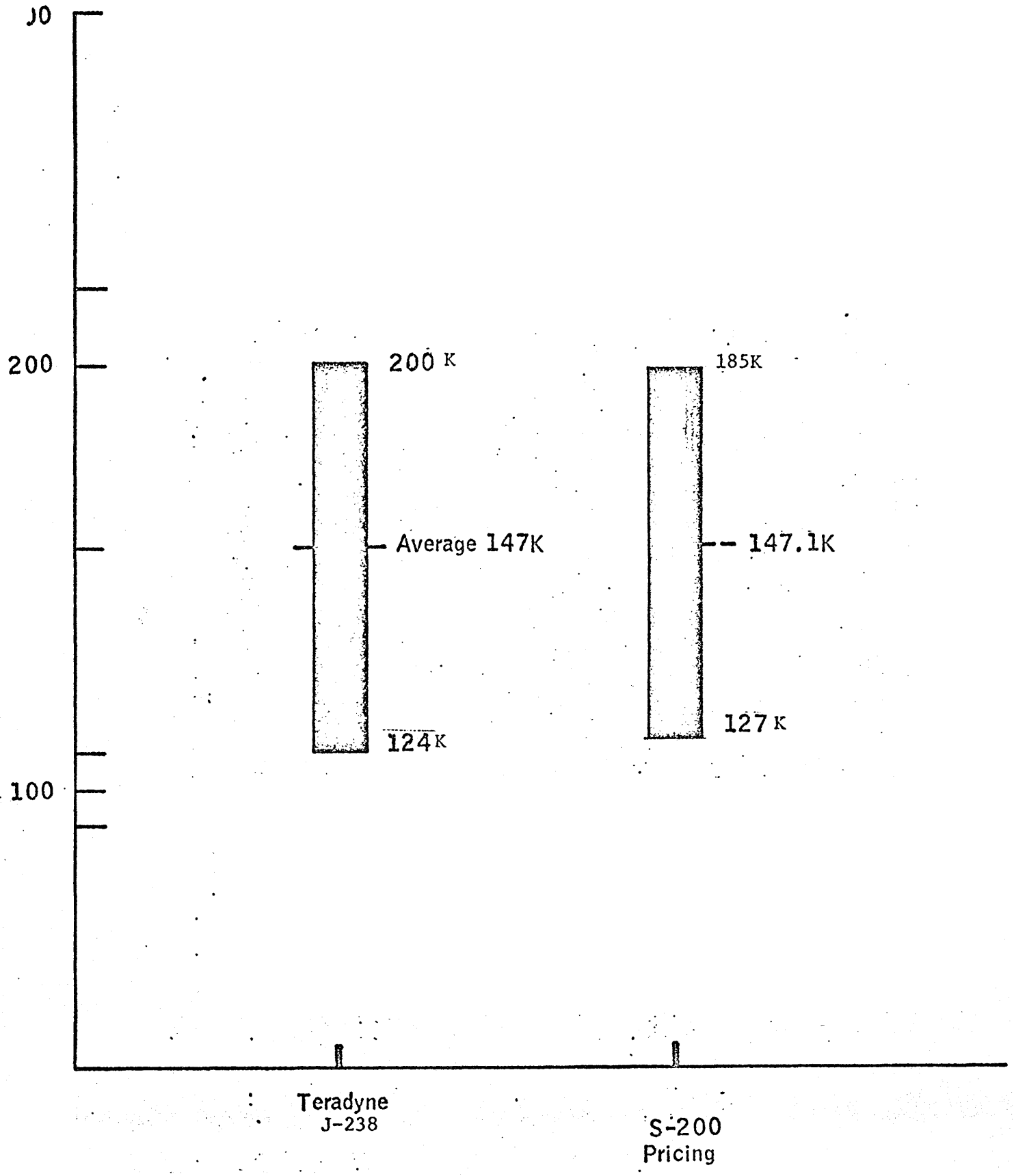
MAJOR COMPETITOR

-- Teradyne J 283

TERADYNE STRENGTHS AND STRATEGIES

- Pricing is competitive ($124K, $147K, $200K)
- Emphasize large customer base as proof of reliability and safety
- Uses successive approximation technique as an advantage
- Have developed extensive datalogging and parameter analysis software
- Offers two teletypes for "on-line" test plan preparation and listing with cartrifile

EXHIBIT V-9



S-200 COMPETITIVE PRICING ANALYSIS

S-500 COMPETITIVE PROFILE -- See Exhibit V-10

Random logic tester

MAJOR COMPETITORS

J-277 - Teradyne

DR-32 - Western Digital

Datatron 4500

TERADYNE STRENGTHS

- 10 MHz data rate
- 1 nsec timing resolution
- No calibration adjustments
- Full foreground background controller oper.
- Inexpensive and extensive prober interfaces
- Established competitor
- 10 year warranty policy
- Price range $185K to $217K

WESTERN DIGITAL DR-32

- 8 MHz data rate
- 1 nsec resolution
- Low price 90K to 110K
- Attractive cost/performance ratio
- Expandable to larger system (DR 64)
- Has datalogging software (opt)

S-500 COMPETITIVE PROFILE -- See Exhibit V-10

Memory tester

MAJOR COMPETITORS

Venture II - Computest

MD 150 - Macrodata

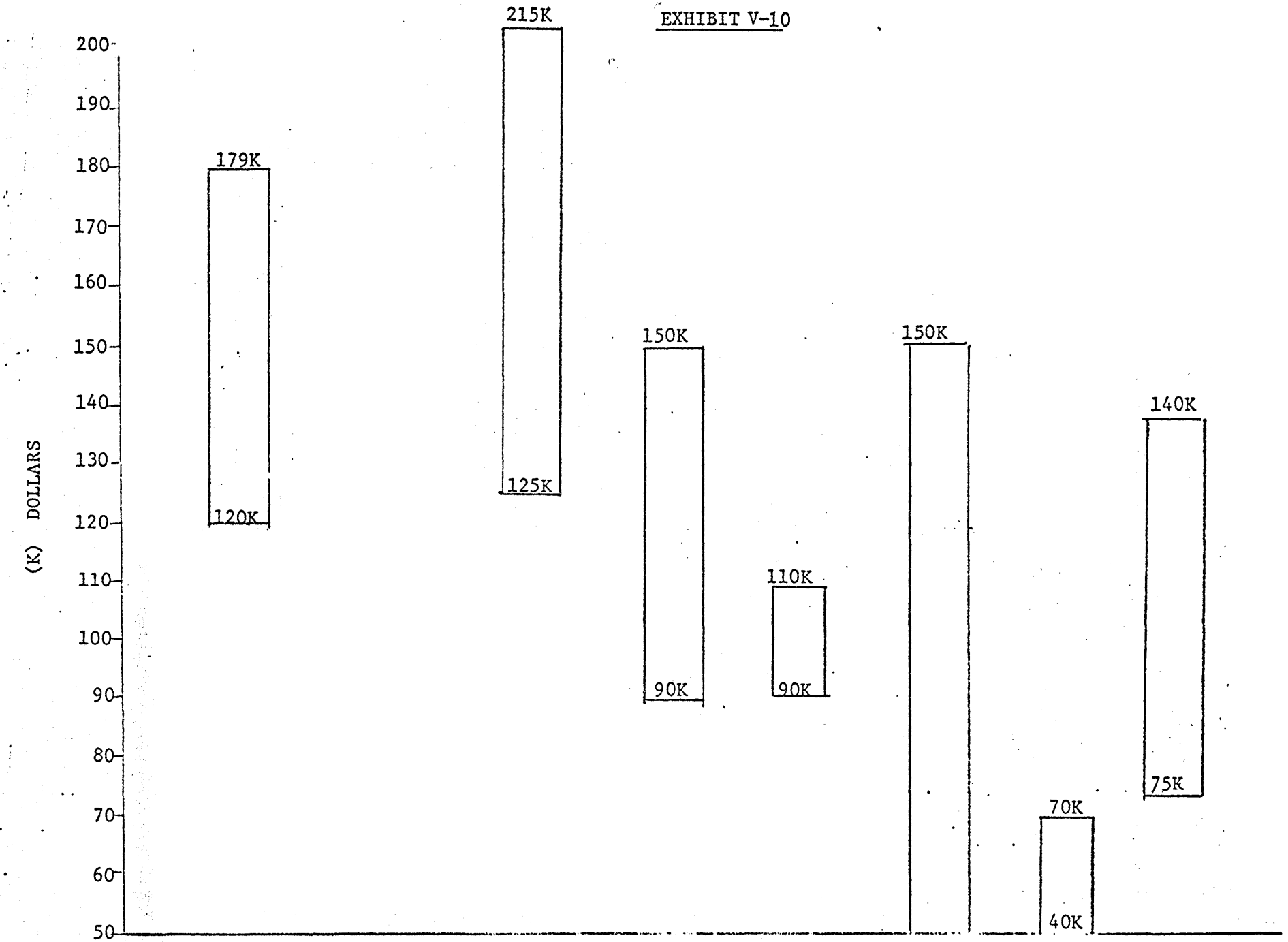
COMPUTEST STRENGTHS

- 10 MHz data rate
- Optional parametric test capability
- Low price -- starts at $40K to $70K
- Stand alone, hardwired controller with mag tape input
- Microprogram control

MACRODATA STRENGTHS

- 5 MHz data rate
- Advertises "zero overhead" testing
- Low price $75K to $120K
- Was first semiconductor memory tester using firmware -- hence image
- Large family of memory exercisers/testers

EXHIBIT V-10



MOS/LSI PRODUCTION TESTERS

S-600 COMPETITIVE PROFILE -- See Exhibit V-11

Multifunction memory and random logic (LSI) tester

MAJOR COMPETITORS

- Teradyne J-277
- ADAR Doctor 64
- Macrodata MD-500
- Datatron 4500 + 10 MHz opt.

