dec INTEROFFICE MEMORANDUM

DATE February 3, 1964

SUBJECT PDP-4 Prototype

TO

FROM H. R. Morse

Computer Guidance Committee
also: A. Hall
Dick Mills
T. Stockebrand

The placement of the PDP-4 Prototype will be on the C.G.C. Agenda, Wednesday. It should not be moved before then.

HRM:tw

To:

K. Olsen
S. Olsen
D. Best
G. Bell
H. Morse
H. Anderson ✓
N. Mazzarese
J. Hastings
W. Hindle

dec INTEROFFICE MEMORANDUM

DATE February 3, 1964

SUBJECT CUBIC EXHIBITS

TO K. H. Olsen
H. E. Anderson ✓
S. C. Olsen
H. Painter

FROM J. L. Atwood

Maybe--just maybe--if the test described on the attached clipping works out, even Will Copp might see the light. This write-up was in the January 17 issue of SALES MANAGEMENT magazine.

J. L. A.

cad
Enclosure

continued

month having recently resigned as executive director, Century 21 Center, Inc., in Seattle. He credits the local group with being three years ahead of Seattle planners in the same amount of time expended.

Show to Test Cubic Exhibits

Housewares Show to allow 12 ft. exhibits and up to 14 ft. along wall. Also new are carpets on aisles (almost 14,000 ft. long).

SINCE there's no space left to go sideways, National Housewares Exhibit in Chicago this month is going up – to 12 and even 14 ft. For the first time, the Housewares Show is allowing cubic uce of exhibit space with a four-foot increase in height over the old eight-foot limit on the upper level of McCormick Place. Exhibits on the wall can go to 14 ft.

The new height can extend to within three feet of the aisle. Reverse side of all back walls over eight feet must be finished smooth and painted white, according to show regulations. No lettering, decorations or identification is permitted on this area. Likewise, sidewalls must be white and unmarked on the outside.

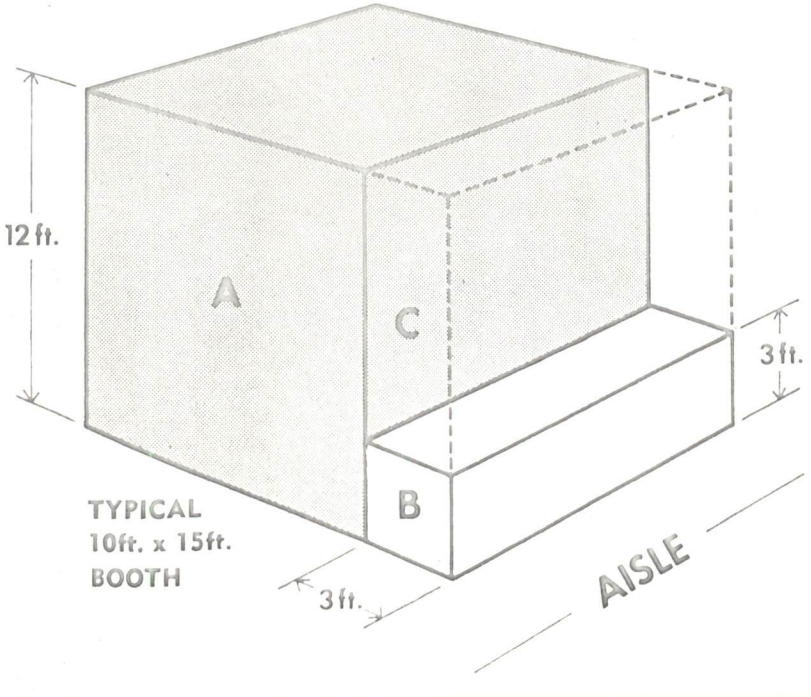
Cubic content exhibits are permitted on the upper floor of McCormick Place only. Over half a million square feet of exhibit space has been taken by the show's 1,214 exhibitors.

In addition to a "new look" created with exhibits going up, there will be something new when visitors look down. Almost 14,000 linear feet of carpeting will cover the aisles at the show. Red carpets flecked with black are five feet wide. The nylon pile runners were specially loomed for the show which expects to get about five years' wear out of them.

Carpet was kept to five feet rather than made wide enough to stretch from booth to booth in order to prevent tripping by visitors.

Another change in show regulations permits corner-booth construction on both levels to permit entry from the side as well as the front.

NEW RULES FOR BOOTH CONSTRUCTION



H Anderson

INTEROFFICE MEMORANDUM

DATE February 4, 1964

SUBJECT

TO Computer Guidance Committee FROM Arthur Hall

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Those consulted were:

H. Morse	L. Gossel	G. Collicelli
L. Hantman	D. Brown	W. Colburn
L. MacLean	H. Hyman	E. Harwood

The point brought up most frequently was the time required to get the computer*. Dave Brown, Harris Hyman, and Leo Gossel commented that they must frequently process PDP-6 tapes on the PDP-4 and that the time required to get to the computer is a large % of the time needed to do the job.

Fred MacLean mentioned that it is a long distance to go with boxes of cards when he is trying to debug BUSPAK routine (which he is now writing). He estimates that he will be processing 10 boxes of cards a day when he gets more deeply into computer card processing.

Bill Colburn said that it takes a much longer time to get Field Service help when there is something wrong with the computer in Building 12. This is a good point. There are times when Jack Shields isn't willing to release a man for 15 or 20 minutes when he might be willing to for 5 minutes or so.

Len Hantman is doing Maintenance Programming on Microtape. The nature of the problem dictates that the available Microtape cabinet be moved frequently between the Service Center computer and the Sales computer (which is in Bldg. 5). This would obviously be more difficult if the PDP-4 were in Bldg. 12.

Dit Morse made the good point that a number of small but relatively important tasks wouldn't get done because of the additional amount of time necessary to get to the computer.

Ed Harwood expects in the near future to be using the PDP-4 Service Center computer to up-date wire lists. It is an obvious advantage to have the computer nearby.

*Based on accurate records of the users and the number of times the PDP-4 was used for a recent 11 week period, the round trip travel time to the computer for Engineering, Field Service and Accounting would have been 40 hours if the computer were in Bldg. 12 and 7 hours if the computer were in its present location.

H.E.C

dec INTEROFFICE MEMORANDUM

DATE February 4, 1964

SUBJECT DEC Computer Histozy Reports.

TO H. Anderson ✓
K. Olsen
N. Mazzarese
S. Olsen
B. Beckman
E. Harwood
J. Smith
J. Shields
J. Rutschman
A. Rose
G. Rice
J. Cowles
B. Maxcy

FROM A. L. Fortin

Attached are the DEC Computer History Reports. Please notify A. L. Fortin of any errors or changes.

These reports have a COMPANY CONFIDENTIAL classification.

HISTORY OF PROGRAMMED DATA PROCESSOR - 1.

Computer	Customer	Acceptance Date
PDP-1-0	III	7/63
1B-1	BBN	11/60
1C-1	ITEK	5/61
1C-2	ADX-0	8/61
1C-3	CRL	6/62
1C-4	CRL	6/62
1C-5	MIT	9/61
1C-6	CRL	10/61
1C-7	BBN	11/61
1C-8	ADX-1	1/62
1C-9	GEOTECH	1/62
1C-10	ADX-2	7/62
1C-11	NEVER BUILT	
1C-12	LRL	6/62
1C-13	JPL	1/62
1C-14	ADX-3	10/62
1C-15	BECKMAN	3/62
1C-16	BECKMAN	4/62
1C-17	SRL	4/62
1C-18	ADX-4	6/62
1C-19	ADX-5	5/62
1C-20	DEC	6/62

HISTORY OF PROGRAMMED DATA PROCESSOR - 1 (CONT'D)

Computer	Customer	Acceptance Date
1C-21	ADX-6	8/62
1C-22	RUTGERS	6/63
1C-23	ADX-7	9/62
1C-24	UNITED AIRCRAFT	12/62
1C-25	MINN. HONEYWELL	9/62
1C-26	MIT	9/62
1C-27	AECL	11/62
1C-28	ADX-8	11/62
1C-29	JPL	1/63
1C-30	SDC	9/63
1C-31	NEVER BUILT	
1C-32	NEVER BUILT	
1C-33	ADAMS-returned-being shipped to Univ. of Mich.	
1C-34	DEC SALES	9/62
1C-35	NSA	7/63
1C-36	CRL	4/63
1C-37	LINCOLN LABS.	3/63
1C-38	RAYTHEON	2/63
1C-39	STANFORD	4/63
1C-40	MIT	4/63
1C-41	HARVARD	10/63
1C-42	YALE	6/63
1C-43	PRINCETON	6/63

HISTORY OF PROGRAMMED DATA PROCESSOR - 1 (CONT'D)

Computer	Customer	Acceptance Date
IC-44	III	8/63
IC-45	BBN	12/63
IC-46	BECKMAN	10/63
IC-47	BECKMAN	10/63

COMPUTERS PRESENTLY ON ORDER

Computer	Customer	Expected Delivery Date
IC-48	STANFORD	2/64
IC-33	UNIV. MICHIGAN	4/64

HISTORY OF PROGRAMMED DATA PROCESSOR - 4.

Computer	Customer	Acceptance Date
PDP-4-1	DEC	8/62
4-2	NABISCO	9/62
4-3	DEC SALES LA	9/62
4-4	CORNING	8/62
4-5	MASS. GEN.	11/62
4-6	DEC SALES	----
4-7	FOXBORO INT.	2/63
4-8	JPL-DAS	4/63
4-9	DEC-MOD.-TEST	6/63
4-10	DEC ENG.	5/63
4-11	JPL - TPS	6/63
4-12	KIE	5/63
4-13	HARVARD	6/63
4-14	JPL	6/63
4-15	FOXBORO	6/63
4-16	JPL	6/63
4-17	UNIV. of MICH.	12/63
4-18	AEGL	12/63
4-19	DEC ENG.	9/63

1
6/19

COMPUTERS PRESENTLY ON ORDER

Computer	Customer	Expected Delivery Date
4-20	COLUMBIA	1/64 *
4-21	FOXBORO	12/63 *
4-22	FOXBORO	4/64

*Delivered - acceptance needed.

HISTORY OF PROGRAMMED DATA PROCESSOR - 5.

Computer	Customer	Acceptance Date	
PDP-5-0	DEC - Prototype	[illegible]	1
5-1	WAS UCLA - TRANSFERRED TO DEC(LA)	10/63	1
5-2	AECL	12/63	
5-3	DEC - FOREIGN	8/63	1
5-4	DEC - SALES	11/63	
5-5	WESTINGHOUSE	12/63	
5-6	DEC - SALES PHYSICS	11/63	1
5-7	BELL LABS	1/64	
5-8	IBL	12/63	
5-9	AECL	1/64	
5-10	DEC - COAST GUARD	1/64	1
5-11	WESTINGHOUSE	1/64	

COMPUTERS PRESENTLY ON ORDER

Computer	Customer	Expected Delivery Date	
5-12	DEC - ENG.	2/64 *	1
5-13	DECAN (DRTE)	1/64 *	1
5-14	UNIV. MINNESOTA	4/64	
5-15	DEC - LA	1/64 *	1
5-16	DEC - SALES	3/64	1

*Delivered - acceptance needed.

9/16

HISTORY OF PROGRAMMED DATA PROCESSOR - 5 (CONT'd)

COMPUTERS PRESENTLY ON ORDER

Computer	Customer	Expected Delivery Date
5-17	COMPUTER SYSTEMS CORP.	2/64
5-18	WESTINGHOUSE	3/64
5-19	UNIV. MICHIGAN	3/64
5-20	APPLIED DYNAMICS	3/64
5-21	RUTGERS UNIV.	3/64

H. Anderson

PROGRAMMING NOTE : #12 (6)

AUTHOR: H. R. Morse

DATE: February 4, 1964

SUBJECT: Dissemination of Programming Information re: the PDP-6

I strongly recommend that PDP-6 users take advantage of Programming Notes to disseminate any information concerning PDP-6 programming. The notes will be distributed to the PDP-6 List and masters and extra copies will be retained in one place so the additional users may be brought up to date immediately.

Anyone wishing to operate a programming note may use this or any other format as long as it is headed "Programming Note (6) #. N" where "N" is a sequential number assigned by my secretary.

Either Gordon's or my secretary will be glad to do the typing, reproduction, and distribution, and see that the masters end up in the proper place.

Programming Notes will be available to anyone, for any reason, in any reasonable quantity.

If you wish to receive PDP-6 Programming Notes regularly, tear off the bottom of this sheet and return to Terry Wilkins or Lydia Lowe. Masters and copies of all notes will be permanently available, so no information will be lost by not receiving notes now.

dec INTEROFFICE MEMORANDUM

DATE February 5, 1964

SUBJECT Teletype Model 33 ASR Printers

TO S. Olsen

FROM D. Kuyamjian

cc: H. Anderson
N. Mazzarese
H. Crouse
R. Savell
D. Smith

Re: Your request for information concerning design changes in the Model 33 ASR.

Teletype is currently assessing the value of offering modification kits that would effect the changes made in all 33 ASR's delivered since the engineering hold of last fall. Pending action on the modification kits, they have agreed to detail the changes that were made in the units. I should receive this information in two-three weeks and will forward same to you.

I also inquired about the possibility of returning units to be up-dated by Teletype. Regardless of any action taken on modification kits, units will not be accepted for purposes of up-dating.

INTEROFFICE MEMORANDUM

DATE 2/5/64

SUBJECT Updating PDP-6 Proposals

TO R. Lane

FROM N. Mazzarese

cc: H. Anderson
G. Bell

There are several discrepancies between infomation in our F-65 manual and what is fact in the proposals we have made.

I suggest that we update all proposals that are still in effect to include all known current revisions. We might also take this opportunity to distribute some of our latest PDP-6 information, i.e., Installation Plan, FORTRAN Write-up, etc.

NM/jr

K. Olsen

INTEROFFICE MEMORANDUM

DATE February 4, 1964

SUBJECT

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dec INTEROFFICE MEMORANDUM

DATE February 4, 1964

SUBJECT Memory Usage

TO N. Mazzaresse
J. McKalip

FROM H. J. Crouse

cc: K. Olsen
H. Anderson
S. Olsen
R. Best
G. Bell

The attached schedule defines, by computer type, the estimated memory usage for the next twelve month period per Nick Mazzaresse.

Ferroxcube Corporation supplied us over six million cores in the past twelve month period at 3.1¢ per core. ($64^2 \times 18 = \$2,285.57$)

Fabritek has supplied us for evaluation and source approval a 50 mil 64^2 x 18 stack, in addition, Fabritek is supplying two 30 mil, 2 microsccond memory stacks.

My objective, to guarantee continuing supply, is to have two sources supplying in parallel our 50 mil requirements at 3.1¢ per core or less within ten weeks and have a second source for 2 microsecond memory able to supply before the summer ends. A considerable amount of documentation will have to be done to accomplish the latter.

We will, necessarily, ask all the major producers of memory stacks to bid against these estimated usage rates.

Henry J. Crouse

Computer	PDP-6	PDP-1	PDP-5	PDP-4	PDP-7	LINC
Configuration	128^2 x 37	64^2 x 18	64^2 x 12	64^2 x 18	64^2 x 18	64 x 32 x 12
No. of Cores	606,208	77,824	49,152	77,824	77,824	24,576
Core Size	30	50	50	50	30	50
Quantity	4	10	96	6	4	10
Quantity x No. of Cores	2,424,832	778,240	4,718,592	466,944	311,296	247,760

TOTALS 50 mil

778,240
4,718,592
466,944
247,760

6,211,536

30 mil

2,424,832
311,296

2,736,128

Special Systems

16 x 32 x 16

INTEROFFICE MEMORANDUM

DATE: 2/6/64

SUBJECT: Decisions made relative to Computer Rental to Harwell and Computer Loan to CERN at a meeting with K. Olsen, H. Anderson and N. Mazzarese

TO: Works Committee

FROM: N. Mazzarese

Computer Rental to Harwell

AERE, Harwell, England is an extremely good prospect for a PDP-4 computer. Their technical staff has proposed purchase of a PDP-4 to their management. Should they have trouble getting all the money (approximately 90K) out of this year's budget, they may have to rent the system.

It was decided that, as a one time offer, we would rent to Harwell under the following conditions:

1. 1/30 of purchase price per month rental, including maintenance.
2. Harwell pays applicable duties.
3. Three year minimum commitment--one year would be considered.

Computer Loan to CERN

A loan of a PDP-4 to CERN at this time would be an effective sales incentive. The success of such a loan would depend strongly on the support given to the installation. We cannot provide this support in the next few months, therefore, it was decided to loan a computer to CERN contingent upon their sending a man to Maynard for approximately one month of training.

NM/jr

dec INTEROFFICE MEMORANDUM

DATE February 6, 1964

SUBJECT PDP-6 INTRODUCTION, March 4, 1964

TO K. H. Olsen
H. E. Anderson
S. C. Olsen
G. G. Bell
N. J. Mazzarese

FROM J. L. Atwood

There are four major considerations to be recognized in planning the PDP-6 introduction at the ARD Annual Meeting:

1. This is first and foremost an ARD event. We can supplement, but we must not divert or detract.

2. We may not have the use of any facilities at the Hancock Building until Tuesday morning.

3. The ARD press conference is definitely scheduled from 10:00 a.m. to 12:00 noon.

4. The annual meeting starts at 2:00 p.m., and the social hour lasts until around 6:00 p.m.

Accepting these ground rules, I suggest the following schedule of events for the PDP-6 program:

Monday

8:00 a.m. Move PDP-6 onto stage or into nearby room - if possible.

Tuesday

8:00 a.m. Move PDP-6 onto stage - if not done Monday.