TERADYNE STRENGTHS AND STRATEGIES

- Liberal use of consignments
- Competitive price ($180K)
- 1 nanosecond resolution
- Hardware pattern generator
- 10 year warranty

ADAR STRENGTHS AND STRATEGIES

- Lower price $90K to $180K
- 8 MHz data rate
- 1 nanosec resolution
- Dedicated hardware (clocks, drivers, comparators) for memory testing
- Upwards compatability from lower cost unit, i.e., Doctor 32

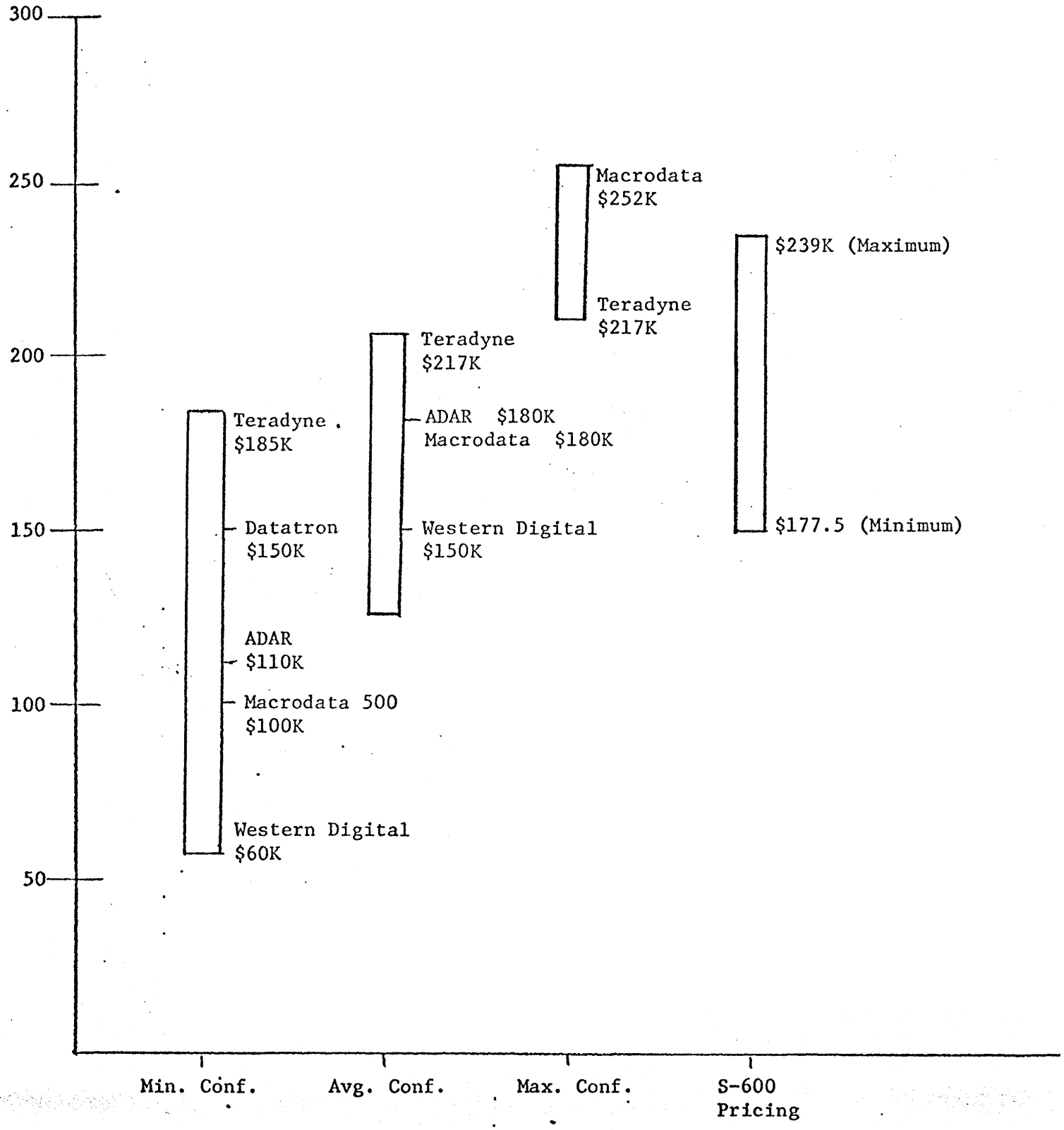
MACRODATA STRENGTHS AND STRATEGIES

- Lower price ($100K to $250K)
- Firmware implementation
- Freestanding modules
- MD 500 has 10 MHz data rate
- Good reputation for understanding MOS test problems
- Has family of testers /MD 104, MD 150, MD 200, MD 500/

DATATRON STRENGTHS AND STRATEGIES

- Higher pin capability (i.e., 100 pins)
- Lower price -- starts at $50K to $150K.

EXHIBIT V-11


300
250
200
150
100
50
Teradyne
$185K
Datatron
$150K
ADAR
$110K
Macrodata 500
$100K
Western Digital
$60K
Teradyne
$217K
ADAR $180K
Macrodata $180K
Western Digital
$150K
Macrodata
$252K
Teradyne
$217K
$239K (Maximum)
$177.5 (Minimum)
Min. Conf.
Avg. Conf.
Max. Conf.
S-600
Pricing

5.4 TECHNOLOGY IMPACT ON CTS PRODUCT LINE

The following summarizes technology trends for semiconductor devices.

DISCRETES

- The discrete semiconductor market will grow 12% between 1972 and 1976.
- Diodes and transistors will account for over 75% of the total discrete component market through 1975.
- Transistor market will decline because of IC replacements.
- Opto-devices and silicon power transistors will be the two high growth components of the discrete device market.

LINEAR/HYBRIDS

- Linear market to grow 130% by 1976.
- Hybrid devices market to grow 150% by 1976.
- Major hybrid users to include Automotive, Communications, T.V. and Radio industries.
- Government to use less than 25% of all production.

DIC- General

- Production of Monolithic DIC market will grow over 100% from 1972 to 1976. Predominant leaders to be TTL/TTLS and MOS, followed by ECL.
- DIC's for computer usage will increase over 100% by 1976.
- The memory area represented by ROMS and RAMS will be the fastest growing market through 1976. RAMS should go to 4096 bits of storage per chip, while ROMS to 8192 bits per chip.

DIC - Bipolar

- DTL will be gradually replaced by TTL.
- ECL growth will be approximately 26% per year over the next five years.
- TTL's will crowd ECL because of its shorter propagation time and cost advantage.

DIC - MOS

- MOS IC market will grow 280% from 1972 to 1976.
- P-Channel to be used in calculators and computer peripherals where low speed is acceptable.
- N-Channel enhancement technology to become viable by 1975.

5.4.1 ANALYSIS OF SEMICONDUCTOR TECHNOLOGY TRENDS

Discrete Devices

Discrete component sales in the U. S. have dropped by about 15% annually during 1969-72 (i.e., Sales in 1972) were at $616 million vs. $680 million in 1971). This trend is expected to bottomout during 1972-73 due to the growth of a number of discrete devices; particularly the silicon power transistors, Thyristors, FETS, Power Darlingtons and Opto-electric devices.

Monolothic LIC

Sales of Linear devices in the U. S. have grown by 16% during the past year. Operational amplifiers have accounted for over 30% of the LIC market. Growth projections for this market are indicated by the table below.

1969	1970	1971	1972	1973	1974
$75.8M	$83.6M	$95.0M	$110M	$126M	$149M

The LIC market will be particularly affected by increasing demands from manufacturers of consumer oriented products (i.e., radio and television manufacturers) who are gradually changing from vacuum tube and transistor circuits to more complex linear integrated circuit devices.

A breakdown of Linear Device Sales for 1972 follows:

Op Amps	39%
TV Ckts.	14.5%
Receivers/Drivers	9%
Comparators	6.5%
Regulators	6%
Sense Amps	5%
RF/IF Amps	4%
Others	16%

Monolithic DIC Market

SSI/MSI Devices

Overall sales of digital integrated circuits continue to grow. Although sales of some devices have diminished (i.e., DTL/RTL) others, such as TTL and ECL have grown. Some DIC's have undergone significant price erosion. EIA (Electronics Industries Association) estimates for the (domestic) DIC market are as follows:

1968	1969	1970	1971	1972	Projected 1973	Projected 1975
$242M	$314M	$255M	$220M	$266M	$295M	$353M

The following projections have been made for devices within this category.

	1972	1973	% Change
DTL	42M	37M	-13%
TTL	172M	195M	+14%
CTL	7M	6M	-16%
RTL	6M	5M	-20%
ECL	32M	44M	+38%

LSI Devices

The MOS/LSI market in the U. S. is one of the fastest growing in the semiconductor business. A pronection of the market is shown below:

1969	1970	1971	1972	1973	1974
$28.0M	$98.0	$103.0M	$130.0M	$160M	$225.0M

Increased MOS sales have been largely large-scale arrays, shift registers and memories. The dynamic growth of this segment of business, the higher complexity of MOS devices, and hence more extensive testing requirements, collectively create a major demand function for MOS testers. Because memories constitute a major segment of this market, these are further delineated below. For 1972, semiconductor memory sales will be at 48 million dollars. This breaks down as follows:

- RAMS: $20M
  - Bipolar: $7.9M
  - MOS $12.1M
- ROMS: $28M

The RAM memory market characteristics in 1972 can also be defined by complexity:

BITS	% BIP	% MOS
≤32	30%	8%
33-256	68%	14%
>256	2%	78%

5.4.2 TECHNOLOGY IMPACT ON FST PRODUCTS

The impact of semiconductor technological trends upon current FSTD products is summarized in Exhibit V-12. Significantly ECL and MOS are two of the highest growth/highest sales volume devices for the near term. Other high growth technologies include such discrete components as opto-devices, TTL, and plastic-silicon power transistors. The growth and size of new semiconductor markets should, therefore, strongly influence commitments for development of new test equipment.

An area of particular concern during 1973 is the competitiveness in the emerging LSI and memory test markets. Exhibit V-13 depicts the characteristic trends that are occurring in this market in terms of introduction of larger and faster memories. Exhibit V-14 describes FSTD product capabilities to serve this market segment. The major concern is FSTD's ability to sell against competitive products that may be 2-4 times faster -- particularly where testing speeds are not device limited, but tester limited. This problem may be more apparent for testing ECL devices (on the S-100/200) and larger BIP or faster and larger MOS. The letter particularly impacts a major segment of FSTD business which includes the S-600/S-500/SS-400 test products. These

constituted over 35% of total FSTD sales in 1972, and are expected to be an even more significant part of Fairchild business in the 1973-74 time frame.

EXHIBIT V-12

Component Family	Impact on present FSTD products	1972 to 1973 % of growth (+) or decline (-)
MONOLITHIC LIC	5000C/5300, Benchtop LIC Testers 301 and 335	+15.7%
MONOLITHIC DIC (Total)	Price erosion in TTL. Equipment applicable includes the 5000C, S-100 & 200 Sentry, 321 and 301 bench top testers. Requirements of growing ECL and BIP memory markets will not be satisfied by existing products.	+11%
ECL		+38%
DTL/RTL		-17%
TTL		+14%
CTL, other		-17%
MOS	S-600, S-500	+26%
DISCRETE DEVICES	600C/PATT; component volume and unit growth still sizeable, reduced dollar growth reflects high price erosion	-5%
Dual Transistors FETS	Potential application for PATT and 600C	+2%
Silicon Diodes Diodes Assemblies	5000C application	-18% 0%
Zener Diodes	No current product capability	0%
Thyristors	PATT capability	+14%
Opto-Devices	No current product capability	+11%
Hybrid IC's	Laser trimming and linear test applications. No current product capability	+8.5%
Chips	No current product capability	+30.6%
Si Power	600C, PATT; the volume growth of plastic devices indicates increased need for two future test applications i.e., power testing and plastic device handler	+7%

EXHIBIT V-13

SEMICONDUCTOR MEMORY TECHNOLOGY TRENDS

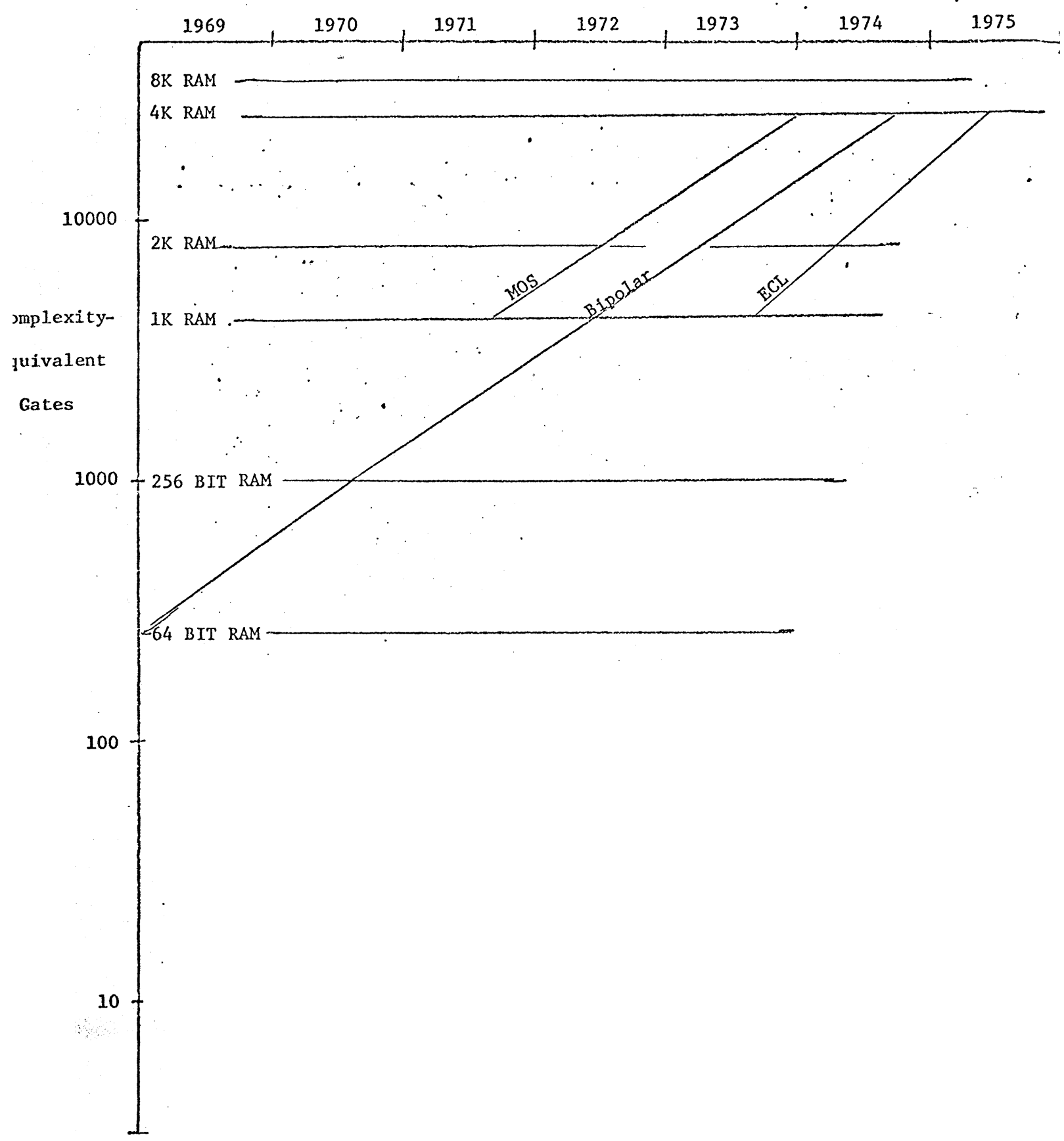
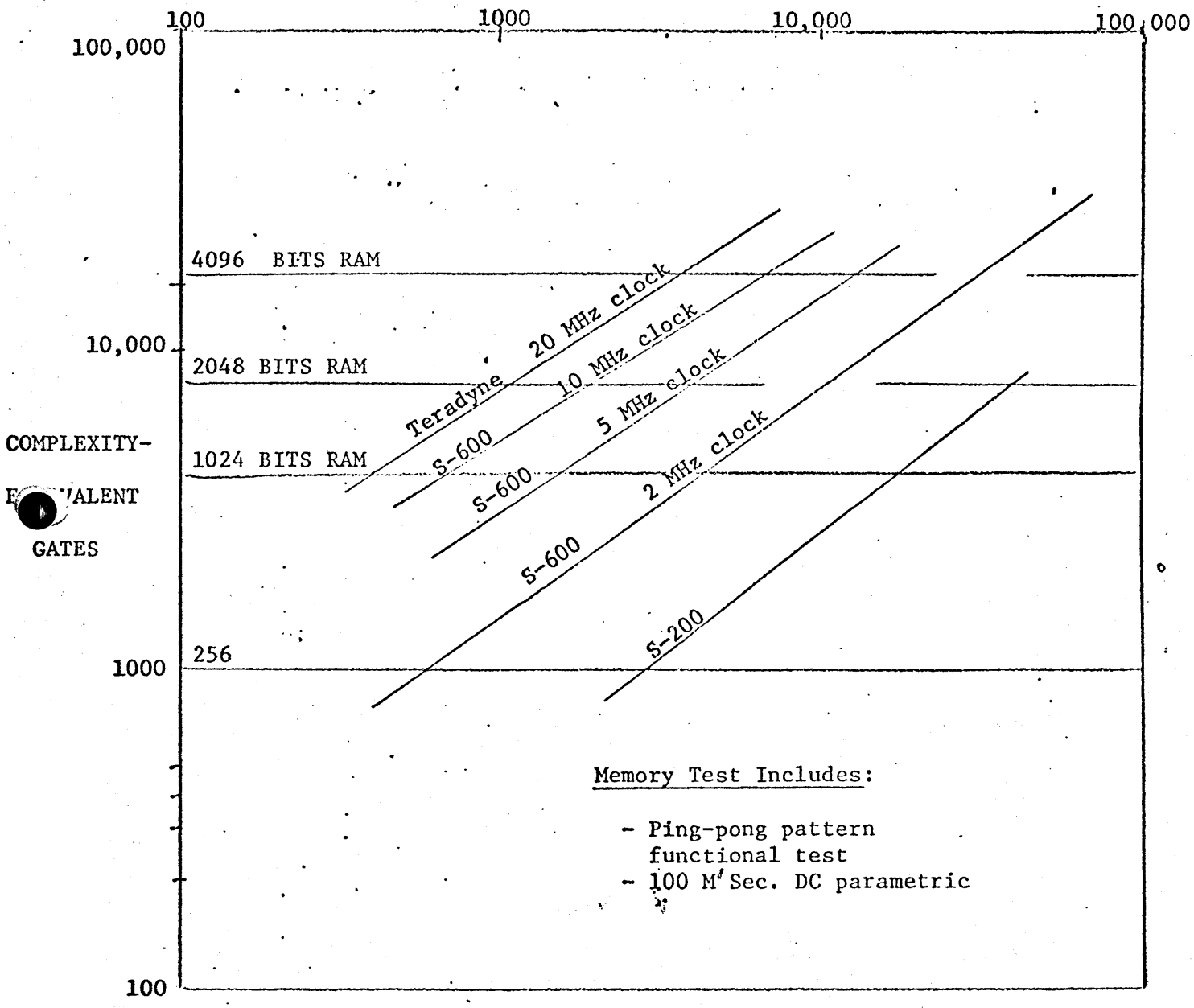