Wednesday

8:00 - 9:30 a.m. PDP-6 and Gordon Bell available on stage for television and news cameramen. Movie and still coverage by commercial photographers for distribution to television stations and other news media.

10:00 - 12:00 noon Harlan Anderson and Bob Lane at ARD press conference to handle questions for financial editors and business press.

12:00 - 12:30 p.m.	Technical briefing in a separate room on PDP-6 for selected prospects, science editors, trade press, and technical press.
12:30 - 1:30 p.m.	Buffet luncheon for those attending the technical briefing. Opportunity for person-to-person contacts between Digital people, prospects and press representatives.
2:00 p.m.	ARD annual meeting
6:00 p.m.	Prepare PDP-6 for return to Maynard

Invitations to the technical briefing should be extended widely to appropriate editors but should be restricted to only those prospects who can be expected to react well in this situation.

There should be a press kit for the ARD news conference oriented to the business aspects of the PDP-6 introduction and to our expanding international operations (the ARD theme). There should be a supplementary press kit for the technical briefing which covers in much greater detail the hardware, software and applications aspects of the PDP-6.

PDP-6 demonstrations, which can be run only in connection with the ARD press conference and the social hour after the meeting, should be graphic, easy to understand, and centered at the machine. The possible exception, if we still plan to have a booth, might be a teletype at the booth connected to the PDP-6 on stage.

INTEROFFICE MEMORANDUM

DATE February 7, 1964

SUBJECT Microtape Literature

TO J Atwood FROM T C Stockebrand

Below are listed the pieces of literature I need to support sales in the next three months. Please look it over, change dates, estimate price and return this list to me. I will treat the revised dates as DEADLINES for the material OFF THE PRESS and return to you an approved Work Order.

DATE	ITEM	PAGES	PRICE
24 Feb	Bulletin	12 (?)	
1 Mar	Mailing to Field Offices		
1 Mar	March Sales Meeting		
2 Mar	Users Literature Bound	30 (Mostly complete)	
	MARCH IEEE SHOW		
23 Mar	Maintenance Manual	30	
29 Mar	New Price and Sales Forms		
30 Mar	Applications Info (Kie)	4	
	MAILING TO INSIDE	200	
13 Apr	Trade Article	6	
20 Apr	SPRING JOINT COMPUTER		
3 May	Space Ad		

TCS:ASJ
CC
S Olsen
N Mazzarese
R Best
H Anderson ✓

digital EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

re: Autotrake

To remote the card reader 100 yds the price is $1,800. and to remote the Model 33 100 yds the price is $300. This assumes all the cabling is inside

the building and
doesn't include any
modification cost to
the building for outside
cabling

Other question to Andy

N.J.M.

c.c. to G. Feldman
S. Olsen
H. Anderson
D. Bell
R. Lane

February 7, 1964

Cablegram

TO: H. Anderson

FROM: Sydney

Universities proceeding nicely please advise extra equipment cost in remote sighting 100 yards of multi user and of card reader 461. (Type 33) Monash hammering Cobol can Morse advise development manmonths or otherwise help.....

Regards

Smart

1. DEC PERMANENT EMPLOYMENT GAINS AND EMPLOYMENT FORECASTS
VS
ACTUAL SALES AND SALES FORECASTS

Employment	4/23/62	5/27/63	2/7/64	Forecast 1/1/64-12/31/64
*Direct	181 - 50%	190 - 41%	239 - 42%	274 - 41%
*Indirect	178 - 50%	278 - 59%	329 - 58%	389 - 59%
TOTALS	359	468	568	663
Sales	6.5 million Actual Sales 7/1/61-7/1/62	10 million Actual Sales 7/1/62-7/1/63	10 million Forecast Sales 7/1/63-7/1/64	11.2 million Forecast Sales 1/1/64-12/31/64

2. BREAKDOWN BY DEPARTMENT OF TOTAL GAIN IN PERMANENT EMPLOYMENT
5/27/63 - 2/7/64

Department	5/27/63	2/7/64	Gain	Forecast 1/1/64-12/31/64
Machine Shop	12	13	1	2
Sheet Metal	16	21	5	2
Model Shop	8	11	3	0
Quality Control	22	23	1	0
Test Equipment	2	2	0	0
Module Assembly	79	87	8	0
Sub-System Assembly	50	53	3	22
Final Test	14	16	2	8
Silk Screen	3	3	0	0
Technical Publications	26	34	8	8
General Administration	32	38	6	4
Personnel	6	5	-1	1
Purchasing	13	15	2	0
Production Control	16	18	2	1
Maintenance	9	11	2	1
Drafting	24	37	13	8
Home Office Sales (Total)	67	79	12	35
Home Office Sales	24	20	0	15
Customer Relations	19	29	0	17
Computer Sales	8	14	0	1
Computer Checkout	16	16	0	2

2. (Continued)

Department	5/27/63	2/7/64	Gain	Forecast 1/1/64-12/31/64
Field Office Sales (Total)	12	28	16	1
Germany	2	2		
Canada	2	5		
Australia	0	1		
Washington	1	2		
New Jersey	1	2		
Illinois	0	2		
Pittsburgh	2	3		
California	4	8		
International Marketing	0	3		1
Engineering (Total)	57	74	17	5
Special Systems	15	14		
In-Out	9	11		
Programming	5	14		3
Computer Engineering	5	7		
Module Engineering	14	18		2
PDP-N	6	6		
Mag Tape	3	4		
TOTALS	468	568	100	98
Direct Production	190	239	43	38
Indirect Production	278	329	57	60

*Direct Production - Hourly Female Assemblers, Machinists, Sheet Metal, Silk Screen, Dip Solderers, Technicians (Except Field Service)

*Indirect Production - Salaried Engineering and Administrative Personnel, Hourly Administrative and Clerical Personnel, Drafting, Quality Control, Maintenance, Production Control, Hourly Field Service Technicians

OPEN PERSONNEL REQUESTS

AS OF 3/2/64

Clerical Female	Administrative Male	Mechanical Male	Tech. Male Hourly	General
7 Home Office Sales	1 Customer Relation	2 Machine Shop (1U, 1R)	10 Cust. Rel. (U)	Assemblers - Female
1 Personnel (1R)	2 Tech. Pub. (2U)	3 Sheet Metal (2U, 2R)	2 Comp. Check. (2R)	Maintenance
1 Drafting		1 Machine Shop/ Sheet Metal	1 Mag Tape	Wiremen
2 Gen. Admin. (1U, 2R)		1 Quality Control	2 Drafting (1R)	
2 Purchasing (2R)			2 Mod. Eng. (1R)	
1 Programming (1R)			2 Special Syst. (U, 2R)	
14 (6 Replacements)	3	4 (3 Replacements)	19 (6 Replacements)	

TOTAL - 37 (13 Replacements)

2/17/64

TUITION REFUND PLAN

School	No. Employees Participating 9/62-9/63	9/63-9/64
Northeastern	3	13
Lowell Tech	2	6
Boston University	2	6
N. E. Institute of Industrial Technology	1	1
Saunders Electrical	1	2
Boston College	1	2
Worcester Junior College	4	1
Mass. University Extension	1	1
Nashoba Regional	0	1
Fitchburg State	0	1
M.I.T.	0	1
Franklin Institute	1	1
Clark University	0	1
Bentley College	0	1
Framingham State	0	1
TOTAL	*16	39

*7 others enrolled, but either dropped out or were not eligible for refund.

Cost to DEC	$1,849.00	$5,689.50 (est.)

A. PAST AND PROJECTED RECRUITING, INTERVIEWING AND HIRING WORKLOAD

	Total Permanent Employment		
July 1962	360		
July 1963	463		
		GAINS - Fiscal Year 1963	- 103
		Terminated - Fiscal Year 1963	- 120
		Permanent Employees Hired 1963	- 223 (19 hires/month)
July 1963	463		
February 1964	565		
		GAINS TO DATE - Fiscal Year 1964	- 102
		Terminations to date - Fiscal Year 1964	- 44
		Permanent Employees Hired 1964	- 146 (21 hires/month)
Projected to 1/1/65	663		
		Projected Gains to 1/1/65	- 98
		Projected Terminations to 1/1/65	- 80
		Projected Hires to 1/1/65	- 178 (16 hires per month)

Estimated interviews to 1/1/65 - 500 per month

B. EMPLOYMENT ADVERTISING COSTS (PAST AND PROJECTED)

Average Monthly Cost

July 1962 to February 1964 - $1200 per month

July 1963 to February 1964 - $1500 per month

Advertising Cost per Hire 7/1/62 to 2/14/64 - $66.00

Advertising Cost per Hire 7/1/63 to 2/14/64 - $71.00

Projected Advertising Costs to 1/1/65

(Based on employment projections and average advertising cost per hire of $70.00) - $1200 per month

H Anderson

2/6/64

1964 REVISED EXHIBITS SCHEDULE

Show	Place	Dates	Booth	Exhibiting
Physics Show	Statler Hilton, N.Y.C.	Jan. 22-25	10'	PDP-5 PHA
ARD Annual Meeting	Boston	March 4	20'	
Scintillation Counter Symposium	Shoreham Hotel Washington, D.C.	Feb. 26-28	10'	PDP-5 PHA
IEEE	Coliseum, N.Y.C.	March 23-26	20'	PDP-5 Modules
Marine Technology Symposium	Statler-Hilton Washington, D.C.	March 25-26	10-20'	PDP-1 (with Fredkin's Programs)
Conference on Non-Linear Magnetics	Shoreham Hotel Washington, D.C.	April 6-8	no exhibit-hotel suite	
Fed. of American Societies for Experimental Biology	Palmer House Chicago	April 13-17	20'	PDP-5
SJCC	Sheraton-Park Hotel	April 21-23	40'	PDP-6 PDP-5 CRT 340
Hanover Fair	Hanover, W. Germany	April 26-May 5	Show not definite yet	
Instruments, Electronics, and Automation Exhibition	London	May 25-30	25'	PDP-5
Canadian Assoc. of Physics	Dalhouise University Halifax, Nova Scotia	June		PDP-5

1964 REVISED EXHIBITS SCHEDULE

Show	Place	Dates	Booth	Exhibiting
Joint Automatic Control Conf.	Stanford University	June 24-26	no exhibit-possibly a demonstration at Palo Alto	
WESCON	Los Angeles	Aug. 25-28	20'	Modules PDP-4 (L.A.)
ACM	Sheraton Hotel Philadelphia	Aug. 25-27	20'	
Canadian Symposium on Communications	Queen Elizabeth Hotel Montreal	Sept. 25-26		Modules
ISA	Coliseum, N.Y.C.	Oct. 12-15	20'	PDP-5
NEC	McCormick Place Chicago	Oct. 19-21	20'	Modules PDP-5
FJCC	Brooks Hall San Francisco	Oct. 27-29	40'	
NEREM	Commonwealth Armory Boston	Nov. 4-6	20'	
Conf. on Magnetism & Magnetic Materials	Minneapolis	Nov. 16-19	10'	

-TENTATIVE-

Conf. On Engineering in Medicine and Biology	Sheraton-Cleveland Cleveland, Ohio	Nov. 16-18		

H. ANDERSON

INTEROFFICE MEMORANDUM

DATE February 7, 1964

SUBJECT Sales Contact

TO All Sales Personnel,
Engineering, Administration,
and Personnel Department

FROM Armand L. Fortin

Commencing February 10, 1964, I will undertake new duties in the Production Department.

Any inquiries you may have regarding my previous position should be directed to Tom Whalen, late of the Production Department. Tom will administer all construction requisitions, overdue computer systems list, information concerning competitive files, scheduling of computers for shows, and DEC computer history reports.

DEC INTEROFFICE MEMORANDUM ---- COMPANY CONFIDENTIAL

DATE: February 10, 1964

SUBJECT: EDMUND and CANUTE

FROM: H. R. Morse

TO:

✓H. Anderson
G. Bell
Programmers
Sales
Customer Relations
Field Services
Field Offices

Once upon a time there was an editor called EDMUND. It was so full of bugs that rather than fix it, a new editor was written, and called CANUTE. It works. It's available. It can do everything EDMUND could do, correctly, and more. Unfortunately, there is some resistance to discontinue EDMUND entirely.

This memo is to encourage people who use PDP-4, and people who have contact with customers to switch immediately to CANUTE, (which is compatible with EDMUND) and encourage other users to switch. The alternative is to propagate our obsolete program, (including errors) which will not be maintained, resulting in unhappy customers and bad name to DEC's software.

HRM:tw

INTEROFFICE MEMORANDUM

DATE February 10, 1964

SUBJECT TESTER TO BUNKER-RAMO

TO Ken Wakeen

FROM Bob Oakley

I am sorry that I will not be at the plant this week. I did not write any of the B-R requirements in the SCR because I am not sure about some of them.

The RFQ copy will be sent to you when we receive it.

Here are a few of the notes I took when talking to Mr. Persell. For the time being, I believe these should be used as food for thought.

1. Over 200 modules - requiring an adapter for each unit.

2. Number of pins per module vary - maximum is 44 connector pins and 16 test point pins - total of 60.

3. Programmed pulse generator for input (Rutherford) requires 1KC to 10MC, 0-25 volt amplitudes. Rise time 10NS or better at 15 volt level. Two pulse sources with automatic seperation and clock delay controls.

4. Programmed power supply 0-60 volts @ 12 amps - 10 required. Each module can have two 8 voltage inputs. Best margin on PS for modules is 7%. Voltages must be .1% or .2% for long range stability (1 month) - available from Perkins for $350. (I don't believe it).

5. Logic levels are 0 volts (ground) for negation. +13 or -13 for assertive tolerance on levels vary from $\pm$1 volt to $\pm$5 volts.

6. A power protection system - or sequencing for module insertion to tester - (Microswitch Interrogation).

7. Module serial numbers to be entered on a simple keyboard for each unit tested - only defects are printed in addition to serial numbers.

(Continued on Page 2)

8. Would like to be able to manual sequence through test routines.

9. Present requirements for speed are 3 minutes per module. (Slow isn't it.)

10. Our approach would be the only one of it's kind that could resequence tests in error, which is one of the strongest selling points to these people.

PROPOSED PROGRAMMING FOR
LETTER WRITING DEMONSTRATIONS

L M Hantman 1-13-64
Revised 2-7-64

1. The following system configuration is assumed:

   a) 4K, PDP-4
   b) Type 57A Tape Control
   c) 1 Type 50 Potter Tape Drive
   d) 1 Type 28 Teleprinter
   e) 1 Paper Tape Reader
   f) 1 Paper Tape Punch
   g) 3 Soroban Typewriters

2. A program will be written to create a tape containing 500 sample paragraphs of approximately 400-500 characters each. Only three different types of blocks will be simulated however; an opening paragraph, a closing paragraph, and a paragraph representing the body of the letter and only two different examples of each of these will be used. All will be internally numbered from 1 through 500 and each type of block will occupy consecutive thirds of the tape storage area. The facility for placing new or revised paragraphs on the tape will not be demonstrated.

3. For actual demonstration another program will be written which will accept input data (the individual's name, address and the paragraph numbers requested) from either the teleprinter keyboard or from a punched paper tape (to simulate a "loaded" system). If the operator should request inconsistant paragraphs (i.e., two closing paragraphs, etc.) an error message will be typed by the computer. When the entire input information has been typed the computer will acknowledge the request by typing back a file number and enter the request in an internal queue. As each request in the queue is processed, the computer will compose the letter by searching for the paragraphs requested on the magnetic tape and then typing the letter on-line on either free typewriter, including the internal address, date, salutation, body, complimentary close, typed signature and secretarial notation. Spacing on the page will be determined by the number and type of paragraphs requested. For certain types of paragraphs the program will assume that certain "fill-in" information (i.e., date or meeting name, etc.) was included with the request, and this information will be automatically included in the letter when typed.

dec INTEROFFICE MEMORANDUM

DATE February 10, 1964

SUBJECT EN 1288 - AUTOMATED BOARD PRODUCTION LINE

TO Works Committee FROM Ken FitzGerald

Rather then bore you by reading the attached information at the meeting tomorrow morning, I felt it would be more advisable to give you the full draft of my presentation today then present a quick preview in the morning and be available for questions.

The automated board production line is an arrangement of equipment to (1) silk screen, (2) bake dry the screening, (3) etch, (4) screen removal and (5) tin plate printed circuit boards.

The first operation silk screening will be done by a semi-automatic silk screen press. This press will require an operator to load, unload, inspect, and place the screen boards in flights on a conveyor. The remaining steps will be carried out on the conveyor, carrying three quad size or five standard size boards at a time moving at a speed of approximately 12" per minute. The machine will probably be run six hours per day producing 1,800 standard boards per day or 1,080 quad size boards per day (which is a monthly total of 36,000 standard size or 21,600 quad size).

The purpose of this machine will be to increase our present production capacity with little or no change in quality standards. The personnel needed will be one experienced silk screen operator to make screens and set up the press. He will also be required to maintain the machine and make any necessary adjustments while it is running. A second person will be needed to operate the semi-automatic screener and load the conveyor. In the event that is is necessary to re-tin plate any boards a third person would be needed at that time to place the boards on the conveyor.

Due to the size, the fact that this is brand new with very little carry-over of present methods and the necessity of conditioning the area of actual silk screening for temperature and dust control, it will be necessary to locate this equipment in an area away from the present area. The top floor of building #5 over the present solder dip and automatic insertion machinery lends itself well to these requirements. The screening area will be located in the corner with the two existing walls of the building, therefore only two additional walls and a ceiling will have to be built. The end of the conveyor will start in the room for loading and extend along the length of the building for the required distance.

The degreaser for etch removal has been purchased and received. The silk screen machines have been ordered and are presently overdue for delivery. Actual construction of some of the equipment has already been started but due to a recent change, what has already been done will have to be redone. A temporary draftsman from "Aid" is working on the overall layout, details of the conveyor system and board holding fixtures, pump and spraying details, oven sections and tin plate tanks. It will require an additional six to eight weeks to get these parts purchased, fabricated and assembled. An additional two weeks will be required to work out bugs and get into production. There is also the possibility that full production will not be realized for perhaps another two to three weeks.

dec INTEROFFICE MEMORANDUM

DATE February 11, 1964

SUBJECT OPERATING PROBLEMS

TO K. H. Olsen
H. E. Anderson
S. C. Olsen

FROM J. L. Atwood

There are three problem areas in the Technical Publications Department which are getting more critical day by day and which I would like to talk over with you at the earliest possible time.

First, our technical manual writing capability is not at all adequate. We have too few people trying to do too much work with too little professional leadership and supervision. We are in the position of single-sourcing our contract writing, and we are therefore at the mercy - finacially and otherwise - of a sole supplier.

Second, our general work load continues to increase rapidly. Our people as a group are working very hard trying to keep up with the demand, and they are subject to many pressures which are often neither necessary nor helpful.

Third, as the volume grows, there seem to be fewer and fewer guidelines as to what comes first and what can wait - what is truly important to the company and what is some individual's conception of his own particular needs.

As a side issue, Jim Hastings reported to me this morning a certain amount of unrest in the Engineering Department over the service (or lack thereof) provided by our group. Since this appears to be a product of the conditions mentioned above, I suggested to Jim that he might meet with us during at least a portion of the discussion.

INTEROFFICE MEMORANDUM

Have Jim call the meeting. HSG

DATE February 11, 1964

SUBJECT Technical Publications Department

TO H E Anderson FROM J P Hastings

There has been a growing undercurrent of dissatisfaction on the part of some of our engineers with the service they receive from Jack Atwood's Department. At first, I ignored what I heard on the grounds that any Service Group is never able to provide everybody with everything they want when they want it. But the ground swells have grown. This morning I spoke with Jack in his office about the hopeless feeling on the part of some of the engineers that when they give a job to Tech Pubs it literally disappears into a bottomless pit. If Jack would schedule his work and assign realistic completion dates, the problem would be solved. Jack is aware of this problem and in my opinion, requires support from Management on assigning proper priorities. As I understand from Jack, the Sales Department at present assists in deciding what shall be done and when.

May I suggest the following approach to the problem:

1. Hold a brief meeting in your office with Stan Olsen, Jack Atwood, Dick Best, Gordon Bell, Win Hindle and Jim Hastings to determine -

   a. If there is a legitimate problem

   and

   b. If so, decide upon a corrective course of action

2. Establish a procedure for assigning priorities (so that other departments, in addition to Sales, may influence the assigning of priorities.

3. Tech Pubs to schedule each job and assign realistic completion dates - (this would do much to eliminate the hopeless feeling that prevails at present).

4. Tech Pubs should anticipate high priority jobs such as the recent Australian proposal and be prepared to handle them without derailing all other jobs in the house.

5. If Tech Pubs is overloaded on a permanent basis, consideration should be given to expanding their resources. If, however, the problem is one of rapid rise and fall in workload, jobs that will not be completed on schedule should be subcontracted to commercial houses.

JPH:ASJ
CC
R L Best, J Atwood, S Olsen, W Hindle, G Bell

INTEROFFICE MEMORANDUM

DATE: 2/11/64

SUBJECT: SJCC

TO: E. Harwood
Computer Guidance Committee
S. Miller
R. Wilson
H. Painter
B. Long
R. Boisvert

FROM: N. Mazzarese

It has been decided to display the PDP-7 computer at the Spring Joint Computer Conference April 21st-23rd.

The main frame will be a PDP-4 in the new PDP-7 cabinet.

The following peripheral equipment will be operated on the PDP-7:

Type 340 Display
Type 370 Light Pen
Type 570 Mag. Tape

One or two PDP-5's will be demonstrated as well. One as a PHA and one with the Calcomp Plotter.

NM/jr

INTEROFFICE MEMORANDUM

DATE February 13, 1964

SUBJECT Notes on Advertising "Digital's New Small Modules"

TO Stan Olsen
Jack Atwood
Harlan Anderson

FROM Ken Olsen

Here are some ideas that you might use in selling our new line of modules. First of all, we should have magazine articles planted to come out about the time of making the announcements. These should push the large investment we have made to make low price modules the same quality that we have been doing for years. This should quote pictures of our new automated etched wiring line, our large punch presses, our automatic inserting machine, the automated soldering line, and then the computerized testing. If we add up the total cost of this line, it would probably be close between a quarter and a half million dollars.

I think, just as we come out with these, we should have a supply of units in clear plastic which we can send out to everyone we would like to impress, along with a blurb.

I propose that we make a real selling pitch out of offering to repair all modules at any time for $2.00 each with 48 hours service, return postage paid.

The other big pitch we should make is that modules cost between $6.00 and $12.00 each.

Ken

KHO:ech

dec INTEROFFICE MEMORANDUM

DATE February 13, 1964

SUBJECT A Two-transistor charge controlled flip-flop

TO Ken Olsen

FROM Bob Hughes

Abstract: A method of utilizing transistor stored charge in a bufferless flip-flop with a good fan-out is discussed.

History: In the early days of transistor circuit design when we built flip-flops, we wanted a built-in delay equal to the width of the trigger pulse. After we would design a flip-flop, we would wonder where the delay came from and attribute it to "the transistors" or overcoming cutoff bias. The facts as we now know them are that the delay was due in part to overcoming the cutoff bias and the greater part was due to minority carrier storage time in the transistor itself.

DEC has been utilizing this storage time to get delays in buffered flip-flops and cursing it mostly because of its variability. This variability made us keep changing the capacitors in the flip-flop to which we attributed the delay. We should have blessed it and specified the minimum and maximum stored charge and then it would not have been necessary to make so many changes to our buffered flip-flops.

Discussion:

The modern planar junction transistor can be manufactured with known minority carrier storage life time. The utilization of storage time in transistors is not new but is little known. It was first proposed by Sparkes and Beaufoy.[1] Stored charge transistors are now being used in the Fairchild integrated J-K flip-flop.[2,3] This flip-flop uses the stored charge of a pair of transistors to actually trigger the flip-flop.

To demonstrate that stored charge could be utilized in this manner, a two transistor flip-flop was designed and

1. "The Junction Transistor as a charge-controlled device" by R. Beaufoy, and J.J. Sparkes. Automatic Telephone Electric Journal (British) April 1957.

2. The J-K flip-flop was originally defined by M. Phister, Jr. in "Logical Design of Digital Computers" John Wiley & Sons, 1958.

3. "J-K Flip-flop Integrated Circuit" Fairchild Semiconductor Corp. July 1963.

tested. It had delayed output of 120 to 60 nanoseconds (input pulse 70 nsec) with the +10V A and B set to 6 and 15 volts respectively. Trigger requirements are low and the unit complements quite well with 5 megacycle pulse bursts.

This circuit is unique also because the pulse steering information is contained right on the input terminal.

Many mixing schemes can be contemplated to pulse the flip-flop, but no attempt was made to test any except the two inverter input connection.

Circuit Description:

Referring to the circuit schematic assume the existence of the voltage levels as noted and that we apply a negative pulse to the base of Q1. The Q1 collector will go abruptly to ground. This action will back bias D1 due to the presence of the V_{BE} of Q3. Q3 will still have a V_{BE} because of the charge stored in its base. This stored charge will then be discharged by the 6.8K resistor to +10V and this is where the circuit delay is obtained. The collector of Q3 will go negative when the base stored charge is removed. The charge stored in Q3 for the assumed 3 mils of IB is about 150 to 200 picocoulombs. The negative going swing of the collector of Q3 is then RC coupled through D3 (which is slightly beyond the threshold of conduction) into the base of Q4. The capacitor C1 must remove any charge stored in D4. Q4 will then saturate and the circuit has now completed its transition. Transistors Q1 and Q2 have an IC of 6 ma for the duration of the pulse so the base RC can be about 6 K ohms, so if we assume an input base current of 0.5 milliamps and that we are using 6 milliamps of clamped current during the pulse, that leaves about 10 mils of clamp current left for fan-out. (This is not a "worst case" design.)

Opinion: The constancy of stored charge is covered in the literature [4,5,6,7], and it can be depended on. The stored charge

4. "Predicting reverse recovery time of high speed junction diodes" by Chih Ho Chen, G. E. Application Note 90.36, April 1962.

5. "The reverse transient behavior of semiconductor junction diodes" by W.H. Ko, IRE Transactions on Electron Devices ED-8, Pg. 123-131, March 1961.

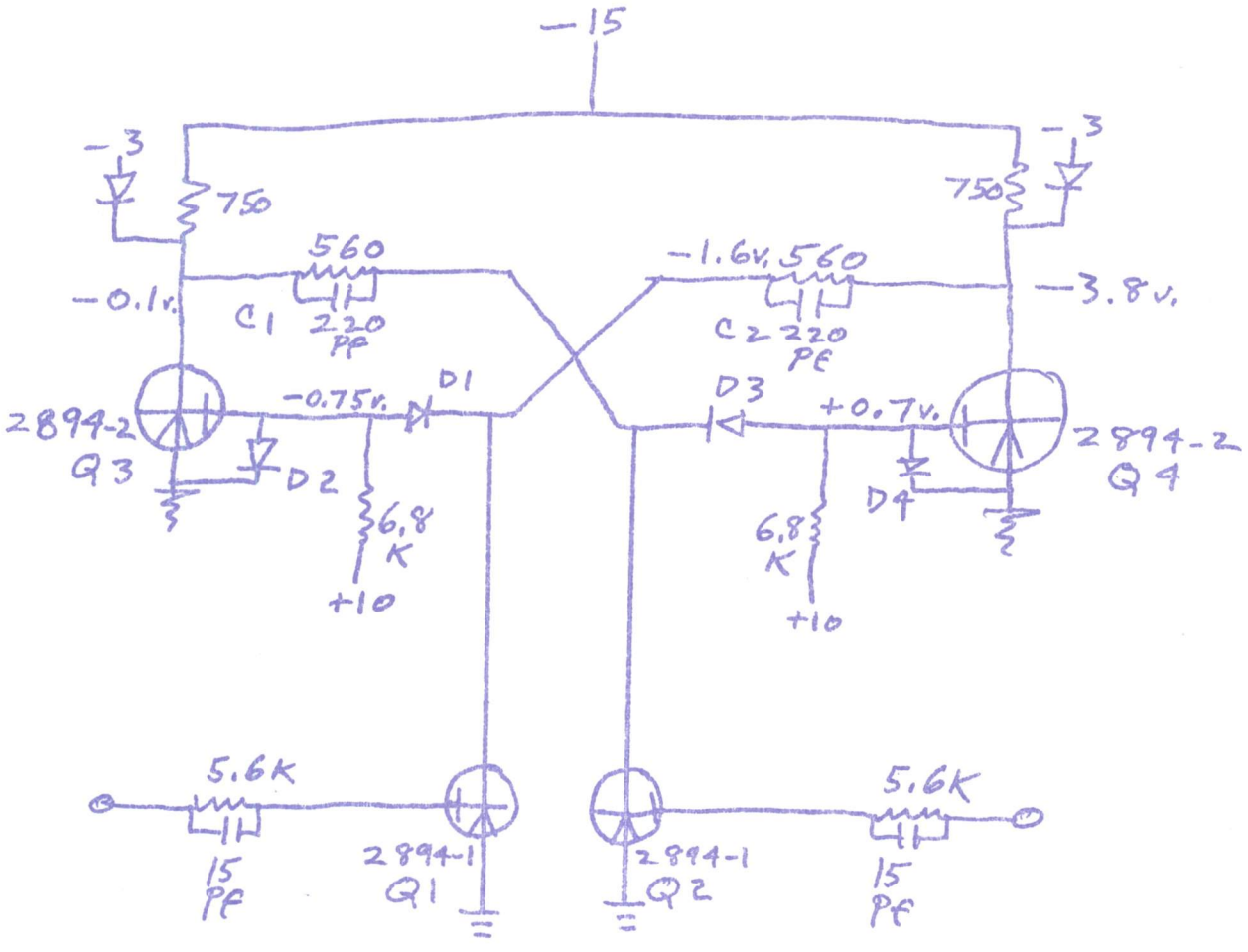
6. "Charge Storage in Junction Diodes" J. Appl. Physics, Vol. 25, Pg. 916-918, July 1954.

7. "Switching time in Junction Diodes and Junction transistors" by R. H. Kingston, PROC. IRE Vol 42, Pg. 829-834, May 1954.

controlled flip-flop works well with our 5 megacycle techniques because the PNP Silicon transistors which we are now buying have the right storage time for 70 nanosecond delays. I believe that the technique will work at 10 MC. with a PNP device which has more of its minority carrier lifetime diminished. The +10 volt line to the flip-flop might be changed to a +3 volt stabistor string so that it could not be varied and then we would marginal check with -15 volts.

RAH/BWF

cc: Harlan Anderson
Stan Olsen
Win Hindle
Dick Best
Don White
Bert Scudney
Russ Doane
Bob Savell
Jim Cudmore
Ulrich Skowronek


-15
-3
750
560
-0.1v.
C1 220 PF
2894-2
Q3
-0.75v.
D1
D2
6.8 K
+10
-1.6v.
560
C2 220 PF
-3.8v.
D3
+0.7v.
D4
6.8 K
+10
-3
750
2894-2
Q4
5.6K
15 PF
2894-1
Q1
2894-1
Q2
5.6K
15 PF

INTEROFFICE MEMORANDUM

DATE February 14, 1964

SUBJECT PDP-1 Programming Course
Convenes February 17, 1964

TO K. Olsen
H. Anderson
S. Olsen
N. Mazzarese
R. Beckman
All Sales Personnel
District Offices

FROM R. Leonard

The following people are scheduled to attend the PDP-1 Programming Course during the week of February 17, 1964.

NAME	COMPANY
E. Gilbert	Bolt, Beranek & Newman, Cambridge, Mass.
C. Smith	CRL, Hanscom Field, Bedford, Mass.
M. White	Massachusetts General Hospital, Boston, Mass.
B. Jarnagan (Mrs.)	" " " " "
C. Diamentis (Miss)	" " " " "
R. Frith	DEC

H. Anderson

INTEROFFICE MEMORANDUM

DATE February 14, 1964

SUBJECT January 16, 1964 36th Meeting of the Test Equipment Committee

TO Richard L. Best

FROM Russell Doane

Members of the Committee:

Robert Hughes, Chairman
Russell Doane, Secretary
George Gerelds
Dick Tringale
Jim Cudmore
Steve Lambert
Larry White
Ed Harwood
Jack Shields
Bill Titelbaum

1. We discussed 50 cycle power at length. Jim Cudmore and Jack Shields reported back on their findings. They expect 50 cycle computer business soon and Jack Shields was insistent that computers which are destined for 50 cycle operation must be checked out with 50 cycle operation here before being shipped. He feels strongly that it would be unacceptable to rewire the power after supplying only enough 50 cycle power to provide one power supply at a time, and that a 60 to 50 cycle rotary converter must be purchased which has capability for running an entire PDP-6 with peripheral equipment. Since this indicates a rather large expenditure and a big machine, the subcommittee recommended that the machinery be installed on the 5th floor adjacent to the computer checkout area. The most immediate requirement however, is for relatively little 50 cycle power at the power supply checkout area. (This was the requirement which originally stimulated our investigation.) The subcommittee will explore further both the frequency and voltage regulation properties of available converters and the installation problems according to Bernie Joyce.

Since our meeting four new factors have come to light:

A. Our regulating transformers can actually stand considerably more than ±1/2 cycle input frequency regulation and we should soon be able to specify exactly what the new wider tolerance can be.

B. All 50 cycle power supplies will be wired for 230 volt operation and consequently we should provide 230 volt, 50 cycle power which is adjustable ±10% to make our usual check.

C. The mag. tape test area will need 50 cycle power too.

D. The power supply test area is about to be moved from its present location.

These new factors may indicate that we should reconsider a separate converter for power supply test, and perhaps even an independent source for mag. tape. Jack Smith will attend the next meeting to discuss the physical locations involved.

2. The model shop requests two 581 oscilloscopes.

3. Ed Harwood reports that he has ordered a Simpson Thermo-probe.

4. Bill Titelbaum suggested that oscilloscope probes be signed out from Test Equipment headquarters to give their users a sense of responsibility for them. At present probes have to be constantly reordered to keep up with losses (broken probes are repairable, but are rarely returned to Test Equipment Service).

5. Jack Shields requested two oscilloscope probes, two type 310 Triplett multimeters with cases, and one ordinary current probe from Tektronix with passive terminator. These will be used to make up one additional field service kit.

6. The Twinco meter calibrator and our Fluke meters need recalibration, after which our multimeters should be rechecked to their original purchase tolerance and repaired. At present there are apparently many multimeters which do not meet their ± 1 1/2% DC accuracy specifications.

7. Jim Cudmore asked how many Tektronix oscilloscopes had had metal-film resistors installed. Russ Doane will find out for the next meeting.

8. The following items previously ordered have been received:

A. The DC high voltage probe
B. The new Tektronix type D differential level preamplifier
C. The log adapter for the type O operational preamplifier
D. The current probe CT2 (2) ordered for use with 580 series Tektronix oscilloscopes.

The next meeting of the Test Equipment Committee will be on Tuesday, February 18, at 1:30 in Bob Hughes' office.