EXHIBIT V-14

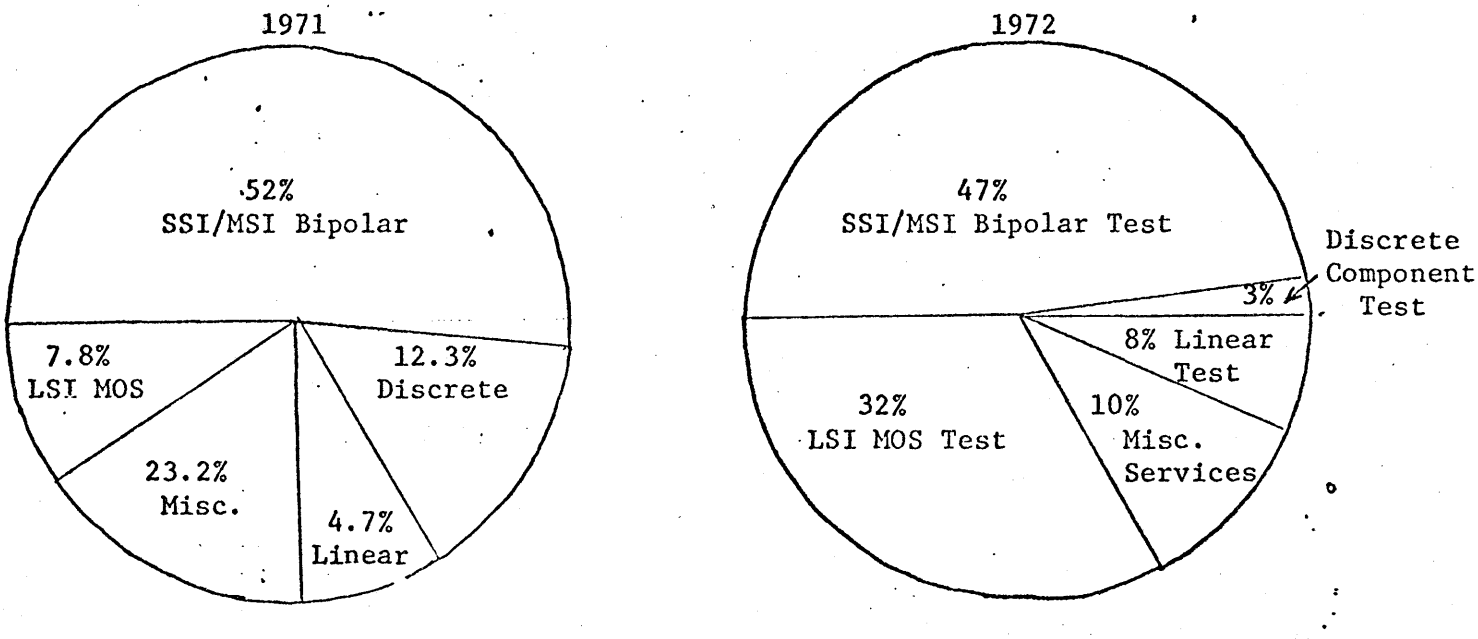
MEMORY TEST TIME -- MILLISECS.



5.5 PRODUCT EVALUATION

5.5.1 FSTD CTS PRODUCT SALES TREND ANALYSIS

The charts below describe the composition of 1971-72 business in terms of test applications. Each application is served by one or more FSTD product; these are delineated in the product table below. Major business shifts include sales increases in LSI MOS, and linear testers; also decrease in discrete component test products.



SSI/MSI Bipolar	LSI MOS	Linear	Discrete
S-100	S-500	5000L	600C
S-200	S-600	321 Benchtop	PATT
S-400			
5000C	S-400/HSTH	335 Benchtop	
5800			
5900			
Sentry Real Time			
301 Benchtop			
321 Benchtop			

For 1972 the Product-business makeup for test systems is compiled in Exhibit V-15. This chart is presented in terms of world wide CTS sales of 68 million dollars. Each of the categories are broken into dollar contribution to total sales, the percent of market that the sales represent, the estimated FSTD sales in the designated market segment and the percent of market that the FSTD sales represents. From the chart it can be summarized that:

- FSTD sales are poor in discrete test sales and have been dropping. FSTD sales for the market segment constituted only 6.6% of the market.
- In general, FSTD does not have products to compete in dedicated digital test equipment sales. The only sales in the SSI/MSI segment are attributed to the bench top testers. The dedicated tester market segment is expected to grow rapidly in the 1972-75 period because of the LSI memory growth.
- FSTD has a good position in the multifunction digital test equipment market. This is a market which largely relies upon computer based test systems to meet the varied requirements of the multifunction tester. The SSI/MSI sales were due predominantly to 5000C sales; and although the S-100 and S-200 sales will pick up in 1973 -- 5000C sales will continue in 1973.

- FSTD sales of linear test products increased during 1972-73 period. However FSTD lacks a product base to be effective in this market place -- hence a capture of only 13.0%. The linear test market should exhibit good growth during the next three years -- this will follow the needs of the growing linear device market.

5.6 1973 PRODUCT STRATEGIES

The Product Strategies required to achieve stated sales goals require that a number of Sentry product enhancements be made available in the proper time frame. Achieving the targeted sales goal also requires introduction of new products to further penetrate existing as well as new markets. These product requirements and their impact on sales are summarized in Exhibits V-16 through V-19.

Exhibit V-16 depicts 1972 CTS sales as contributed by incremental sales in various market segments. This exhibit also provides estimates of 1973 CTS business with and without required product enhancements. These estimates have been generally accepted by both the Sales and Marketing Organizations. Exhibit V-17 analyzes the impact of product enhancements and introductions on long term revenue. Finally, Exhibit V-18 summarizes product strategies, completion dates, short and long term revenue impact.

EXHIBIT V-16

1973 Revenue - CTS Base and New Products/Enhancements
(Does not include Gov't ATE.)

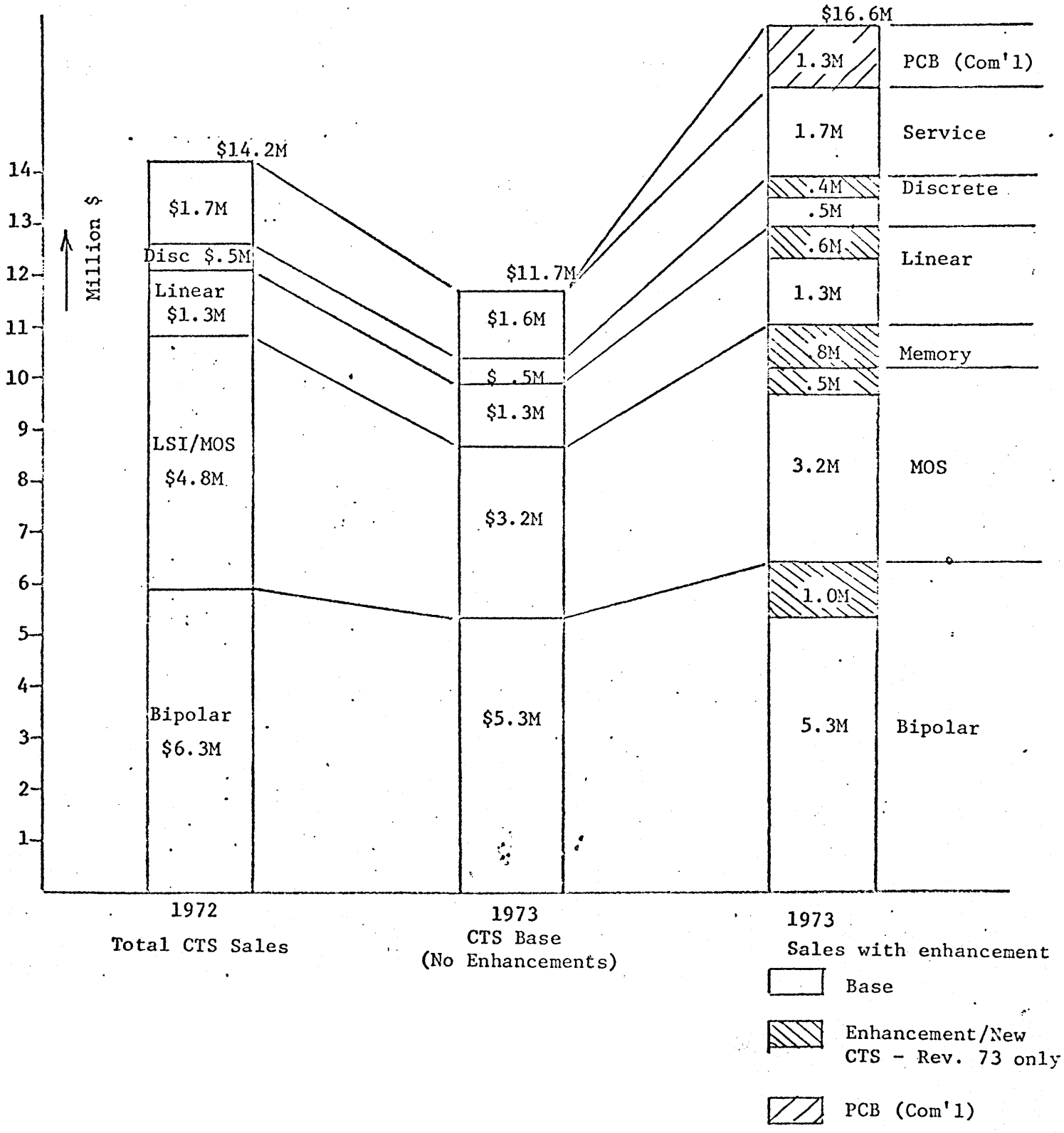
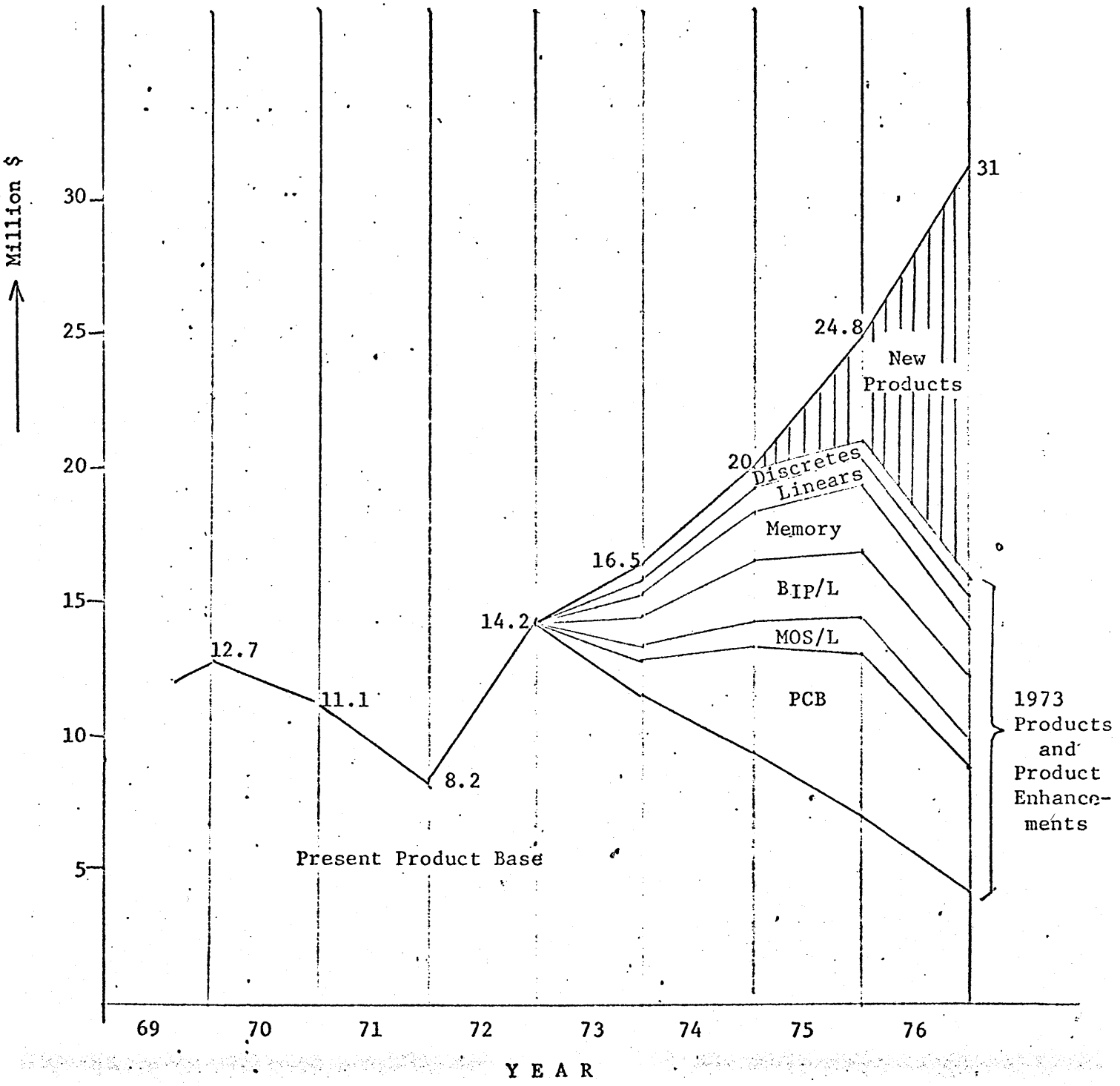
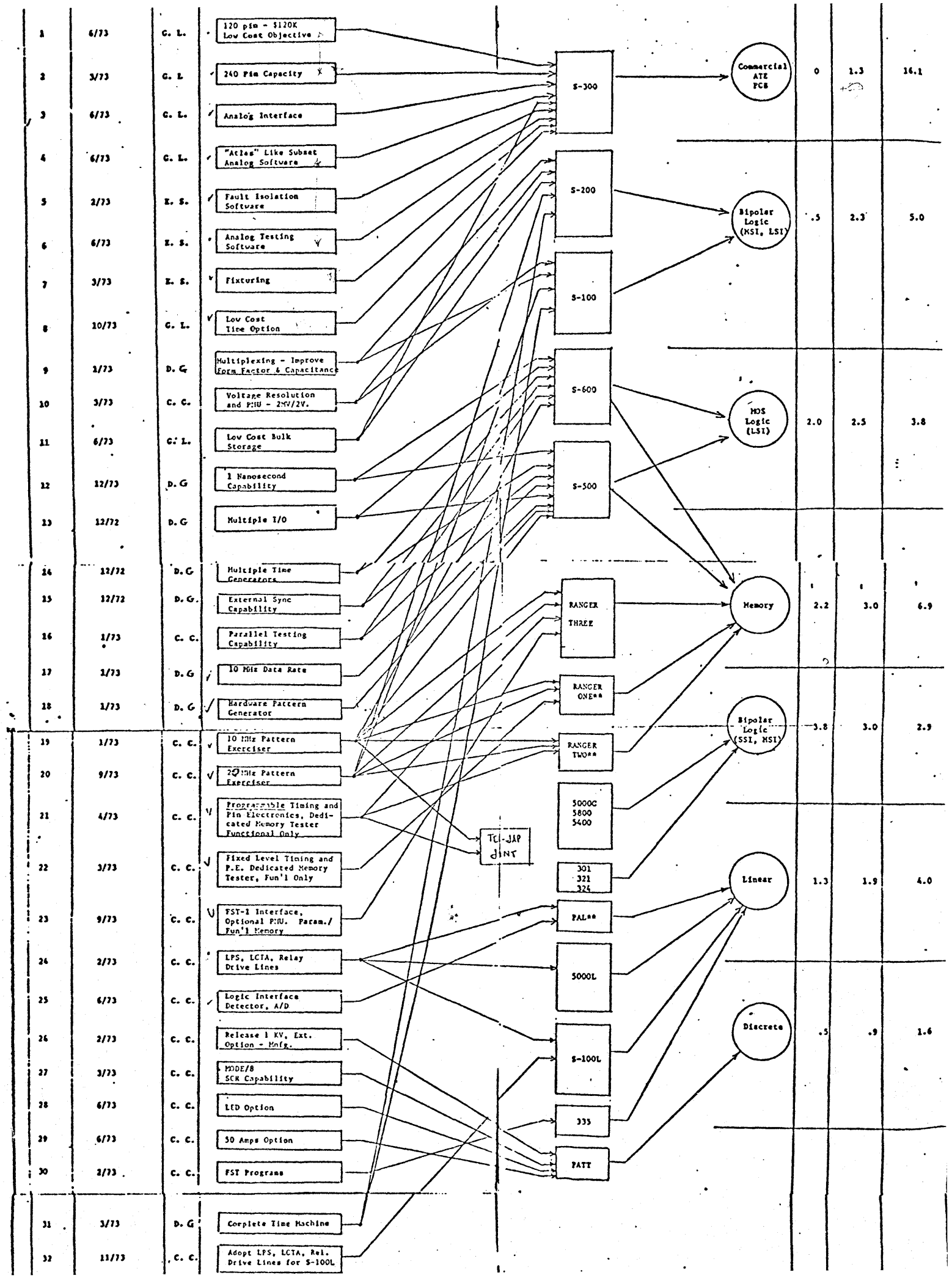