RD/bf

dec INTEROFFICE MEMORANDUM

DATE February 17, 1964

SUBJECT SYSTEMS ENGINEERING EXPOSITION
June 8-11, 1964 N.Y. Coliseum

TO Ken Olsen
Harlan Anderson
Stan Olsen
Nick Mazzarese
Jack Atwood
Alex Stephens (for Sales News Letter)

FROM Howard O. Painter

We have had our deposit for the Design Engineering Show transferred to the Systems Engineering Exposition. Looks like a PDP-5 will fit nicely in the 15' booth assigned to us (#607).

While this is a brand new show, it may turn out to be well worth our effort.

INTEROFFICE MEMORANDUM

DATE February 17, 1964

SUBJECT QUARTERLY REPORTS

TO K. H. Olsen
H. E. Anderson

FROM J. L. Atwood

I think it would be entirely reasonable for you to request quarterly reports from the Cost Center Managers. The Works Committee review sessions are very thorough and very helpful, but they are slow. It will apparently take some time to get a first-hand report on each individual cost center. On the other hand, a written evaluation and forecast submitted by each manager on a regular basis should tend to keep you better posted on current developments. I suggest quarterly reports because I think monthly reports would tend to offer too much repetitive information and semi-annual or annual reports would be too far apart to let you spot specific problems in time to take effective corrective action.

J.L.A.

fd

dec INTEROFFICE MEMORANDUM

DATE February 17, 1964

SUBJECT LARRY BUCKLAND'S PROJECT

TO H. E. Anderson FROM J. L. Atwood

You have mentioned from time to time that I should get aboard the Larry Buckland project. Is there something specific you would like me to do? It sounds very interesting, and we might even derive some direct benefit from it. However, I hesitate to elbow my way in without a suitable introduction.

J.L.A.

fd

dec INTEROFFICE MEMORANDUM

DATE February 17, 1964

SUBJECT 1964 ANNUAL REPORT

TO K. H. Olsen
H. E. Anderson

FROM J. L. Atwood

If we decide fairly soon whether we will publish a 1964 Annual Report, there is a reasonable chance that we will have time to do the sort of job we would like to.

J.L.A.

fd

dec INTEROFFICE MEMORANDUM

DATE February 17, 1964

SUBJECT FEDERAL EXCISE TAX

TO H. E. Anderson FROM J. L. Atwood

Will the projected extension of our sales efforts in the business field via the PDP-5 Data Handler have any affect on the applicability of the Federal Excise Tax to our computers? I know John Koudela plans to avoid using the word "business" in any of the promotional literature we prepare, but is this sufficient to protect us from tax liability?

J.L.A.

fd

dec INTEROFFICE MEMORANDUM

DATE 17 February 1964

SUBJECT Letter to Dr. Wells

TO Harlan Anderson

FROM Robert Beckman

Attached is a rough of a suggested letter to Dr. Wells.

There is no doubt that the troubles with the tape system have been an inconvenience to them and an embarrassment to us. We have been and will continue doing everything possible to correct the situation. However, I feel that we should try to put some time limit on their part of the job; namely completing their programming for the 510. If we leave it too open they may never get around to shifting over to the high density system. For that reason, I have suggested some time limits for the operations that are still required.

The time limit for checkout and acceptance of the 510 is, I think, quite reasonable. If we can't have it operating satisfactorily by that time, we should pull in our horns and try to sell the 50/51 system they're now using.

This whole thing has been another example of insufficient in-house use and testing of a new product.

* * * * * *

letter / rough draft 2/17

Dr. Walter I. Wells
Massachusetts Institute of Technology
Lincoln Laboratory
Lexington, 73, Massachusetts

Dear Dr. Wells:

Thank you for your letter of 6 February. We appreciate the courtesy and patience you've shown in the matter of the 510 magnetic tape control.

Digital's primary concern in this matter is to insure that your system is completely operational as soon as possible. We realize that our difficulties with the tape system have been a great inconvenience to you, and we will do everything possible to minimize any further inconvenience. If further work is required on the 510 we will be happy to perform such work at those times most convenient to you. Contact Mr. Beckman or Mr. Shields for anything you may need.

The interim tape system which we loaned to you is urgently required for other work. Obviously, you must continue to use it until the 510 can be checked out, accepted, and programmed to handle the job. At the same time, we would like to have some idea of when we can have the loaned system available. We feel that it would be reasonable to expect the shift to take place within one month after the 510 has been checked out and accepted. In addition, it should be possible to complete the checkout and acceptance testing of the system within one month from the date it was re-installed, even though such work is not to interfere with your scheduled operations.

Operational + accepted 1 month prior to April 3?

Dr. Wells ?

Page Two __ February 1964

If these arrangements are acceptable to you, it means that you can plan on having your final system operational no later than 3 April, and we will have our tape units available to us by that date.

Very truly yours,

Robert J. Beckman

~~Harlan E. Anderson~~

~~Vice President~~

the hardware will be accepted by 3 March,

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

DATE: February 17, 1964

SUBJECT: Adoption of PDP-4-#9 (Module Tester) for Maximum Use as a Production Checkout Machine

TO: Works Committee FROM: J. Smith

The PDP-4-9, which is being used for the automatic testing of modules, is not being utilized to its maximum potential. Module testing utilizes approximately 20 per cent of its time and capabilities.

Manufacturing Peripheral Checkout could make excellent use of the unused time for its equipment checkout responsibilities. On certain pieces of equipment, the later stages of the checkout procedure require the use of a computer. In all cases, equipment is run on a computer prior to being released to Computer Checkout.

The present procedure is to schedule time on one of the in-house computers that has the necessary I.O. plugs wired in. This, at times, is virtually impossible due to customer commitments, programming, maintenance, etc. Delays on the order of one day to three weeks are the rule rather than the exception. It seems there is not sufficient computer time available to fill all the demands.

In order to eliminate the above problems and insure on-time deliveries to customers and Computer Checkout, the following proposals are submitted for your consideration.

Proposal Number 1

Adoption of the PDP-4-9 (Module Tester) to enable testing of the following equipment:

Mag. Tape Control 57A and Associated Interface 520, 521, 522
Mag. Tape Control 131/510 and Tape Units 370, IBM
Mag. Tape Control 51 and 52
Tape Units, type 50
Micro Tape Control 550
Micro Tape Drives, type 555
4K-8K-16K Memories
30 Series Displays
34 Display with 503 Scope
750, 75A Controls

There is no capital equipment expenditure required by this proposal.

Material expenditure required - approximately	$50.00
Wiring labor expenditure - 50 hours @ $6.60/hour	$330.00
Total Expenditure	$380.00

Proposal Number 2

We also foresee, in the near future, the need and a means for testing I.O. equipment and options that will be used in conjunction with the PDP-6. A simulator has been designed by Dave Pinkney, the output of which simulates the PDP-6 operation, input is a PDP-4. It is proposed that we construct a simulator of this type that could be plugged into the Module Tester, PDP-4. By its very nature of being associated with the evaluation of PDP-6 I.O. equipment, it is my feeling it could be expensed rather than capitalized.

Material expenditure required - approximately	$30.00
Modules required - 45 @ $30.00	$1,350.00
Wiring labor - 50 hours @ $6.60/hour	$330.00
Estimated Total Expenditure	$1,710.00

INTEROFFICE MEMORANDUM

DATE February 14, 1964

SUBJECT Method of Implementing
Proposed Change to ASCII on PDP-4

TO Computer Guidance Committee
and E. Harwood
B. Savell
G. Rice
D. Fellows

FROM H. R. Morse

1. Put type 33's on the 6 DEC PDP-4's, at a total cost of $10,000, immediately. The type 28's will not be removed.

2. Change software to use ASCII, (this will take three weeks elapsed time).

3. Offer the type 33 (or 35) to present PDP-4 owners for $2,000. The materials cost to us is $1,740. The small markup is to encourage changing.

4. Offer to buy back the type 28, within three months of changeover, for $1,000. Total materials returned $1,000 of modules, plus one type 28.

5. Change the card reader and line printer to ASCII (total cost $6,200). This is a more serious change, as it must wait until in-house dealings with PDP-4 are in ASCII. The proposed target date should be three months after step one is completed.

6. Put type 33 KSR (optionally 35's and/or ASR) on all new PDP-4's.

The reasons and advantages for this change are contained in my earlier memo.

HRM:tw

To:
C.G.C.:
S. Olsen
K. Olsen
D. Best
G. Bell
H. Morse
H. Anderson
N. Mazzarese
J. Hastings
W. Hindle

INTEROFFICE MEMORANDUM

DATE February 14, 1964

SUBJECT Columbia PDP-4

TO Ken Olsen
Computer Guidance Committee
Dave Fellows

FROM H. R. Morse

Our Sales Department promised Columbia (as they should have) that PDP-4 FORTRAN would run 5 to 10 times faster with an extended Arithmetic Element, which Columbia therefore bought.

However, due to the fact that we do not have an EAE in-house, we have not been able to provied a FORTRAN system which runs EAE. Columbia is understandably perturbed. As a stop gap measure, we will send Dave Fellows down there to modify their system. However, we cannot maintain such a system without an EAE in-house. Let's get one.

If we are to develop, maintain, and demonstrate software systems which use our hardware to full advantage, we must have configuration available with the necessary hardware.

HRM: tw
cc to:
S. Olsen
D. Best
G. Bell
H. Morse
H. Anderson
N. Mazzarese
J. Hastings
W. Hindle

dec INTEROFFICE MEMORANDUM

DATE January 16, 1964

SUBJECT

TO N. Mazzarese
J. Hastings

H. Anderson
J. Atwood

FROM Gordon Bell

I'm frustrated with computer literature.

The advertising document series F11, F41, F51, and F61 are all redundant in that the information contained therein is also available as the first chapter of F15, F45, F55, and F65, and they are all similar. In trying to talk with customers I find that:

1. I never have the right Fx1 series along regarding the computer for them.

2. The special options and services are inadequately covered in Fx1 and Fx5.

3. The appropriate Fx1 or Fx5 has a high probability of being out of print. (Out of the 8 critical documents two are now out of print)

4. Since DEC doesn't advertise, a blurb to tell who we are is not there.

I propose:

1. All Fx5's be "beefed up" to get rid of the miscellaneous literature (mag tape 57A bulletin, etc).

2. There be one (1) F1 document which provides a general summary for all DEC computers, computer options, computer programs, displays, special equipment, etc. that trys to sell and still be informative.

This cuts literature from eight pieces to five pieces, and affords opportunity to provide better product coverage at smaller $'s.

GB/ll

INTEROFFICE MEMORANDUM

DATE February 17, 1964

SUBJECT TWX Lines and Interfaces

TO K. Olsen
H. Anderson
G. Bell
J. Hastings
D. Smith
R. Savell
T. Stockebrand

FROM Alan Kotok

For some months now, I have been negotiating with the NET&T Co. for TWX lines to be used for direct connection with PDP-6. A few weeks ago, I enlisted the support of Jim Hastings to carry on negotiation. Most recently a letter was sent to AT&T in New York formally requesting this service (see attachment).

Unfortunately there is an area of disagreement between Don Smith and myself. Simply, I feel that any connection to the TWX network should be all electronic, while Don favors mechanical connection to teleprinters.

The attached letter proposes my scheme while unfortunately requesting the phone company to contact Don. This will surely lead to confusion.

I have proposed the all-electronic connection because of my extreme lack of faith in mechanical gadgetry. The phone company has assured me that the electronic connection is entirely practical from an engineering point of view. As an example, the MIT Computation Center and Project MAC systems are all electronically interfaced. The AT&T data set provides standard logic levels, and should be directly compatible with our existing equipment. I simply cannot conceive of 24 Model 33's all operating reliably, and for that matter, the noise level would be deafening.

Both Jim Hastings and I have been assured that only "legal" problems remain in the way of offering standard TWX service to computers. I have recently talked to PDP-6 prospects who expressed interest in remote consoles. What better way than TWX? The duplication of teleprinters at both ends of such a line is unnecessary.

Some decision must be made as to how we are to continue negotiations with AT&T.

AK/ll

February 13, 1964

Mr. Virginius Vaughan
Data and Teletype Engineer
American Telephone and Telegraph Company
195 Broadway
New York, New York

Dear Mr. Vaughan:

Our local A T and T representative has suggested that you are the proper person to act on our request to connect a Digital Equipment Corporation PDP-6 computer to the TWX network. Specifically, we wish to connect a computer in our Maynard, Massachusetts headquarters to the standard TWX network to allow any TWX user to make use of the computation equipment.

This facility should include a minimal amount of mechanical equipment, specifically no keyboards or printers. The computer should be able to both answer and originate calls, including dialing. The interface should be electrical, in serial form. 110 bit/sec. service is preferred. Should multiple lines be desired, the telephone company should provide the necessary line-hunting mechanisms to allow use of only one incoming number.

We appreciate your consideration of this request. If you should need additional technical information, please feel free to contact Mr. Donald Smith in our Maynard office.

Sincerely yours,

Kenneth H. Olsen
President

KHO:ech

bc: A. Kotok
D. Smith

INTEROFFICE MEMORANDUM

DATE February 18, 1964

SUBJECT PERSONNEL REPORT

TO Works Committee

FROM Bob Lassen

The continued success of DEC will be determined largely by our collective abilities to do the best possible job of recruiting, selecting, developing, and utilizing our people to accomplish meaningful and profitable company objectives.

AND WE MUST DO THIS BETTER THAN OUR COMPETITORS.

The Personnel Department, therefore, must devote all of its abilities and energies to these activities. To give our department more significant direction, I have outlined the following objectives:

PERSONNEL DEPARTMENT - OBJECTIVES

Employment

Maintain the high employment standards that were initiated when the company was formed.

Employee Performance and Progress Rating

Develop and employ more meaningful and informative methods of measuring and appraising each employee's performance, progress, skills, interests, and growth potential--and develop more effective administration for recording, retrieving and using this information. (Basically the problem is one of better measurement, better feedback and better use of the resulting information.)

Training and Development

Assist with the formation of productive vocational, supervisory, and management training sources (in-plant and out-of-plant).

Continue working with our present employee development and progression programs and assist with the formation of new programs as the need arises.

Communications

Continuously (particularly verbally) communicate DEC's philosophies, attitudes, objectives, policies, and procedures. Encourage and educate our managers and supervisors to take a more active interest in communications.

Advisory--Personnel Matters

Work closely with company managers and supervisors on matters pertaining to supervision, employee relations, employee development, employment practices, wage administration, and personnel policy interpretation. Give advice when necessary and encourage interchange of ideas on these matters.

Wage Administration

Maintain an effective up-to-date wage administration program for hourly (wage classes 1 and 2) employees.

Personnel Policies and Practices

Assist with the development of effective personnel policies, procedures, and plans.

Public Relations

Develop and maintain positive relationships with our community, local industry, schools, business and civic groups, and recruiting sources, particularly through closer personal contact.

Administration and Services

Effectively, efficiently and economically maintain a professional personnel function and one that will devote all of its abilities and energies to the above objectives and in addition will continue to provide the following services:

(a) Group insurance administration.

(b) Administration of DEC Tuition Refund Plan.

(c) Coordinate Northeastern University Co-op Program.

(d) Coordinate immigration procedures.

(e) Administer unemployment compensation claims.

(f) Coordinate military deferment requests.

(g) Conduct surveys and studies on matters pertaining to DEC and area wage structures, benefits, personnel policies, turnover, absenteeism, health and safety, company and departmental employment gains, advertising and recruiting effectiveness and costs, employee morale, etc.

(h) Study federal and state laws pertaining to employment and wage practices and insure that the company's practices are not in violation of state and federal requirements.

(i) Supervise company sponsored recreational activities.

(j) Maintain an up-to-date file of evening school catalogs, training films, and maintain company bulletin boards.

(k) Coordinate summer and temporary employment program.

(l) Assist with company internal security program.

(m) Maintain a well run first-aid facility and assist with plant safety, health and sanitation.

(n) Prepare employment practice and compliance reports as required by state and federal agencies.

dec INTEROFFICE MEMORANDUM

DATE 18 February 1964

SUBJECT

TO Harlan Anderson

FROM Robert Beckman

We have looked into the problem of the start/stop switch on the Project MAC PDP-1. Jack Shields and Dick Edwards have both tried to make the problem occur, and as yet have not done so. They talked to the people using the machine and could get no further information about it. As of right now everyone there seems to be satisfied.

INTEROFFICE MEMORANDUM

DATE February 18, 1964

SUBJECT SUPERVISORS' DISCUSSION GROUP (supersedes memo dated 2/5/64)

TO Personnel Committee FROM Bob Lassen

After our most recent meeting, I feel we all have a clearer idea of what we wish to accomplish and the approach we should use in conducting the supervisors' discussion group.

Objective - To provide our supervisors with the opportunity to actively participate in a series of informative discussions designed to help them (individually and collectively) better understand their job as a supervisor and their responsibilities to their company, their people and their fellow supervisors.

Method - Informal (round table--group participation) discussions assisted by a discussion leader who will be responsible for introducing worthwhile and meaningful subjects pertaining to supervision in general and supervisory problems and responsibilities peculiar to DEC.

Subjects may be introduced in such ways as pre-selected material, films, case studies or individual problems peculiar to a supervisor or to the company.

Spirit of the Discussion Group - Informality and freedom to participate should prevail. The discussion leader's job is to introduce worthwhile subjects and to motivate the group to exchange ideas pertaining to the subject.

The leader should not assume a teacher-student or "consulting expert" relationship.

Time Schedule -

Monthly meetings starting March 11, 1964.

Time - 5:30 P.M.-6:00 P.M. - Supper

6:00 P.M.-7:30 P.M. - Discussion period

SUGGESTED SUBJECTS

The first eight or ten meetings should be designed to cover the basic elements and responsibilities of supervision. Eventually the supervisors will take over as discussion leaders, and they will have the opportunity to select subject material.