EXHIBIT V-17

Product Impact on Future Sales




1 6/73 G. L. 120 pin - $120K Low Cost Objective
2 3/73 G. L 240 Pin Capacity
3 6/73 G. L. Analog Interface
4 6/73 G. L. "Atlas" Like Subset Analog Software
5 2/73 E. S. Fault Isolation Software
6 6/73 E. S. Analog Testing Software
7 3/73 E. S. Fixturing
8 10/73 G. L. Low Cost Time Option
9 1/73 D. G Multiplexing - Improve Form Factor & Capacitance
10 3/73 C. C. Voltage Resolution and PMU - 2MV/2V.
11 6/73 G. L. Low Cost Bulk Storage
12 12/73 D. G 1 Nanosecond Capability
13 12/72 D. G Multiple I/O
14 12/72 D. G Multiple Time Generators
15 12/72 D. G. External Sync Capability
16 1/73 C. C. Parallel Testing Capability
17 1/73 D. G 10 MHz Data Rate
18 1/73 D. G Hardware Pattern Generator
19 1/73 C. C. 10 MHz Pattern Exerciser
20 9/73 C. C. 20 MHz Pattern Exerciser
21 4/73 C. C. Programmable Timing and Pin Electronics, Dedicated Memory Tester Functional Only
22 3/73 C. C. Fixed Level Timing and P.E. Dedicated Memory Tester, Fun'l Only
23 9/73 C. C. FST-1 Interface, Optional PMU. Param./ Fun'l Memory
24 2/73 C. C. LPS, LCTA, Relay Drive Lines
25 6/73 C. C. Logic Interface Detector, A/D
26 2/73 C. C. Release 1 KV, Ext. Option - Mnfg.
27 3/73 C. C. MODE/8 SCR Capability
28 6/73 C. C. LED Option
29 6/73 C. C. 50 Amps Option
30 2/73 C. C. FST Programs
31 3/73 D. G Complete Time Machine
32 11/73 C. C. Adopt LPS, LCTA, Rel. Drive Lines for S-100L
S-300
S-200
S-100
S-600
S-500
RANGER THREE
RANGER ONE**
RANGER TWO**
5000C 5800 5400
TEL-JAP DINT
301 321 324
PAL**
5000L
S-100L
333
PATT
Commercial ATE PCB
Bipolar Logic (MSI, LSI)
MOS Logic (LSI)
Memory
Bipolar Logic (SSI, MSI)
Linear
Discrete
0 1.3 16.1
.5 2.3 5.0
2.0 2.5 3.8
2.2 3.0 6.9
3.8 3.0 2.9
1.3 1.9 4.0
.5 .9 1.6

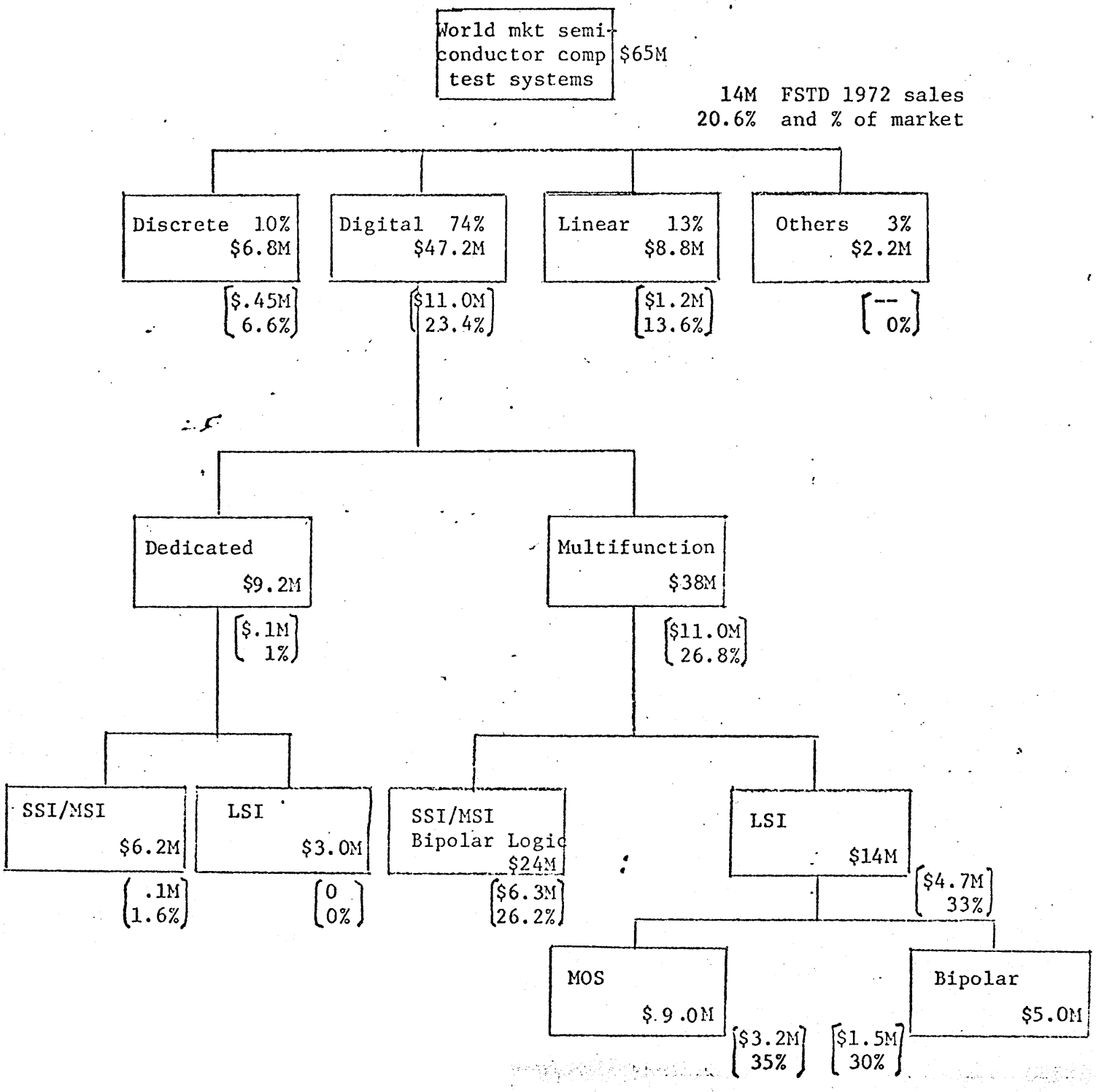
SECTION VI

COMPETITIVE STRENGTHS AND WEAKNESSES

6.0 Exhibits VI-1 and VI-2 summarize FSTD's competitive strengths and weaknesses which impact upon the companies position in the Semiconductor test market.

EXHIBIT V-15

PRODUCT-SHARE OF MARKET CHART



COMPETITIVE STRENGTHS & WEAKNESSES

(Rank according to importance)

SENTRY SERIES
Product Line

Served Market Competitors*

	FAIRCHILD	TERADYNE	DATATRON	MACRODATA
MAJOR STRENGTHS	• Systems Family Upward/downward compatibility in system architecture across Sentry family • Commonality in hardware and software packages across system lines • Modular system structure permits capability expansion/growth • Family members oriented towards specific testing applications • Lower maintenance costs due to standardization across product lines • Extended product life cycles • Part of major corporation • Affiliation with semiconductor industry leader • Image of leadership in industry • World wide sales/service organization • Easy field retrofit and expansion • System architecture permits easy data manipulation • Custom product engineering capability • Largest installed product base	• Proven field reliability • Products address broad spectrum of applications • Well accepted in semi production world • Broad customer base resulting from 5 years in low cost products • World wide sales/service organization • 6 years of demonstrated sales/profit growth • 10 years parts warranty policy • Modularity in product design • Well established applications oriented literature • Heavy use of consignment/loaner equipment	• Low cost system • Good, new approach to test system concept • Operate a successful test lab • Parent company has broad systems capability (Astrodata spinoff) • Very easy to program	• Early entry into MOS market • Company founders from semiconductor development area • Active in MOS/LSI technologies and CAD • Offer the only MOS bench top tester (S • Offering two second generation MOS capability enhancements.
MAJOR WEAKNESSES	• Ability to assimilate a new product introduction • Image for poor product price performance house • 1 year parts warranty • Some required options not available upon introduction • Lack of depth in semiconductor technology expertise • Lack of applications oriented literature • Late entry of Hi Speed MOS test capability	• System architecture does not permit efficient data manipulation • Lack of system specification documentation • High pressure sales techniques in highly competitive business situations • Dogmatic management techniques • New system concepts indicate decline in comprehension of new device technology • Unaccustomed to operating in an unprofitable situation • Poor market acceptance of MOS test capability	• No service organization • Lack of established customer base • Financial problems • Sales effort via reps • No significant international sales/service • Poor product reliability • Lack of applications engineering support group • Single product offering • Hang all kinds of bells and whistles on system	• Start up company • No sales/service organization • Narrow product base • One man show (B. Mow) • No large corporate association • Poor reliability on large system • Sell through reps • Very limited customer base • MOS test system limited to 2 MHz

COMPETITIVE STRENGTHS & WEAKNESSES

(Rank according to importance)