1st Meeting - "Your Job as a DEC Supervisor"

a) Introductory talk by K. H. Olsen outlining the purpose of the meetings. I suggest that Ken outline the company's objectives and perhaps the supervisor's role in helping to fulfill these objectives.

b) General discussion of the basic responsibilities and accountabilities of a supervisor. Include the characteristics and behavior of a good supervisor and discuss the "sins" of poor supervision.

Start the discussion with a related film.

Tentative Films:

"The Supervisor as a Modern Manager"

"The Supervisor as a Leader"

"A New Supervisor Looks at His Job"

2nd Meeting - "Understanding Your Company's Policies, Attitudes and Objectives"

A panel moderated discussion of DEC policies, philosophies, attitudes and objectives. Emphasize the supervisor's responsibility for representing these policies, philosophies, etc., with integrity.

3rd Meeting - "Introducing a New Employee to DEC and to His Job"

A discussion of the supervisor's responsibility for creating a lasting first impression--which begins with the employment interview. Making him feel at home, making sure he understands DEC policies, facilities, activities, rules, etc., introducing him to fellow employees and beginning effective job instruction, building his confidence while he is adjusting to new situations and following up during his adjustment period. (Reading material will be included.)

4th and 5th Meetings - "Getting the Job Done Through People"

Group discussions of Leadership and Motivation (satisfying the needs of people), Supervision by Making Assignments and Results Expected (letting people know what is expected of them), Fostering Feeling of Approval, Emphasizing Fairness and Firmness and the Influence the Supervisor has on his People, Use of Authority, Knowing your People and Building an Effective Work Team, Morale--handling complaints--recognizing "danger" signals and identifying the causes, Disciplining when all else fails.

Tentative Film (4th Meeting) Leadership - "The Inner Man Steps Out".

Tentative Film (5th Meeting) Motivation - "Key to Motivation"

6th Meeting - "Productivity, Planning and Control"

A group discussion of the supervisor's responsibility for planning work, productivity of his group--including techniques and controls to help him get the job done. Suggest Maynard Sandler be our discussion leader on this one.

Tentative Film - "Concept of Scheduling"

7th Meeting - "Your Responsibilities Also Include Instructing, Developing, Appraising and Counselling with Your People"

A group discussion of the supervisor's responsibilities for teaching, training and preparing his people for more complex responsibilities. Discuss teaching techniques. Also discuss performance appraisal and techniques used in discussing the appraisal with the employee. Reading material to be included.

Note: Will attempt to get film on teaching techniques.

8th Meeting - Cost Reduction and Economy"

A group discussion of supervisor's responsibility to be "cost conscious" and techniques used in locating and controlling excessive costs. This might include a non-technical explanation of company finances and is intended to show the supervisor that a significant part of his job is to help the company make a profit. Suggest Dick Mills be our discussion leader on this one.

Tentative Film - "Building Organization Cost Awareness"

9th Meeting - Recap of previous meetings. General discussion of supervisory problems peculiar to DEC. Hopefully this will provide some feedback and will aid in organizing future discussion.

Then, one meeting per month to discuss problems, cases, films on special subject matter. By this time the supervisors, with our help when needed, will be able to generate their own discussion groups.

RTL/jfr

INTEROFFICE MEMORANDUM

DATE February 18, 1964

SUBJECT Two-transistor Charge Controlled Flip-flop

TO Ken Olsen

FROM Bob Hughes

Questions asked so far about the flip-flop have been:

Question: When the temperature increases, won't the stored charge disappear?

Answer: The manufacturer has estimated that for this device the stored charge temperature coefficient is 0.3 picocoulombs per °C under the conditions that we use in the flip-flop, and he is currently measuring it to give us the actual number.

Question: What do diodes D2 and D4 do? (These diodes clamp the base from going more positive than plus 0.7V.)

Answer: The flip-flop as drawn will run perfectly well without these diodes, but without them the collectors of Q1 and Q2 go quite a bit positive and this signal would be coupled through the base collector diodes of Q1 and Q2 and it would appear on the base, and if we try to do a different type of input gating, this DC level might cause some peculiar problems.

Question: When you pulse the base of Q1, won't that pull down the output collector?

Answer: No, it will merely reduce the clamp current by about 6 milliamperes.

Question: If the input pulse is too narrow, will the flip-flop fail to flip?

Answer: Yes, but this is true of any flip-flop.

cc: Harlan Anderson, Stan Olsen, Win Hindle, Dick Best, Don White, Bert Scudney, Russ Doane, Bob Savell, Jim Cudmore, Ulrich Skowronek, Gordon Bell, Barbera Stephenson

RH/bf

dec INTEROFFICE MEMORANDUM

DATE February 18, 1964

SUBJECT SALES NEWSLETTER

TO K. H. Olsen
H. E. Anderson
S. C. Olsen

FROM J. L. Atwood

We now seem to have reached the point in the HISTORY OF THE SALES NEWSLETTER when everyone is sitting around waiting for "George to do it." The contributions are not coming in.

I have what seems to me a rather effective answer to this problem. I suggest that we establish a "subscription price" of one contribution per month per subscriber.

In actual practice, we would not drop anyone from the subscriber list. However, we should send the delinquents a strongly worded warning over Stan's signature.

I think this would bring home quite dramatically to everyone involved the fact that the Newsletter is a two-way avenue of communication and that its virtue lies in the active exchange of information between the recipients.

J.L.A.

fd

Description of PDP-5 FORTRAN — February 19, 1964

To: Computer Guidance Committee — Larry Portner

STATUS

COMPILER	OPERATING SYSTEM
Design -- 100 % Completed	Design -- 80 % Completed
Coding -- 35 % Completed	Coding -- 40 % Completed

DOCUMENTATION

Being written by Jack Ridgeway, expects to have drafts available by scheduled date of March 20.

DESCRIPTION

This is a one pass compiler, which means the source language tape must be read only once. The compiler will generate one tape, which will contain binary coding in a form which is executable under control of the object time system, but is not machine language. Part of this tape will contain data required to handle forward references, necessary because of one-pass design. There is no assembly phase.

To use the system, it is only necessary to load the compiler, which will then process the source language tape and generate the object program tape. This object program tape can be run at any time simply by loading the object system, which contains all the machinery necessary to load the object program tape, fix up forward references, and run the object program.

The compiler itself (as well as the object system) is being written in logical blocks such that it may be modified easily to become an expanded (Micro tape) FORTRAN, and the design is such that no major modifications are necessary for the generation and execution of arbitrary-size programs, where non-resident program and data will be shunted back and forth on Micro tape.

INTEROFFICE MEMORANDUM

DATE February 20, 1964

SUBJECT PDP-5 Maintenance Class, Convening February 24, 1964

TO K. Olsen
H. Anderson
S. Olsen
N. Mazzarese
R. Beckman
All Sales Personnel

FROM R. Bernier

The following individuals are scheduled to attend a one-week

PDP-5 Maintenance Class convening February 24, 1964.

R. Hall	-	Consolidated Systems Corp., Monrovia, Calif.
J. Mutzeneek	-	Digital Equipment Corp., Ottawa, Canada

****

RB:ajc

INTEROFFICE MEMORANDUM

DATE February 20, 1964

SUBJECT Demonstration for DuPont of a PDP-5 Operating with an Instron Testing Machine

TO
Ken Olsen
H. Anderson
Stan Olsen
Nick Mazzarese
W. Hindle
Jack Ridgeway
Ed de Castro

FROM Allan Titcomb

Mr. Edward Yetter has requested a demonstration of a PDP-5 operating an Instron tensil testing machine. The demonstration would consist of digitizing analog voltages, timing the extension of a test sample, and performing 6 typical calculations.

Originally DuPont was considering the PDP-5 for use in their Chattanooga plant. Since that time approximately 5 DuPont plants are now involved and this method of testing nylon and other synthetic fibers will become the standard method. Since a large number of computers may be involved, other manufacturers are bidding on this system. From conversation with Mr. Yetter, it appears certain that the lowest cost system may not be the one chosen. DuPont must satisfy itself that the system chosen will perform reliably. Mr. Yetter has indicated that he may have Foxboro bid on this job. CDC is also bidding.

Instron has agreed to rent a machine to us. Their table model machine with load cell and load cell amplifier would be suitable. The approximate price of this machine is $5,000.

I feel that the required program will be ready within two weeks. Interfacing to the Instron should take no more than one week. Debugging the completed system should take two weeks. One week would remain for demonstrations. This schedule would require that we have the Instron machine two weeks from now, and retain it for one month.

K. Anderson

INTEROFFICE MEMORANDUM

DATE February 20, 1964

SUBJECT Display Sales Plan

TO Members of the Works Committee

FROM Robert E. Savell

Attached is a copy of the Display Sales Plan which the Works Committee requested me to prepare at its meeting of December 24, 1963. It will be discussed at the meeting on February 25, 1964. It has been prepared with some collaboration from W. Hindle, N. Mazzarese, and S. Olsen.

Some of the actions proposed in the plan have already been commenced and results reported to the Engineering Projects Committee and Computer Guidance Committee. The other actions proposed will be commenced if they are approved by the Works Committee.

My aim while preparing the plan was to try to find application areas where numbers of substantially identical computer -display systems could be sold. The single area that looks most promising so far as a limited section of computer-aided-design; namely, producing and up-dating block and circuit schematics and parts lists. It offers an early return on a not-too-large investment, and is an area that certainly offers good future prospects.

The film reading market has been investigated and reported on by Ken Wakeen. No convincing argument can be made for entry into this area at present. One of the reasons is that a major portion of the problem is pattern recognition of the data that has been read. We should certainly keep aware of what progress is being made by others in this area however, as I am convinced that more and more data will be entered in this manner.

I still feel, as I have since last spring, that we should continue to design an electrostatic CRT deflection system and a faster, more flexible character generator. The Display Type 340 is a fine display for computer generated information, but is no better than the Type 30 for random point data display.

Please read the plan before attending the meeting, as I intend primarily to answer questions rather than duplicate the written material with an oral presentation.

RES/ll

Robert E. Savell
February 10, 1964

DISPLAY SALES PLAN

GENERAL

In line with DEC's General Sales Plan the following statements can be made about display sales.

1. Sales should be commercial if possible, not military.

2. We must attempt to show prospective customers how display equipment may be used in their application.

3. Quality and performance of equipment must be high.

4. We must do more applications programming in line with #2 above.

5. Both customer and field service personnel must be instructed in operation and maintenance of displays. Customer Relations has sent Ray Bernier to our last class on Type 30 Display and will be responsible for training future personnel on this type.

6. Sales Personnel Motivation

Sales Engineers must be given more tools to work with. Brochures describing the basic displays are quite good and each sales person and sales office has a quantity of material that describes briefly every single piece of display equipment we have made along with price, delivery and ordering instructions. This is not enough, however.

For the Maynard and Los Angeles offices, and for future shows, better demonstration programs are needed along with instructions for their operation.

DDT for PDP-4 using the display 340 could be finished by Chuck Stein in approximately 2 weeks at a cost of approximately $900.

Other demonstrations are mentioned later on.

7. Additional Sales Personnel

The General Sales Plan calls for two sales people to be hired in 1963. One of these was requested by me in February, 1963. So far no one has been hired. This is probably not a good time to hire anyone for this purpose; instead we should make use of people we already have.

I am becoming quite convinced that is is necessary for the person most familiar with new products being developed to get out and drum up the initial customer interest. Once the product has been solidified to the point where specifications and brochures have been written, the general sales force should be motivated to get out and push the product. I think the reason for this is farily obvious: That is that the large number of general sales people we have should be able to cover many more prospective customers than a single engineer selling his own product and trying to design it at the same time. They should also be able to do it more economically.

All leads should be reported back to and all requests for quotation processed by one person here at Maynard, however so that the sales effort may be carried out in an organized manner. In addition, a reference file should be kept of all display inquiries. As it stands today, there is to the best of my knowledge no complete file of this sort and inquiries are handled by many different people. Since no file exists, many inquiries never become known to engineering, and so valuable information about the needs of the market is lost.

The engineers who design the equipment must not lose contact with customers, but neither must they spend so much time with them that nothing gets designed. If the display sales person and the general sales force can handle most of the routine customer contact and rely on the design engineers only for new product assistance as outlined above and for special equipment and special price quotations, I believe both ends will be satisfied. The design engineers should, of course, be assigned booth duty at trade shows and make occasional sales calls.

For programming assistance and writing of demonstration programs Chuck Stein seems to be doing a good job so far. He is very enthusiastic about displays and communicates well with people. He should be able to prepare the demonstrations mentioned above and motivate the general sales force by passing these programs on to them along with demonstrations of their use.

8. Internal Use of Displays

If they are really as good as we say they are then we should use them- computers too! The fact that we know how to use them should give us an edge over competitors like Data Display, Inc. who only build them. Some uses are:

DDT for display, preferably on PDP-4. DDT requires mag tapes to be effective for long programs.

Drafting of A and B size mechanical details with paper tape outputs for the milling machine and Type 31 photo output to use with the Xerox to produce hard copy. This is quite a programming chore, so should not be attempted at present.

Drawing of block schematics with the information in the computer then being used to produce wiring lists can be implemented for the following cost:

According to L. Hantman and C. Stein, the program to draw the schematics could be produced in about 5-6 months at an estimated cost of approximately $10,000. The addition to theprogram necessary to produce wiring lists can be produced at a cost of about $4,000. The extra hardware necessary to perform subroutines from the computer memory that would simplify the programming somewhat could be produced for a cost of approximately $2,000. Note that these costs do not include costs of computer time or 340 Display time.

9. Market Evaluation

We should attempt to sell displays as part of complete systems that include our own computers. Both of the other computer manufacturers - CDC and IBM - that have in the past looked like good prospects for our displays look less so now because they are both building new display equipment to use with their computers. Especially if they provide software to go with their equipment, they should have an edge over us for displays on their own computers.

The following factors must be considered in surveying the market for display products:

a) What is the size of the market?

b) How long can we expect it to last?

c) Is it one to which we can make a unique contribution in terms of the product or its application?

d) What investment is required in terms of people, money, and time?

10. Prices and Costs

We must be very careful of development costs and pricing in the future. The development costs for Type 30 Displays were apparently about three times as high as they should have been with respect to sales prices, also sales prices were not raised high enough fast enough. The sales price for a Type 30, in fact, still is too low since its manufactured cost is about $6,000. Based on the most recent pricing formula information its price should be at least $18,000. If it is to return anywhere near the expected return on investment from now on, this increase must be made.

While manufacturing costs must be kept as low as possible, I don't believe that spending much effort on reducing the cost of an existing display design will be profitable. We spent quite a bit of effort this spring to try to reduce the cost of the Type 30. It was generally unsuccessful. The amount of effort required to achieve the savings would offset the savings completely for any reasonably low quantity of displays.

SPECIFIC PLANS

1. Present Products

The Incremental Display Type 340, Character Generator Type 342, and Light Pen Type 370 should be accorded the most effort since they appear to be the products of most general usefulness to the most customers. Most of the remaining sections of the Sales Plan refer to plans for these items. A mailing of brochures on these units is being made to all computer customers by the Sales Department, at a cost of about $70 for about 101 copies.

The Ultra-Precision Display Type 31 has not received much attention lately from prospective customers. A survey by mail and phone of those who have shown interest in the past should be made to determine why they haven't purchased one. The Type 31 could easily be driven by the CDC-160A adapter designed for the Type 30, so brochures on the 31 should be included in the mailing to 160A users. The survey could be made in about 2-3 weeks at a cost of $1,000 to $1,500. It should be made by Derrick Chin since he has responsibility for the Type 31.

The Precision Display Type 30 should receive very little effort. It should be offered as an alternative to customers who cannot afford or do not need a Type 340. It's price should be raised as mentioned in the General portion of this plan.

The Display Type 30 to CDC-160A Adapter Type 360 should be pushed only to the extent warranted by the response to a mailing being made to all 160-A users. This mailing will include the newly printed bulletin on the Type 360 and should also include brochures on the Type 30, 33, 31 and 340, and 370. Since the 160A is quite a slow computer it probably will not be worthwhile to interface the 340 to it. The mailing will be made by the Sales Department at a cost of about $350 per thousand.

The Display Type 30 to IBM 7090 Adapter Type 361 should be pushed only to the extent warranted by a mailing to 7090 users similar to that made to 160A users. This mailing will cost about $350 per thousand.

This adapter could be redesigned without too much effort to accept the Type 340, however the IBM output would have to be modified to produce 36 bits instead of the present 23.

2. New Products

A relatively inexpensive film reader to sell for maybe $15,000 appears to be a worthwhile product.

A proposal for a reader is being made by Ken Wakeen. He is also conducting a two week survey, at a cost of about $1,000 to determine the needs of the market, the size of the market, and the extent of the competition. The survey is including talks with Geodyne, L. R. L., E. G. & G., Aerospace, Lincoln Laboratory, Information International, Harvard, Princeton, Michigan, and M. I. T. Physics, Oceanography, military A-scope radar, and Weather information seem to be the major areas of interest so far.

Logic to be used with the Type 340 to implement jump, jump and save program counter, and deposit return jump instructions will be built shortly. This will probably be of interest to many other people and should be offered as a standard option. It permits the display to perform sub-routines, thus for pictures containing repetetive information the display data storage requirement is reduced. It will sell for about $5,000.

Other possible new products are:

a) Special display for typesetting

b) Electrostatic display. This would give us more random point plotting speed for quick-look applications involving random data input and the ability to plot characters at a faster rate. (We kept U. of Michigan sale only because of line drawing speed of 340; we lost Stanford multi-display because of low character speed)

c) Curve Generators for Type 340

d) Projection display as part of a computer-aided-design display

e) PEPR Systems. These would probably be direct copies of whatever system Dr. Pless arrives at.

f) A cheaper CRT and deflection system. Our present price of about $12,000 for that part of a Type 340 constitutes about 40% of the price. A lower priced unit would also put us in a better position for multi-CRT display systems.

3. Areas of Application

As previously mentioned, we should attempt to sell displays for applications that also will result in a computer sale for us. Some of these are listed below:

a) Computer Aided Editing and Type-Setting

Larry Buckland of Inforonics had done quite a bit of work over the past few years investigating the market and doing programming for this application.

He feels that the daily newspapers are not the market that is most worthwhile, since all that can be done for them is line justification. This can presently be done by mechanical means very cheaply. Unions are a horrible problem in this market. How about weekly newspapers? offset, complete typing.

Scientific journal, technical manual, and catalogue publishing, where composition costs are 50% of total publishing costs and frequent updating is necessary look like the most fruitful areas.

Many of these people are beginning to use offset printing, which is quite compatible with the photographic output that would be produced froma CRT.

There is some question as to whether the resolution of CRT's is sufficient to produce acceptable copy. If not, the area of editorial proofs may still be a worthwhile one. At present they are produced by hard copy printing methods and final lay-outs are produced by cutting and pasting.

Inforonics has been given a contract for $2,000 by DEC to study the Display 31 cathode ray tube output to determine whether it is suitable for producing high quality typographic output. If this study proves successful, then they will be given a contract for $10,000 additional to generate a character set, make some recordings on film of sample text, and produce printing samples. This entire program is presently the responsibility of the Sales Department.

Demonstration programs and sales effort will for the present be performed by Inforonics. The Peripheral Equipment Department will assist in CRT measurements as necessary to an extent that should be defined by the Sales Department.

b) Oceanography

Oceanographic explorations have increased greatly in the past few years and appear to offer another area where computers and displays may be profitably employed. Lt. Robert O'Hagen who has been in the Coast Guard for seven years, most of which has been spent in oceanographic work, has provided us with most of the following information.

There are about two dozen or more oceanographic laboratories up and down the East and West Coast that all record data on film in the same manner. They record digital information using channels longitudinally along the film and record either marks or spaces at intervals along the film. They usually use 17 channels containing two seven bit and one three bit binary numbers. Apparently everyone doing oceanographic work records in the same manner on the same width film -16mm.. At first glance this seems to be a fairly easy thing to read; almost any kind of a film reader should do the job. Wakeen's conversations indicate that there isn't much film of this sort to read and that its quality is pretty bad however.

O'Hagen feels that there would be a chance of selling possibly 8 to 10 PDP-4's with film readers providing they had FORTRAN capability. The scientists who would use these systems are not interested in learning about how they work or in machine language "programming" so he feels that FORTRAN is a necessity. Subsequent investigation indicates the market is probably more like 2-4 systems.

Another application that looks more feasible would use the cathode ray tube display for a quick look at random point data which has to be screened with a light pen. One example of this are plots of temperature versus salinity which Lt. O'Hagen says cannot be scanned very well by a computer but requires human intervention. One of the ways this data is obtained is by means of BT slides. These are gold coated slides into which a line has been traced with a stylus. The slides are presently photographed and the data, in the form of X, Y coordinates, is taken manually. Reading these slides into the computer and displaying the data for screening would seem to be a double-barrelled application.

c) Psychology

Air Force Cambridge Research Laboartory, the University of Michigan, Harvard Center for Cognitive Studies, and BBN are using displays for psychological and learning experiments. AFCRL has, in fact, demonstrated some of our equipment at a meeting of psychologists. George Rice who has dealt with some of these customers could give me very little information as to whether or not this is a worthwhile market. It is apparently non-renegotiable for the most part, with money coming from the National Institute of Health and National Science Foundation.

An estimate of the cost for making a market survey in this area would be one man week at a cost of $500. Since George Rice has been dealing with these people it is my opinion that he should be the one to make the survey.

d) Medical

My feeling is that the medical field should be a fertile one, unfortunately I have no solid facts to back up this feeling. The ability to monitor EEG data on-line seems to be a very powerful application - but is it really? Professor Rosner from Yale uses the display to manipulate tape recorded EEG data. Are there other who would alos like to do this?

I talked withour sales specialist in the medical field, Gerry Moore, and he gave me the following information.

There is probably a market for reading slides and X-Ray film into a computer. (IBM has a facility at Tulane to do this. It was set up to operate for two years with a 1.6 million grand.)

Histogram generation might be of interest.

Average response computation is not worth much alone, even as a demonstration, since cheap $10,000 special purpose computers are available to do it. Generally not adequate however!

One of our users, M. G. H. I believe, has been experimenting with a cat equipped with a brain probe wired on-line and viewing a display. The probe data causes modification of the displayed information, thus establishing a closed loop feedback system.

A survey to determine whether there are applications should probably be made by Gerry Moore since he is the Sales Department specialist in this field. I estimate that it would take one man week and cost approximately $500.

e) Physics

The film reader will be useful in this area for reading spark chamber data. Whether or not it is useful for reading bubble chamber data probably depends on the accuracy and stability of the CRT's. So far MIT and the University of California at Berkeley seem to need more accuarcy and resolution than we can provide.

Another physics application is the plotting of points on a plane taken through a three dimensional surface. Columbia University is using a computer to do this. The plot involves having the computer take the data stored in the computer for each point on the surface and comparing it with a manually set level which determines the plane through the surface. Points which are greater in magnitude or lower in magnitude as desired are then plotted on the face of the CRT. They are going to build a hardware comparator for this to conserve computer time.

The survey of the Type 31 customers should include the physics people and should include determining how many of these are interested in PEPR specifically. This survey cost is included in the cost of the Type 31 survey.

f) Computer Aided Design or Drafting

It would be nice, and some people here at DEC would enjoy it greatly, if we could do research like "Sketchpad" into the computer aided design problem. Unless we have a much clearer picture of the market and its needs than we have now, I don't see how we can afford it. We can take a step in the right direction by writing the programs that will allow us to draw block schematics on the display and to insure that the computer knows enough about the drawings to produce wiring lists. Blcok schematics are simpler to implement than mechanical drawings with dimensioning and so are a good first step.

Boering Aircraft is interested in being able to enter information about curvilinear surfaces into the computer via sketches on the display. They talk about "hundreds" of display consoles.

Chuck Stein has begun to contact prospective customers to see if he can evoke some interested prospects for a system to draw block schematics on the face of the CRT, store them on magnetic tape, and output them either via a camera or on a mechanical plotter. He estimates the cost of the program to draw the block schematics as $10,000 with a completion date of 5-6 months. To go one step further and produce wiring lists would cost another $4,000. So far he has not been talking to the customers about the possibility of producing wiring lists, simply producing block schematics. The extra hardware to use to produce sub-routines with the 340 could be produced at a cost of approximately $2,000. My estimate of the time required to determine whether there are enough truly interested prospects and do very preliminary thinking about the system would be 3 man weeks at a cost of approximately $1,500. I believe we should continue the start we have made on this step and invest up to this three man week maximum in determining whether there really is a market or not. So far, the results that Chuck has obtained look encouraging.

A demonstration of block schematic drawing capability at a show or two with invitations sent out to selected prospects might do a lot to put us into direct contact with people who are seriously interested. A starting point for such a list might be a list of people obtained from Ivan Sutherland or Doug Ross. CDC apparently feels that the aircraft companies offer the greatest promise so far. Jack Gilmore should also be a fast, fairly economical source for some programs. Harlan Anderson and I will contact him in the near future.

g) Hybrid Computer Systems

The display can be used in these systems to allow the user to draw his analog system in block diagram form with the computer than interpreting the information drawn to make the required analog connections. Input and output functions can also be entered and displayed via the CRT.

h) General Display and Modification of Data

Control of the computer from a console like CDC-6600 using programs similar to DDT may be fairly uneconomical if one has no other use for the display, but there are a number of ways in which the display may save money and hence help pay for it-

self. It's output is instantaneous, so programmers time spent waiting for slow typewriter printout is saved. We have already talked about using one common set of indicators for all IO devices selected by a mechanical switch on PDP-6. If these are programmed to appear on the display we still save all the indicator panels and in addition can cause labels to appear on each "light". Equipped with a camera it produces fast hard copy output and may therefore take the palce of a line printer in some installations.

DDT for the Display Type 340 on PDP-4 is about one week away from completion. I propose it be finished as a useful show demonstration. I also propose that as much computer control and program debugging information as possible be programmed on the PDP-6 Display.

It has been suggested that FORTRAN statements for the Display Type 340 be written. H. Morse says that this is very simple to do if the routines needed can be decided upon. The block schematic programming, film reader programming and in fact all future routines should be developed with this in mind.

4. Selling Methods

a. Demonstrations

Demonstrations to motivate our own sales people and to show prospective customers what we can do are probably the most effective way to sell displays. The demonstration programs should be those decided upon for each application area we seek to enter. I too am tire of nothing but "spacewar".

The cost of the demonstrations at trade shows is approximately $5,000 per year based on an estimate of 7-8 per cent of the total cost of the shows. This does not include the cost of the time of people who man the shows.

b. Brochures

Aside from equipment brochures, applications brochures for each area of application we seek to enter should be prepared. These should be used both in combination with the demonstration programs at shows and as direct mail advertising. The cost for a brochure similar to the 340 brochure is about $1000 for 5000 copies.

c) Display Advertising

I read display advertising and I think quite a few other people do too. I feel a small amount of display advertising in publications selected according to the application being advertised would be a worthwhile adjunct to our show and direct mail program.

The cost for a full page black & white ad in Datamation is about $1700.

5. Costs and Expected Volume

If the combined computer sales volume of PDP-1, 4 and 6 continue at the same overall rate as in the past I would estimate sales of about 24 Display Type 340, 24 Light Pen 370, 8 Character Generator 342, 2 Display 31, 8 Monitor Displays Type 343, and 4 Display Type 30 over the next two years.

24 - 340 at 30K	720
24 - 370 at 1.6K	38.4
8 - 342 at 7.7K	61.6
2 - 31 at 41.2K	82.4
8 - 343 at 12K	96.0
4 - 30 at 18K	72.0
	1,070.4K TOTAL

SUMMARY OF COSTS

0 Subroutines for FORTRAN

1.	Finish DDT on display for PDP-4		900
2.	Block Schematic drawing program on PDP-4		10,000
3.	Wiring List program for PDP-4		4,000
4.	Sub-routine hardware		2,000
5.	Special mailing of 340, 342, 370 brochures		70
6.	Display 31 survey		1,500
7.	Display Adapter 360 for 30/160A mailing		350
8.	Display Adapter 361 for 30/7090 mailing		350
9.	Film reader survey		1,000
10.	Film reader engineering		
11.	Computer Aided Editing & Typesetting	Pt. 1	2,000
		Pt. II	10,000
12.	Psychological market survey		500
13.	Medical market survey		500
14.	Computer Aided Design market survey		1,500
15.	Demonstrations at trade shows		5,000
16.	Brochures for film reader		1,000
17.	Display Advertising		1,700

INTEROFFICE MEMORANDUM

SUBJECT: JOB ALLOCATION, MECHANICAL DESIGN DATE: February 24, 1964

TO: All Engineers
K. Olsen
S. Olsen
H. Anderson
N. Mazzarese
M. Sandler
J. Smith
R. Maxcy
R. Maroney
K. Peirce
H. Crouse
B. Brackett
W. Hindle

FROM: Loren Prentice

To better acquaint all engineers and management with job responsibility within the mechanical design department, a memo will be issued periodically as required.

ENGINEER	JOB NUMBER OR EN NUMBER	DESCRIPTION	% COMPLETE
Scott Miller	1022	Power Supply Labels	95%
	1023	1906 Redesign	40%
	1289	Eyeball Unit	10%
	1088	Module Pouch & Box	95%
		Other packaging	Open
	1177	PDP-5 Arithmetic Option	95%
	1188	Module Development	75%
	1211	Light Pen 370	85%
	1282	PDP-7	75%
	1292	PDP-8	30%
		Product Identification	--

ENGINEER	JOB NUMBER OR EN NUMBER	DESCRIPTION	% COMPLETE
Ken FitzGerald	1023	Additional assembly jig for 1914 mounting panels	75%
	1000	Paint adhesion on steel components	30%
	1053	Welding jigs for standard computer cabinets	99%
	1253	Sheet metal, cabinet assembly and carpenter shop supervision and administration	--
	1254	Machine shop supervision and administration	--
	1173	PDP-6 console mechanical design and prototype fabrication	100%
	1178	PDP-6 console, drafting & redesign	50%
	1208	DEC paper tape reader (Stepping motor drive)	30%
	1000	"Plastic" doors and end panel research	0%
	1254	Programming tape controlled milling machine	--
	1288	Automated Board Production line	15%
Loren Prentice	1000	Building Layout	--
	1196	Tape transport type 570	95%
	1072	Engineering standards	0.5%
	1237	555-A tape unit Solid State Dev.	30%
	2609	Micro Tape 555	85%
	1252	Security	--
	1292	PDP-7	0.5%
	1291	18 - 36 pin module	.05%

ENGINEER	JOB NUMBER OR EN NUMBER	DESCRIPTION	% COMPLETE
Ron Cajolet	1178	PDP-6	90%
	1236	Display 340	97%
	1236	Light pen mounting	50%
	1027	Stability test stand	50%
	2667	PDP-1D	99%
	1180	Camera mount type 372	80%
	1023	Mounting panel development	--
	1177	PDP-5	--
	1000	Plastic cover panels	--
	1068	Card Reader	15%
	100.00	Dynasert fixture plates	25%
	1232	PDP-7	20%
Phil Backholm	1196	M3000 Tape transport Prototype type 570	98%
	1185	Automatic silk screen	50%
	1191	PDP-5 Prototype	80%
	1291	18 - 36 pin connector	20%

JOBS PENDING - UNASSIGNED		ASSIGNED ELECTRONIC ENG.
1151	Large Tape Storage - Hold	T. Stockebrand
1165	Projection display	R. Savell
1181	Camera Equipment for 31 Display	R. Savell
1086	Holley printer	R. Savell
1182	Electrostatic display development	R. Savell

INTEROFFICE MEMORANDUM

DATE February 24, 1964

SUBJECT 19 BIT MEMORY STACKS

TO K. Olsen
H. Anderson
N. Mazzarese

FROM J. Smith

Present status of 19 bit memory stacks is listed below.

Manufacturer	In Stock	On Order	Total
Ferroxcube	4*	0	4
G.C.	8	0	8

*(PDP-6 is currently using 4, which will be returned next week)

Total 19 Bit in Stock 12

1 Type 12 with Ferroxcube stack and modules also in stock, (returned from Stanford system).

Location of Ferroxcube stacks in DEC machines (Maynard):

PDP-1-20 (Customer Relations)	2
PDP-1-34 (DEC, Sales)	1
PDP-4-19 (DEC, Engineering)	1
Total	4

Considerations:

A. Ferroxcube has agreed to rework 19 bit stacks to our present 18 bit stack for a cost of $400./stack.

B. Status of G.C. Stacks:

G.C. stacks are running with a 10 volt margin spread at room temperature. When heat tested, margins decrease as heat increases until at 100°C margins are at a 6 volt margin spread. "Schmoo" tests are currently being run on all 8 G.C. stacks

that we have on hand. Discussing the situation with Jim McKalip, it is his feeling that the G.C. stacks are now usable.

Proposal Number 1

Return all Ferroxcube stacks in stock for rework.

(Type 12 in stock will be replaced with a G.C. stack).

Cost - 5 at $400.00 - $2000.00

(Inventory of 8 G.C. stacks remains)

Proposal Number 2

Replace all in-house machines using Ferroxcube stacks with G.C. stacks. Return for rework with above stacks. Five above and four replaced, total of 9.

Cost - 9 at $400.00 - $3600.00

(Inventory of 3 G.C. stacks remains)

Type 12 Returns as the Result of 16K Field Installations

Number Returned	From	Reassigned To
1	Project MAC	ITT
1	Yale University	CRC
1	Princeton University	Harvard
1	M.I.T.	Sales
1	Harvard University	Field Service
1	Stanford University	In Stock

Mr. A. Anderson

INTEROFFICE MEMORANDUM

DATE February 24, 1964

SUBJECT Rewards for Patents

TO WORKS COMMITTEE FROM J P Hastings

Cesari's attitude: Essentially he is not in favor of financially rewarding inventors, however he finds most clients disagreeing with his opinion. Sanders Associates, for example, award $50.00 to the inventor when the application is filed and another $50.00 when the patent issues. Cesari's reasons are:

1. Patents usually develop from certain areas of a Company and to solely reward employees within that area you imply that other employees are of less value.

2. Salaries should reflect an employee's value to the company, therefore by giving him an award you are suggesting his original salary is insufficient.

3. You expect an employee to give you his best - why pay him again for an understood obligation?

Cesari suspects employers use rewards to help overcome employees' inherent laziness and indifference to making known their inventions.

Other Comments: Len Hartman - definitely yes. Provides the necessary incentive. After all, the company is making money on the patent, why shouldn't the inventor share in it.

McKalip - No. As a professional engineer it is part of your duty to disclose to your employer your inventions. It is an understood obligation of employment.

Savell - Yes. Stimulates people to think. Offer enough money to make it worth-while. For example, in the hundreds, maybe thousands of dollars. Perhaps the reward should be a percentage of patent royalties.