PATT Bench Top

Product Line

	Served Market Competitors*		
FAIRCHILD	TERADYNE	MICRODYNE	LORLIN
MAJOR STRENGTHS			
Bench Top • World wide field service • Direct sales force • Strong association with Fairchild Semiconductor customers • Broadens product offering • Add on capability to installed 5000C • Attractive to existing customer base • Provides low cost "starter" system for small customers PATT • Architecture/capability is unique • Production sort capability is one of a kind • Demonstrated cost effectiveness • MOS memory utilization • Market acceptance	• Proven field reliability • Well accepted in semi production world • Broad customer base resulting from 5 years in low cost products • World wide sales/service organization • 10 years parts warranty policy • Heavy use of consignment/loaner equipment • Pillar in the bench top field	• Broad product line for I/C's • Fairly successful in market penetration • Good rep sales organizations • Reps provide field service locally • Part of stable small corporation (Computer Test Corp) • Product offering in linear testing • Good product literature	• Low cost • A new, novel computer controlled discret device test system
MAJOR WEAKNESSES			
Bench Top • Private brand product • Program board logistics • No value added on equipment • Sales force oriented towards large systems • Applications/Engineering support • Lack of in-depth product knowledge PATT • Delivery slow at introduction • Sales force historically oriented towards large systems • Applications support not staffed • No upward/downward integration with other product lines • Option offerings not completed	• System architecture does not permit sufficient data manipulation • Lack of system specification documentation • High pressure sales techniques in highly competitive business situations • Dictatorial management • New system concepts indicate decline in comprehension of new device technology • Unaccustomed to operating in an unprofitable situation	• No direct sales/service force • Lack of systems oriented products • No upward expansion capability • Lack of applications support	• Sell through reps • Small company • Lack of established customer base • Lack of field service • Questionable financing

Product Line

SERVED MARKET COMPETITORS' MARKET/PRODUCT STRATEGIES

(A concise paragraph of their respective approaches)

FAIRCHILD

- Maximum sales penetration at key semiconductor houses, world wide.
- Equipment upgrading program for established customers
- Applications assistance and contract services to enhance customer utilization of equipment
- Demonstrate competance and understanding of broad component testing requirements
- Broaden customer base via low cost configuration "starter" systems
- Sales effort at multiple levels stressing cost effective testing concepts
- PCB test product entry into new and expanding market
- Applications oriented product literature targeted to specific user requirements
- Product prices structured to permit quantity discounts to stimulate multiple system purchases by companies with strong buying power
- ~~New line product introduction to all key customers on confidential basis prior to general announcement.~~
- Stress total systems turn key responsibility

COMPETITOR A - TERADYNE

- Liberal use of consignment/loaner equipment
- Advertise and stress advantages of liberal 10 year warranty
- Intensive use of propaganda
- Stress cost effective testing and high throughput in the production area
- Overt attempt to penetrate influence areas of semiconductor houses
- Use of intimidation techniques in sales situations
- High level management involvement in sales situations
- Upgrade established customers with add-on capability
- Stress system reliability
- Offer unlimited free training for customers
- Promote to semiconductor houses that purchases of Fairchild equipment will aid FSC--their competition
- Products address broad spectrum of requirements
- Product specialization versus generalization

COMPETITOR B - MACRODATA

- Concentrating on expanding MOS market
- Offer low cost bench top MOS memory tester (~~at first~~)
- Promote their alleged comprehension of MOS/LSI technology
- Provide wafer probe test capability for MOS products

COMPETITOR C - DATATRON

- Stress low cost system
- Promote new, unique testing techniques

EXHIBIT F

Product Line

SERVED MARKET COMPETITORS' MARKET/PRODUCT STRATEGIES

(A concise paragraph of their respective approaches)

FAIRCHILD

- Use of field demos
- Specific sales effort to broaden customer base
- Revisit sales effort to established customers
- Strong low cost entry item for user market
- Low complexity system for semi production world
- Forerunner into planned future product family-MTS
- Tap capital expenditure funds not requiring high level management approval
- Pursue market base 5 - 8 times market previously served
- Educate user market in cost reduction effectiveness of incoming inspection testing
- Field service provided at strategically located service centers versus field service engineer travel

COMPETITOR A - TERADYNE

- Heavy use of consignments
- Dogmatic philosophy to testing techniques
- Stress long history of discrete device knowledge
- Stress very complete systems approach - i.e., handlers
- Heavy literature support
- Large applications force
- Strong headquarters marketing

COMPETITOR B - MICRODYNE

- Pursue entire I/C bench top market
- Capture larger share of total market via private brand through FST
- Use reps for sales and service
- Offer upward vertical product development/integration

COMPETITOR C - LORLIN

- Copy Teradyne low cost discrete device testers
- Offer novel computer controlled discrete device test system
- Offer low cost, simple products

SECTION VII

MARKETING DEPARTMENT ORGANIZATION, RESOURCES, AND PERFORMANCE

7.1 ORGANIZATION

The Marketing organization is structured to provide functional efficiency and short communications among Sales, Service, Technical Support, and Administrative activities. The headquarters support activities include:

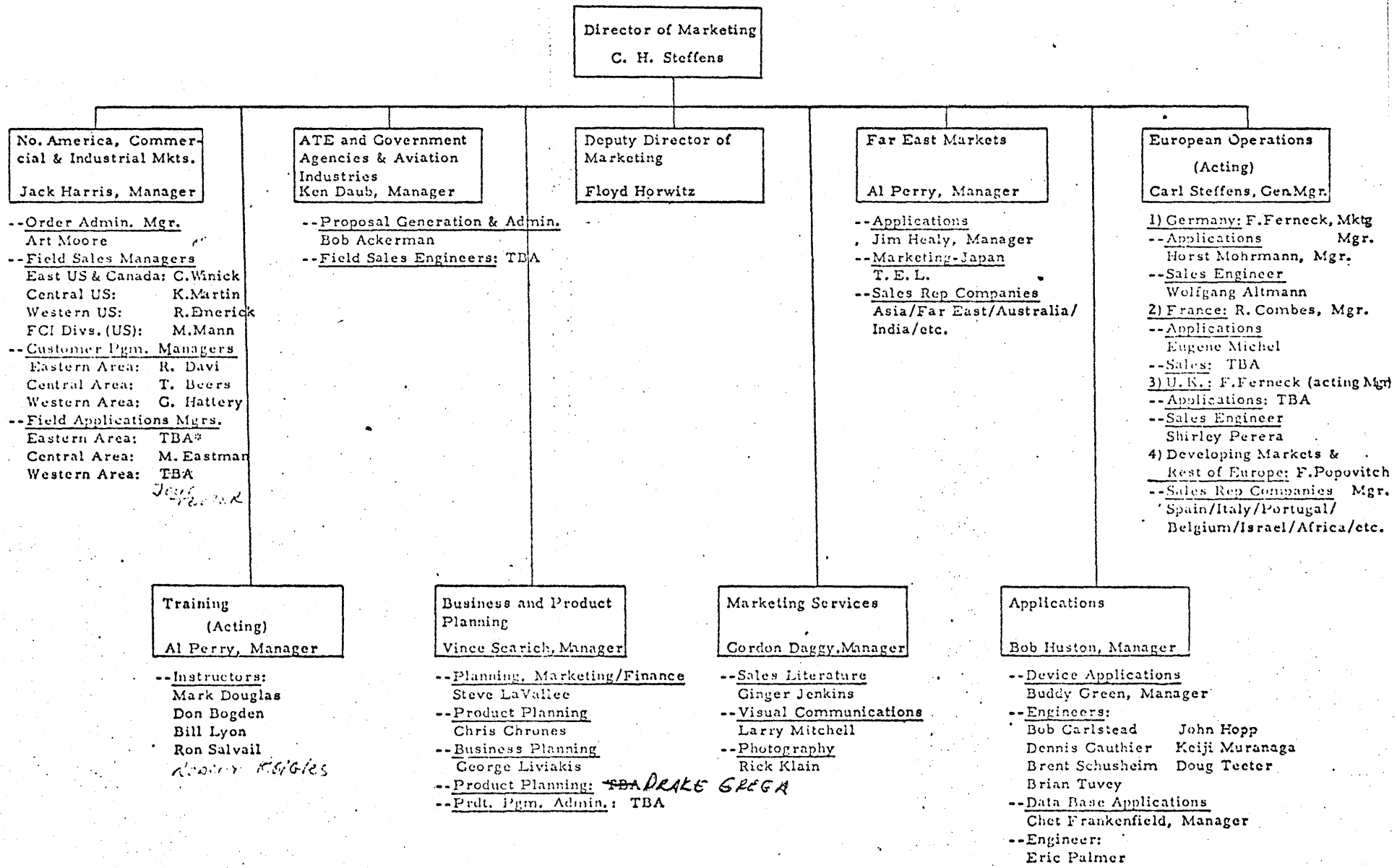
- Product Planning
- Business Planning
- Marketing Services
- Technical/Applications Support
- Field Sales
- Contracts Administration
- Training

Organization charts for the Marketing Department and its various activities will be found in Exhibit VII-1. Functions provided by these activities are described in Exhibits VII-2.

EXHIBIT VII-1

Marketing Department Organization Chart

10-2-72



*TBA: To Be Assigned

EXHIBIT VII-2

ORGANIZATION FUNCTIONS

Product Planning

- New market development
- New product definition
- Definition of technical support needed
- Creation of mid-range marketing plans
- Define, develop and coordinate implementation of new product introduction
- Define marketing strategies for new products
- Define and develop salesman training for new products
- Define needs for product modifications and requirements of customer specials
- Define program for analysis of competitive products and publish results
- Establish marketing strategies for sales organization on respective products
- Guide factory organization on product priorities

Business Planning

- Establish planning criteria
  - Develop forecasts of market opportunities
  - Collect and disseminate information pertinent to the environment which impacts on company business
  - Gather and disseminate intelligence about competitors' technology, strategies, etc.
- Propose objective and goals (strategies) for company growth
- Recommend course of action to achieve objectives
- Assess management plans and related courses of action submitted by operating department and regional managers
- Coordinate plans into a unified course of action
- Examines new business opportunities
- Develops business models
- Assess long term implications of the business environment to FST sales
- Recommend long term product development

Marketing Services

- Product literature penetration
- Mailing lists
- Trade shows coordination
- Proposal generation support
- Materials for product presentations
- Advertising
- Sales and Marketing meetings

Area Sales

- Generate product sales stimulation programs
- Conduct product presentations during customer negotiations
- Make monthly analysis of field sales forecast prior to manufacturing interface
- Acceptance and contract review
- Proposal generation
- Liaison and coordination between field sales and headquarters

Technical/Applications Support

- Acceptance tests
- Product presentations support
- New product development
- Product demonstration
- New software releases
- Proposal support
- Testing techniques for new technologies
- Pre/post sale support

Training

- Customer training
- Product presentations
- Product demonstrations
- Training manuals
- Proposal support
- Product training - sales and service

Contracts/Customer Service

- Review all contractual do
- Interface contractual/leg matters with FCI
- Coordinate review/accepta of customer orders
- Convert Marketing Forecas information into Manufact loading documentation
- Coordinate delivery sched
- Authorize shipping and ob export clearances
- Compile business statisti
- Compute sales incentives bookings/sales analysis

7.2 SALES/MARKETING RESOURCES

FSTD marketing and support personnel are geographically distributed as follows:

Current Sales/Marketing Resources

	Sales Force or Rep.	FSTD Service Force	FSTD Sales Support	Educational Facilities
U. S.	16+ Datacom (Pac. NW) KLM (N.Y.) EMI (New Mexico)	31	51	2
Europe	5	8	5	1
Japan	TEL (3)	TEL	1	TEL
Far East	Mackarl (Taiwan/ Hong Kong)	0	0	0
R. O. World	Grech (Australia) Flash (India) Sayyadain (Pakistan) M & N (Scandinavia)	0	0	0

Basic to the Marketing departments' sales philosophy is a completely integrated Sales/Support team working closely to present an image of complete systems capability. For this reason, each sales center also houses service and technical support personnel.

Currently, there are five (5) Sales/Service offices in the U. S., located in Los Angeles; Chicago; Dallas; Sunnyvale, California and Cherry Hill, New Jersey, administrated through three (3) area managers. International offices include Munich, Germany; Tokyo, Japan; London, England; and Paris, France.

Each salesman's territory is large enough to support a profitable sales effort, yet produce effective account penetration of the area. The average annual performance goal has been set at approximately $700,000 per year. Exhibits VII-4 and VII-5 depict performance statistics for the division. From these charts, it is seen that although the sales per direct salesman ratio exceeded the above performance goal during 1972, it was below this figure during 1971. Based upon the above criteria, the current equivalent* sales force should be of sufficient strength to support approximately a $16 million CTS sales level.

* TEL rep. equivalent to 3 salesmen.

ROW reps equivalent to 1/2 salesman.

1972 Sales Performance by Area

The relative 1972 sales performance of the division as well as area is compared to plan in the table below.

Sales Area	1972 Plan	1972 Actual*	$Δ	%Δ
Eastern	1850K	2400	+550K	+29%
Western	3100K	2950	-150K	- 4.8%
Midwest	2350K	1890	-460K	-19.5%
Interdiv.	850K	2 800	+1950K	+229%
Europe	1650K	800	-850K	-51%
Japan	1850K	1070	-780K	-42%
ROW	240K	20	-220K	-91%
Spare/Misc service	1039K	1500	+411K	+39%
Gov't ATE	1596K	1596K	0	--
Total	15,025K	15,026K		

*Preliminary estimate - 10/25/72

EXHIBIT VII-4

FAIRCHILD SYSTEMS 1972-73 PERFORMANCE

Bookings Per Salesman - Annualized

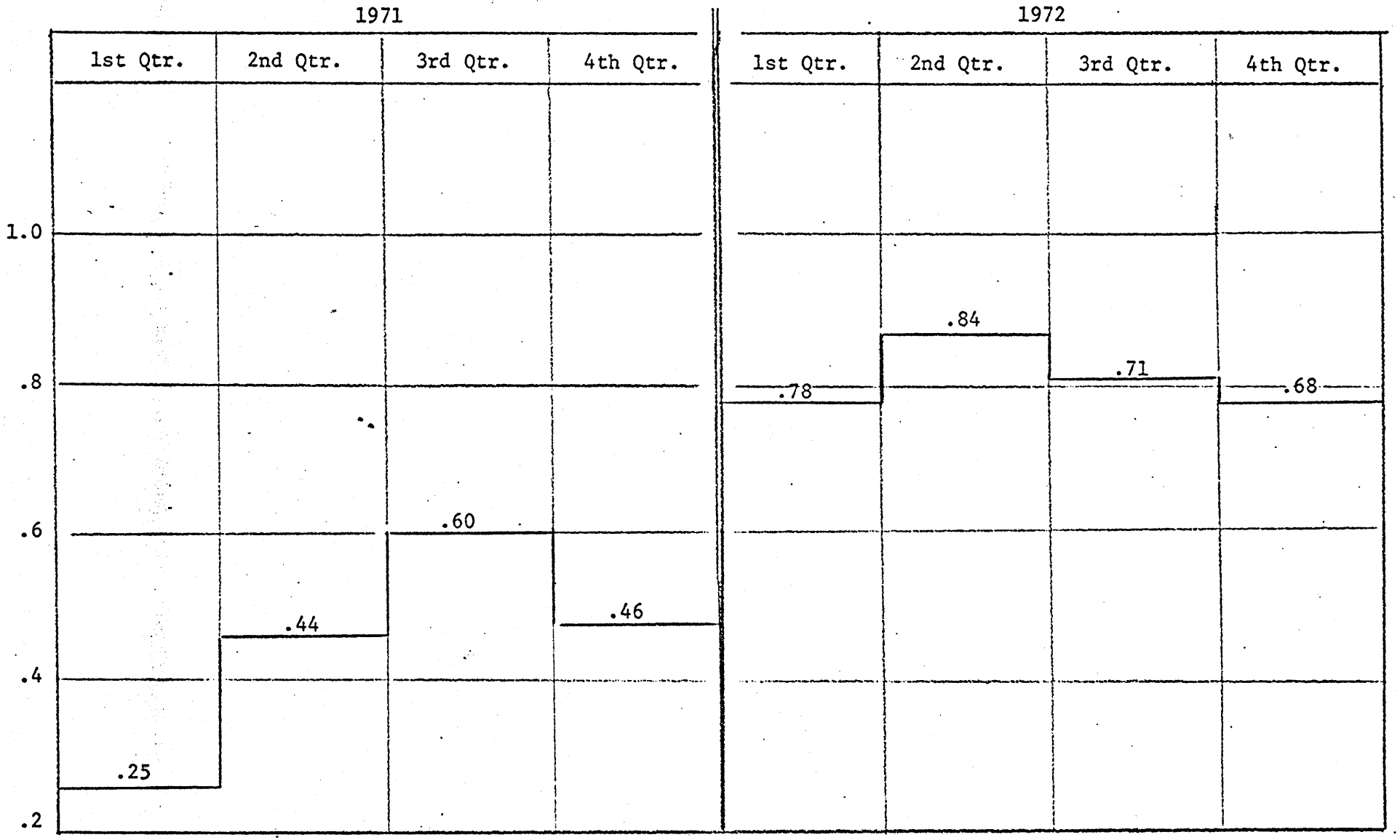


EXHIBIT VII-5

Division Performance Statistics

	1969	1970	1971	1972
Sales (million dollars)	12.8	11.1	8.2	15.4
Personnel				
Mktg. staff and support (including sales)	94	108	80	100
Sales staff (domestic)	11	13	15	15
Sales staff (international	4	7	4	6
Manufacturing	447	335	81	260
Engineering	145	149	73	92
G and A	73	48	28	31
Total employees (average annual)	774	662	300	420
$ Sales/employee	$16,481	$16,862	$26,800	$35,800
$ Sales/direct salesman	$850K	$557K	$430K	$735K

STRENGTHS AND LIMITATIONS

A number of operating strengths and weaknesses have been summarized in Exhibit VII-7.

EXHIBIT VII-7

Marketing Department Strengths and Limitations

Strengths	Limitations
1. Experienced sales engineers	1. Lack of product capability
2. Broad based Mktg. Org.	2. Inadequate presence of Product/Marketing planning
3. Strong day-to-day business support capability	3. Small system service support function
4. Recognized Field Service organization	4. Inordinate market penetration in Europe
5. Training organization	5. Insufficient product marketing support
6. Traveling headquarters	6. Insufficient application support for Bench Top testers
7. Impressive total capabilities image at Headquarters	7. Sales training program
8. Capability to develop analytical tools for measuring market trends, product pricing, product performance (i.e., SAVE), and computerized decision making tools; i.e., product ROI, cash flow model, etc.	8. Tech. publications support