JPH/dhw

H. ANDERSON

dec INTEROFFICE MEMORANDUM

DATE February 24, 1964

SUBJECT PDP-8

TO ALL SALES OFFICES FROM Mort Ruderman

The Linc Computer (Laboratory Instrument Computer) is going to be marketed here at DEC as the PDP-8. It will be essentially identical to the existing LINC computers in that we here at DEC do not initially intend to alter the system concept or any of the logical configurations.

I feel that it is important that I bring the people in all district offices up to date in exactly what the situation is with the PDP-8. The price has been determined at $59,000. This includes the 30 foot cables that exist with all existing LINC systems, the LINC Tape, the Display Scope and the 16 Channels of Analog-to-Digital Input. We plan to offer the PDP-8 with the options to have the cable so that the 4 remote pieces of gear: Scope, Tape Transport, Data Terminal Position and the Operator's Console can be removed from the central processor and operated from remote positions. Therefore, we are also offering the PDP-8 without the cables and without the ability to take the 4 units of remote. The price without these options will be approximately $57,500.

We really anticipate and are hoping to sell PDP-8's in groups of 5 or more. The reason here being that the potential market for the PDP-8's is so inviting and the institutions and hospitals that are the prime market for the PDP-8 can group themselves through one central purchasing source or granting agency to make benefit of our 24% discount. This now brings the price of the PDP-8 to $44,500. This is a very inviting price for these people for the reason that for someone to build the LINC in kit form and assemble it and check out themselves would cost them approximately $42,000.

The basic differences between the original LINC computer and DEC's PDP-8 are: 1) It is housed in 2 of our standard cabinets rather than the special cabinet that they had constructed. 2) It uses our power supplies rather than the power supply designed and built by North Electric for the LINC. We are offering it with the option of having the 30 ft. cables or eliminating the 30 ft. cables. Other than this the PDP-8 will be identical in operation and flexibility as that of the LINC Computer.

The PDP-8 would consist of:

1. 2K Memory (12 Bit Word)
2. Display Scope (With Built-in Character Generator)
3. 2 Dual LINC Transports (Micro Tape) (Control inherent to the basic central processor)
4. 16 Analog Inputs
5. Built-in High Speed Multiplier (48 usec)
6. Memory Cycle Time, 8 Microseconds
7. Soroban Keyboard Input
8. 8 of the Analog inputs are connected to potentiometers so that you can manually control inputs
9. 2 sets of 12 bit digital input terminals
10. 2 Analog Output Channels are Available

The software situation with the PDP-8 will be approximately as follows: 1) An assembler for the LINC Computer does exist, we will have to look at this very carefully and decide whether it is adequate or whether we should tie up some loose ends. 2) There are 25 existing systems in the field presently and they all have existing software. Therefore, a group such as a users group or someone to just gather all the existing programs and review them would have to be done. Also, we will not do programming for customers on the PDP-8 but we will offer the same programming assistance that we offer on all of our other PDP systems.

Hopefully documentation will be available within the next month. I feel very confident that we can get our first PDP-8 out of the house 6 weeks after documentation is available. We should be able to produce PDP-8's at the rate of one every 2 weeks after the first one is delivered here at Maynard. Therefore, we are in a position presently to sit down and discuss any purchases concerning the PDP-8 immediately and a realistic delivery time would be 3 months after documentation or 4 months from today is also a realistic delivery time.

I feel that this memo will essentially enable people in district offices to tell people about our version of the LINC. Please do not hesitate to question me or have anybody contact me concerning the PDP-8. I am spending 100% of my time in this effort now.

LINC USERS

Distribution List for Equipment Change #7:

Dr. E. O. Attinger, Res. Dir.
The Presbyterian Hospital in Phila.
51 N. Thirty-Ninth Street
Philadelphia 4, Penn.

Prof. Donald S. Blough
Assoc. Prof. of Psychology
Dept. of Psychology
Brown University
Providence 12, Rhode Island

Dr. C. Alan Boneau
Assoc. Prof. of Psychology
Dept. of Psychology
Duke University
Durham, North Carolina

Mr. James S. Bryan, Chief
Section on Tech. Development
NIMH/NINDB
National Institutes of Health
Bethesda 14, Maryland

Dr. J. R. Cox
Central Institute for the Deaf
818 S. Kingshighway
St. Louis 10, Missouri

Dr. Sidney Goldring
Washington University
School of Medicine
660 South Kingshighway
St. Louis, Missouri

Dr. Fred S. Grodins
Professor of Physiology
Northwestern Univ. Med. School
303 E. Chicago Ave.
Chicago 11, Illinois

Dr. Joseph E. Hind
University of Wisconsin
283 Medical Sciences Bldg.
Madison, Wisconsin

Mr. Lee Hundley
Department of Genetics
Stanford Univ. Med. School
Palo Alto, California

Dr. Keith Killam
Dept. of Pharmachology
Stanford University
School of Medicine
Palo Alto, California

Dr. John B. Lewis
Lincoln Laboratory
L-257
Lexington, Mass.

Dr. John C. Lilly, Director
Communication Research Inst.
3430 Main Highway
Coconut Grove
Miami 33, Florida

Mr. Henry Littleboy
Mass. Eye & Ear Infirmary
243 Charles Street
Boston, Mass.

Dr. George S. Malindzak
Dept. of Physiology
Bowman Gray School of Medicine
Wake Forest College
Winston-Salem, North Carolina

Lt. Charles E. Molnar
AFCRL, Hanscom Field
Bedford, Mass.

Dr. Gian F. Poggio
Dept. of Physiology
Johns Hopkins U. Sch. of Med.
725 N. Wolfe Street
Baltimore 5, Maryland

Dr. Ralph W. Stacy
Institute of Statistics
State College
Raleigh, North Carolina

Dr. Bernard Weiss
Dept. of Pharmachology
Johns Hopkins U. Sch. of Med.
725 N. Wolfe Street
Baltimore 5, Maryland

Prof. J. Walter Woodbury
Dept. of Physiology and Biophysics
University of Washington
Seattle, Washington

INTEROFFICE MEMORANDUM

DATE February 25, 1964

SUBJECT: PDP-5 Programming Class, Convening March 2, 1964

TO K. Olsen
H. Anderson
S. Olsen
N. Mazzarese
R. Beckman
All Sales Personnel

FROM J. Richardson

The following students are scheduled to attend a one-week PDP-5 Programming Class convening March 2, 1964.

Henri Boutin	-	Watertown Arsenal, Watertown, Mass.
John Buissola	-	Applied Dynamics, Ann Arbor, Mich.
Robert Hall	-	Consolidated Systems Corp. Monrovia, Calif.
Robin Frith	-	Digital Equipment Corp. Maynard, Mass.
John Jorgensen	-	Digital Equipment Corp. Maynard, Mass.
George Cook	-	Boeing Huntsville, Huntsville, Alabama

JR:db

dec INTEROFFICE MEMORANDUM

DATE February 25, 1964

SUBJECT Overdue Computer Systems and Options.

TO K. Olsen
H. Anderson
S. Olsen
G. O'Dea
W. Hindle
D. Best
D. Mills
M. Sandler
R. Beckman
R. Savell
B. Stephenson
E. Harwood
J. Shields
J. McKalip
J. Smith
S. Lambert
T. Stockebrand
J. Rutschman
P. Greene
J. Myers
F. Gould
J. Fadiman
F. Kalwell
A. Ross

FROM N. Mazzarese

The following is a list of overdue computer systems and options. The engineer responsible for the project's completion is indicated in each case.

Customer	Item	Quantity	EN#	Original Date Due	Reason for Delay	Acceptance Expected	DEC Order Number & Price	Engineer in Charge
AECL	Core Memory Module	1	2735	1/20/64	Customer requested delivery in March.		05493 $40,000.00	S. Mikulski
AECL	Core Memory Control	1	2736	1/20/64	Customer requested delivery in March.		05493 $12,000.00	S. Mikulski
AECL	Special Modification to PDP-1		2737	1/20/64	Customer requested delivery in March.		05493 $19,000.00	S. Mikulski
BB&N	PDP-1C-45	1	2649	12/1/63	Delivered and being installed.	3/1/64	05109 $153,000.00	G. Moore
BB&N	16K Word Core Module Model 2650	1	2650	12/1/63	Delivered and being installed.	3/1/64	05109 $60,000.00	G. Moore
BB&N	4K Word Expandable Memory Modules.	2	2651	12/1/63	Delivered and being installed.	3/1/64	05109 $60,000.00	G. Moore
BB&N	Memory Controls	3	2652	12/1/63	Delivered and being installed.	3/1/64	05109 $36,000.00	G. Moore

Customer	Item	Quantity	EN#	Original Date Due	Reason for Delay	Acceptance Expected	DEC Order Number & Price	Engineer in Charge
BB&N	32 Field Drum System	1	2653	12/1/63	Delivered and being installed.	3/1/64	05109 $73,400.00	G. Moore
BB&N	16 Line Teletype Interface Modules.	2	2654	12/1/63	Delivered and being installed.	3/1/64	05109 $73,400.00	G. Moore
BB&N	16 Channel Seq. Break System Model 120	1	2665	12/1/63	Delivered and being installed.	3/1/64	05109 $	G. Moore
BB&N	Modification to Memory Extension Control.	1	2667	12/1/63	Delivered and being installed.	3/1/64	05109 $	G. Moore
BB&N	Special Instructions for Control Processor.	1	2668	12/1/63	Delivered and being installed.	3/1/64	05109 $	G. Moore
BB&N	32 MS & 1 Minute Clock	1	2769	12/10/63	Delivered and being installed.	3/1/64	05109 $	G. Moore

Customer	Item	Quantity	EM#	Original Date Due	Reason for Delay	Acceptance Expected	DEC Order Number & Price	Engineer in Charge
BB&N	Trap Buffer (18 bit)	1	2785	12/20/63	Delivered and being installed.	3/1/64	05109 $	G. Moore
Columbia	Mag-Tape Control Type 57A	1	2758	12/15/63	Shipped. No purchase order received.	5/1/64	NONE $	S. Lambert
Columbia (loan)	Interface Logic Type 520	1	2759	12/15/63	Shipped. No purchase order received.	5/1/64	NONE $	S. Lambert
Columbia	PDP-4C-20	1	2797	12/24/63	Shipped. No purchase order received.	5/1/64	NONE $	E. Harwood
Columbia	Extra 4K Memory Type 134	1	2798	12/24/63	Shipped. No purchase order received.	5/1/64	NONE $	E. Harwood
Columbia	Extended Arithmetic Element Type 18	1	2799	12/24/63	Shipped. No purchase order received.	5/1/64	NONE $	E. Harwood
Columbia	Printer Keyboard & Control Type 65	1	2800	12/24/63	Shipped. No purchase order received.	5/1/64	NONE $	E. Harwood

Customer	Item	Quantity	EM#	Original Date Due	Reason for Delay	Acceptance Expected	DEC Order Number & Price	Engineer in Charge
Columbia	Perforated Tape Punch & Control Type 75.	1	2801	12/24/63	Shipped. No purchase order received.	5/1/64	NONE $	E. Harwood
Columbia	Data Interrupt Multiplexor Type 133	1	2802	12/24/63	Shipped. No purchase order received.	5/1/64	NONE $	E. Harwood
Columbia	Tape Transport Type 50	1	2803	12/24/63	Shipped. No purchase order received.	5/1/64	NONE $	E. Harwood
Columbia	Interface Logic (for IBM 7330)	1	2804	2/1/64	Being modified for 7330 Transport.	5/1/64	NONE	S. Lambert
DEC (Sales)	Micro-Tape Control 550	1	2638	9/1/63	Late acknowledgment of order.	3/20/64	NONE $	T. Stockebrand
DEC (Sales)	Micro-Tape Unit 555	1	2639	9/1/63	Late acknowledgment of order.	3/20/64	NONE $	T. Stockebrand

Customer	Item	Quantity	EN#	Original Date Due	Reason for Delay	Acceptance Expected	DEC Order Number & Price	Engineer in Charge
DEC PDP-4 Prototype	Micro-Tape Control 550	1	2719	10/14/63	Awaiting final DEC acceptance.	3/1/64	NONE $	T. Stockebrand
DEC PDP-4 Prototype	Micro-Tape Transports 555	3	2720	10/14/63	Awaiting final DEC acceptance.	3/1/64	NONE $	T. Stockebrand
DEC (Production)	Micro-Tape Transport 555	1	2755	12/10/63	Complete contingent upon Micro-Tape 550 EN# 2756.	3/4/64	NONE $	T. Stockebrand
DEC (Production)	Micro-Tape Control 550	1	2756	12/10/63	Design noise problems.	3/4/64	NONE $	T. Stockebrand
DEC (Cust. Rel.)	Extra 4096 word Core Memory Module Type 12	1	2823	1/28/64	Being installed.	2/28/64	NONE $	J. Shields
DEC (Cust. Rel.)	Memory Extension Control Type 15	1	2824	1/28/64	Being installed.	2/28/64	NONE $	J. Shields
Elec. Systems Div. Air Force	Mag. Tape Control Unit for PDP-1 Type 52	1	2788	2/1/64	Rewiring Problems.	2/29/64	05864 $29,000.00	R. Leonard

Customer	Item	Quantity	EN#	Original Date Due	Reason for Delay	Acceptance Expected	DEC Order Number & Price	Engineer in Charge
Elec. Systems Div. Air Force	Mag. Tape Transports	2	2789	2/1/64	Contingent upon EN# 2788.	2/29/64	05864 $36,000.00	R. Leonard
Ft. Meade	Line Printer	1	2498	6/15/63	Original Printer did not work.	Undeter-minable	04289 $28,900.00	B. Savell
Ft. Meade	Micro-Tape Control 550	1	2604	8/15/63	Design noise problems still exist.	3/1/64	04289 $	T. Stockebrand
Ft. Meade	Micro-Tape Trans-port 555	1	2609	8/15/63	Completed delivery contingent on Micro-Tape 550 EN# 2604.	3/1/64	04289 $7,400.00	T. Stockebrand
Harvard Univ.	Printer Keyboard & Control Type 65	1	2786	12/30/63	Installed. DEC's ac-ceptance test in-complete.	2/14/64	05885 $2,520.00	D. Smith
MIT - Project MAC	Micro-Tape Control Type 550	1	2731	11/1/63	Man-Power shortage due to Dec. Pro-totype Checkout.	3/1/64	05483 $9,400.00	T. Stockebrand

Customer	Item	Quantity	EN#	Original Date Due	Reason for Delay	Acceptance Expected	DEC Order Number & Price	Engineer in Charge
MIT - Project MAC	Micro-Tape Transport 555	1	2732	11/1/63	Contingent on EN# 2731.	3/1/64	05483 $9,400.00	T. Stockebrand

INTEROFFICE MEMORANDUM

DATE February 25, 1964

SUBJECT Australian Quote, PDP-6 Prices

TO N. Mazzarese

FROM Gordon Bell

H. E. Anderson
J. Atwood
R. Savell
R. Lane

The discounts given above, in the cases of outside purchased items, resulted in selling at a loss. Our standard price lists do not differentiate the two types. The casualness with which we are now modifying prices "to get the business" is rather dangerous.

GB/ll

INTEROFFICE MEMORANDUM

DATE February 25, 1964

SUBJECT Overdue Computer Systems and Options.

TO K. Olsen ✓
H. Anderson
S. Olsen
G. O'Dea
W. Hindle
D. Best
D. Mills
M. Sandler
R. Beckman
R. Savell
B. Stephenson
E. Harwood
J. Shields
J. McKalip
J. Smith
S. Lambert
T. Stockebrand
J. Rutschman
P. Greene
J. Myers
F. Gould
J. Fadiman
F. Kalwell
A. Ross

FROM N. Mazzarese

The following is a list of overdue computer systems and options. The engineer responsible for the project's completion is indicated in each case.

Customer	Item	Quantity	EB##	Original Date Due	Reason for Delay	Acceptance Expected	DEC Order Number & Price	Engineer in Charge
AECL	Core Memory Module	1	2735	1/20/64	Customer requested delivery in March.		05493 $40,000.00	S. Mikulski
AECL	Core Memory Control	1	2736	1/20/64	Customer requested delivery in March.		05493 $12,000.00	S. Mikulski
AECL	Special Modification to PDP-1		2737	1/20/64	Customer requested delivery in March.		05493 $19,000.00	S. Mikulski
BB&N	PDP-1C-45	1	2649	12/1/63	Delivered and being installed.	3/1/64	05109 $153,000.00	G. Moore
BB&N	16K Word Core Module Model 2650	1	2650	12/1/63	Delivered and being installed.	3/1/64	05109 $60,000.00	G. Moore
BB&N	4K Word Expandable Memory Modules.	2	2651	12/1/63	Delivered and being installed.	3/1/64	05109 $60,000.00	G. Moore
BB&N	Memory Controls	3	2652	12/1/63	Delivered and being installed.	3/1/64	05109 $36,000.00	G. Moore

Customer	Item	Quantity	EN#	Original Date Due	Reason for Delay	Acceptance Expected	DEC Order Number & Price	Engineer in Charge
BB&N	32 Field Drum System	1	2653	12/1/63	Delivered and being installed.	3/1/64	05109 $73,400.00	G. Moore
BB&N	16 Line Teletype Interface Modules.	2	2654	12/1/63	Delivered and being installed.	3/1/64	05109 $73,400.00	G. Moore
BB&N	16 Channel Seq. Break System Model 120	1	2665	12/1/63	Delivered and being installed.	3/1/64	05109 $	G. Moore
BB&N	Modification to Memory Extension Control.	1	2667	12/1/63	Delivered and being installed.	3/1/64	05109 $	G. Moore
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Customer	Item	Quantity	EN#	Original Date Due	Reason for Delay	Acceptance Expected	DEC Order Number & Price	Engineer in Charge
MIT - Project MAC	Micro-Tape Transport 555	1	2732	11/1/63	Contingent on EN# 2731.	3/1/64	05483 $9,400.00	T. Stockebrand

Harlan Anderson

INTEROFFICE MEMORANDUM

DATE February 26, 1964

SUBJECT Future Memory Testing Business

TO Pat Greene

FROM Kenneth H. Olsen

cc: Works Committee
Jon Fadiman
Jim Hastings
Don White

After reading your memo on the situation of the memory testing business, it is my suggestion that we make the bold decision to immediately and completely get out of the memory test business. I think we should continue to offer the current driver modules which we now have as they are now, but that we do no future work on them. I then suggest that you trim your organization down to a very small number of truly competent and enthusiastic people and that you then go out after new markets and then build up the crew and keep only people who will keep the group technically competent to always have a secure position in the market place.

This is not an arbitrary order, but it is my suggestion as to what you might do. However, if you do want to stay in the memory business, I think that you're going to have to figure out how to catch up technically and where you're going to get the personnel necessary.

I think that we often tend to be so polite and thoughtful of individuals that we do not boldly take care of incompetence when it becomes obvious. The result is that we have lost our position in the memory test business. We may also have lost our computer business because we have not been able to deliver certain key items in workable form during the last year. I hope that we haven't lost the computer business completely but I'm quite sure that we have lost it in certain areas and we now have to look to new markets which have not had experience with our poor promises during the last year. It may seem cruel to remove an incompetent engineer from a project but, if one procrastinates, it is only postponing the day because the market place will eventually take the whole product line off the market and maybe even remove the company. This apparent thoughtfulness on our part is really only postponing the day of reckoning and probably makes it more severe when it shows up.

Ken Olsen

KHO:ech

INTEROFFICE MEMORANDUM

DATE February 26, 1964

SUBJECT Computer Construction

TO R. Mills FROM J. Myers

Construction Requisitions have been issued for the following PDP computers:

Type	Qty. built or under construction	Sold or committed to Customers	D.E.C. Machines
PDP-1	49	44	5
PDP-4	23	15(a)	8
PDP-5	23	16(b)	7

Location of D.E.C. Machines:

	PDP-1	EN	Inventory Status Jan.1964	Charges Jan. 1964	Currently Located
	20	2153	Capitalized	31,745.24	Customer Relations Bldg.#5 Top Floor
x	22	2239	W.I.P.	52,137.88	at Rutgers on loan 6/63
	31	2390		120.08	not built
	32	2396		28.11	not built
	34	2445	W.I.P.(d)	46,468.69	Sales, Cust. relations Bldg. 12, lst. floor
				130,500.00	

	PDP-4	EN	Inventory Status Jan.1964	Charges Jan. 1964	Currently Located
	0(c)	1191	Expensed	12,846.81	Programming-Dit Morse, Bldg. 5, bottom floor
	1(c)	1062	Expensed	124,464.60	Accounting-Bldg. 5,Top floor
	3	2286	Capitalized	26,493.93	Sales, Los Angeles Office
x	5	2385	W.I.P.	12,866.89	at Mass.General on loan
	6	2442	W.I.P.(d)	29,788.70	Customer relations for trade shows
	19	2669	W.I.P.(d)	23,896.64	Engineering, R. Boisvert Bldg. 5, bottom floor
	9(c)	1157	Capitalized	10,053.51	Engineering - Module tester Bldg. 5, Middle floor
	10(c)	8000-8060	Capitalized	18,170.19	Engineering, A. Hall Bldg. 5, Bottom floor
				258,581.27	

(a) Includes machine at Columbia University on consignment for which we have no purchase order as yet.
(b) Includes machine currently on U.S. Coast Guard Cutter Evergreen
(c) No construction requisition issued.(d) To be capitalized in Feb.1964 accounting period.

INTEROFFICE MEMORANDUM

DATE February 26, 1964

SUBJECT Computer Construction

TO R. Mills FROM J. Myers

PDP-5	EN	Inventory Status Jan.1964	Charges Jan.1964	Currently Located
3	2643	W.I.P. (d)	13,523.24	Sales, Munich Office
4	2723	W.I.P. (d)	12,775.96	Sales, New Jersey Office
6	2746	W.I.P. (d)	12,761.35	Sales, Physics - to be used for shows
12	2812	W.I.P.	10,361.68	Engineering (per DeCastro in Bi-weekly 1/31)
13	2863	W.I.P.	9,805.43	Ottawa Office (for possible sale to customer)
15	2864	W.I.P. (d)	10,344.43	Sales, Los Angeles Office
16	2881	W.I.P.	11,426.37	Sales, Jack Ridgeway - Bldg. 12, 2nd floor

(d) To be capitalized in Feb. 1964 accounting period.

INTEROFFICE MEMORANDUM

DATE February 26, 1964

SUBJECT PDP-5 Floating Point

TO Ken Olsen
H. Anderson
Stan Olsen
ALL SALES PERSONNEL

FROM Jack Ridgeway

This memo is to announce the availability of a floating point system on the PDP-5.

This system provides a capability of floating point arithmetic without the addition of costly hardware and obviously should be emphasized to our customers.

The following information generally describes the system.

Programs are written using floating point symbolic commands such as FMPY, FDVD, FADD, and assembled on the 4K PAL assembler (PAL's symbol table has been expanded to include floating point symbols). When programming in floating point the programmer writes the floating point commands in the sequence that they will occur preceeded by a jms to floating point. The floating point system interpretes the floating point commands and executes the necessary arithmetic or logic operation on the specified operands. When a FEXT (floating exit) command is interpreted the system returns control to the operational program. There is no limit to the number of times the floating point mode can be entered so the programmer can mix floating and fixed arithmetic.

The system uses 3 memory registers per data word, 1 word characteristic (exponent) and 2 word mantissa (normalized data). Operations are performed on these 3 register data words and a 3 register floating accumulator. Since two memory registers are used for each data word up to 7 1/2 place accuracy is maintained.

The advantages of floating point arithmetic are accuracy and relative ease of programming (the programmer doesn't have to worry about scaling, binary points, leading zero's, overflow, etc.). The restrictions of floating point software as opposed to hardware are limited memory (the package takes about 1K and each data word requires 3 registers) and speed (multiply time is about 10 mls.).

The floating point package is operational so talk about it. The first user was the U.S. Coast Guard. They programmed an extensive data reduction program in floating point. Incidentally, their programmer had no previous machine language programming experience and he took our PDP-5 programming course and wrote his program in about two months. Any extra help we gave him was because the system hadn't been completely checked out (floating point PAL, and floating point).

Sample routine to demonstrate the use of PDP-5 floating point.

Problem: $C=A \times B^2$ where A and B are inputs and C is to be printed.

```
start, jms  i  FINK      /read B into floating ACC
       jms  i  FPNT      /transfer control to floating point
       FPUT      B       /store floating ACC in B
       FEXT              /exit from floating point
       jms  i  FINK      /read A into floating ACC
       jms  i  FPNT
       FMPY      B
       FMPY      B
       FEXT
       jms  i  FOUT      /print floating ACC
            .
            .
            .
```

2/27/64

Evaluation of Solid State Microtape

I Reasons for Consideration

A. Provide greater flexibility
B. Increase reliability
C. Improved performance
D. Stay abreast of market trends

II Justification

A. Development cost
B. Development time
C. Price difference

III Introductory Plan

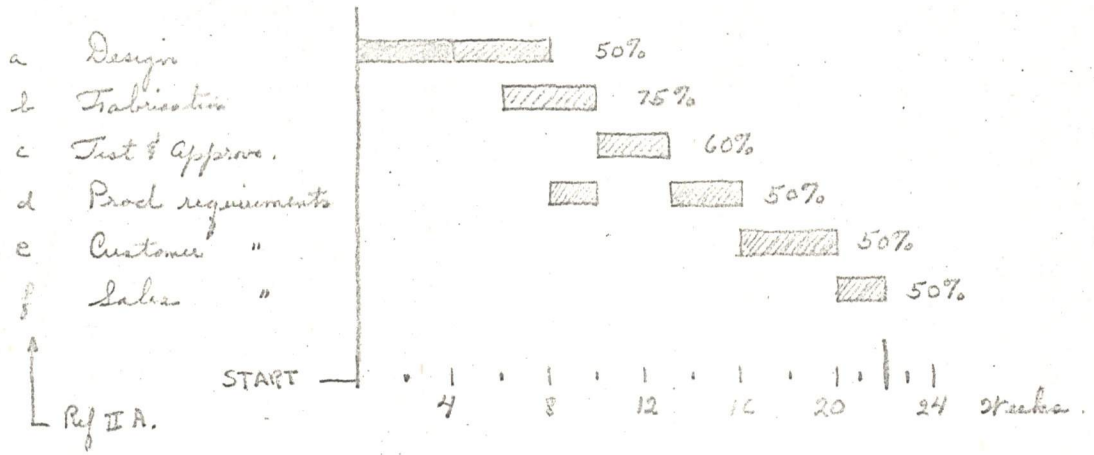
A. Data Break Control

Note: Effort, [illegible] include in this estimate are not with[illegible] charges to the project.

21 Feb 1964
D.S.V.

II B Development time

Using the estimated times in II A. and assuming 50 - 60% of actual work day available for work on project, the milestones are as follows.



II C. Price difference

The major difference in cost will be the cost of the necessary logic modules. From the preliminary design and using catalog prices the additional cost will be between $160 and $2200. However further design may reduce this figure.

III Data Break control

It is becoming increasingly obvious that a Data Break control will be necessary in the near future. Provided the D.B. control is planned the S.S. drive is the natural development for it. If no such control is planned, the S.S. is hard to justify with regard to cost. "Customer is more likely to pay more for D.B. thus additional cost can be justified."

I Reasons for Consideration

A Provide greater flexibility

The S.S. drive is to be designed to allow easy conversion for use with two controls.

B. Increase reliability

Relays are basically unreliable and have already proven themselves to be so. Eliminating the relays will therefor eliminate the problem.

C. Improved performance

The shortcomings of the relay design will be reduced, especially in the area of manual control and motor control. More communication with the control and computer will be established. e.g.: drive selected or drive in manual control, etc.

D. Stay abreast of market trends

Every one expects solid state!

II. Development cost

	Engineer	Technician	Drafting	
1. Logic design[a]	10	0	0	
2. Circuit design[a]	10	0	0	
3. Prototype fabrication[b]	2	15	0	
4. Test[c]	3	3	0	
5. Redesign[c]	4	0	0	
6. Re-test & approval[c]	2	2	0	
7. Drafting[d]	1	3	30	
8. Wiring lists[d]	1	2	0	
9 Servid & Operator's Manual[e]	7	0	0	
10 Maintenance manual[e]	3	0	0	
11. Check out procedure[d]	5	0	0	
12. Incoming inspection procedure[d]	5	0	0	
13 Sales literature[f]	5	0	0	
	58	25	30	man days

Engineer
58 days × 8 hr/day × $5.50 = $2552.00

Technician
25 days × 8 hr/day × $3/hr = $600.00

Drafting
30 days × 8 hr/day × $2.50 = $600.00

$3752.00
80% OH 3002.00
$6754.00
G&A 15% 1013.00
$7,767.00

Note: hourly wages, Overhead, and G&A. have not been verified and therefore may not be indicative of actual cost.

February 27, 1964

NOTES FOR ALLAN KOTOK TO DELIVER TO RON SMART IN AUSTRALIA

1. PDP-5 is in one bay and additional equipment is in another, making up a two bay system. These can easily be split apart and re-assembled. Floor loading of 150 pounds per square foot is completely adequate for the PDP-5, indeed their floor loading in our factory is not even that.

2. We'll have to check further about 7 1/2% duty on rented equipment. It looks as if it will have to be paid.

3. I feel if we get some kind of letter of intent from Professor Billings we should certainly fly someone here to see the computer. As far as having someone like an independent witness report on the PDP 6, possibly someone from M. I. T. could do this; maybe Andy has some ideas here. John McCarthy of Stanford.

4. In answer to your letter of February 18, for Les Hill of New South Wales, the $95,000 does include the Drum and Processor. The cost of an additional drum on the same Processor would be approximately $65,000. In answer to your question about the PDP-5, the ASR 33 Teleprinter comes only with an 8-inch carriage and it is not possible to use a 12 1/2-inch carriage. If this larger size is required we would put on a Soraband printer, which would not be very difficult to do. I believe we have a price for the Soraband printer on the PDP 1 and the price would be the same for the PDP-5. Thus, we could definitely offer such a machine with the Soraband printer.

5. In answer to your questions about the CRT we do use a P-7 phosphor, which is a medium long persistence phosphor. Actually it is a short persistence blue flash with a medium-long yellow after-flash. Other phosphors could be ordered if required at no additional cost. The characteristics can be found in any good chemistry handbook. The Light Pen Type 370 is our latest version of Light Pen and I think you have the information on this. The Display that they would use would be the Type 340 Display,

which answers point a and point c of your letter. The price is $28,600. We have a new Character Generator, which Allan Kotok should know something about which generates characters every 30 microseconds.

6. Allan Kotok will have to answer questions on programming.

7. In answer to your letter of February 17, I think some of your questions have already been answered. The number of PDP-5's sold and in the field is 7. There are 16 operating systems (PDP-5's) including machines which DEC owns. There are 8 outstanding firm purchase orders, and there are 15 additional purchase orders with full cancellation privileges. For part 2, ~~it seems to me that you~~ we are definitely are interested in ~~hiring~~ renting this machine to Aeronautical Research Laboratory. Paragraph 3, Al Kotok will bring over some literature. Concerning your letter of February 24, the answer to your ~~your~~ question about the power mains, we have already taken some data on this and I will get this data to you. In general the output voltage of the transformers varies by the same percentage as the frequency. Thus the change in frequency of one cycle per second will product a two per cent change in output voltage from the transformer, that is, .3 volts on a 15 volt supply. Since our systems will run with a 15 volt supply which is anywhere between 12 and 18 volts, this is not a problem. Thus a change of 5% or 2 1/2 cycles on a 50-cycle line would still leave plenty of margin for safe operation.

8. We will definitely ~~want~~ have to hire someone in Melbourne. When I come to Australia toward the end of March I would like to talk with any candidates whom you might know of. Robin Zvith has no good ideas after all.

Proposed Discount Schedule for Australia:

Modules - 22%

Computers - 22% if no discount

Systems - 22%

Computers - Discount to be deducted from subsidiary discount to a maximum of 12%. This will leave 10% to the subsidiary for warranty, maintenance, operating expenses, and some programming support.

NOTE:

This is only a proposal worked out this afternoon by Dick Mills and myself.

Jonathan Fadiman

JF:nlz

H. ANDERSON

INTEROFFICE MEMORANDUM

DATE February 27, 1964

SUBJECT Interface to TWX lines.

TO Ken Olsen

FROM Don Smith

Mr. Pigott of ATT telephoned in reference to Digital's letter requesting TWX interface.

The Vice-Presidents and Board of Directors of ATT have reached a decision in this area in the last few weeks.

Their decision is as follows:

1. No more serial relay interfaces experimental or otherwise.

2. No more parallel interfaces.

3. All interfaces to Business Machines (TWX') will be accomplished through the model 103A Data Set.

4. All business machines will be on the TWX' network. Teletypes may be switched from the standard TWX service lines to talk with Business Machines or other teletypes on the TWX' line. Thus a customer with one teletype may switch between TWX or TWX' lines. The monthly rental of the switch is $2.00.

In view of the above, I suggest that my letter to ATT should not be sent.

CC: H. Anderson
J. Hastings
A. Kotok

Mr H Anderson

dec INTEROFFICE MEMORANDUM

DATE February 28, 1964

SUBJECT New Techniques for PDP6-1

TO K H Olsen FROM R Doane

The main arguments relating to the type of mounting panel to be used in the PDP-1 arithmetic unit are:

Heat

With no extra fans and with rear doors open, the Prototype arithmetic modules showed the symptoms of heat poisoning. There are several available remedies:

a. Improve air flow through mounting panel by installing vertical wiring outside of horizontal wiring.

b. Use silicon semiconductors, which are greatly superior in their resistance to high temperatures.

c. Reduce the power dissipated by the circuits.

d. Keep rear doors closed whenever possible during checkout.

e. Close air leaks before starting checkout.

f. Use modules without handles, to increase convection cooling with rear doors open.

All of these but "f" are already planned using present methods, and we can even cut away the handles if we want to go whole hog. Switching to the new mounting methods would block all air flow through the wiring side, so that the arithmetic modules would pass their warmed air on to other modules, some of which will probably contain germanium semiconductors.

Rear Bus

Three of our computers use rear bus systems, and none of them has ever been quite satisfactory, although none have proved so bad as to be unworkable. If we could make full use of all the pins in the proposed new system we could eliminate the rear busses from PDP 6. Unfortunately, there are serious questions about whether we could really utilize the extra pins:

a. Making a usable board layout is already difficult and very time-consuming, where the signal flow through the board is largely in a logical, straight-line path from rear to front. If all signal paths make a U-turn, there will be many more lines to fit within the 10" width available (and the board length will probably have to be greater to hold the increased wiring).

b. The extra lead-length that would be involved in bringing pulses in from the front would tend to increase crosstalk, and the additional capacitance to ground tends to resonate with pulse-transformer inductance at such a low frequency that 10 Mc operation may be impossible or at least difficult to achieve, due to pulse width increases.

Perhaps with a determined effort we could overcome these problems, but it will take time and the outcome does not seem predictable.

Schedule

The use of new techniques of wiring, new wire lists, new hardware, new module manufacturing techniques, and new working skills in a machine that has a tight schedule is ill-advised. At a time when we are trying to recapture a reputation for on-time delivery, the only possible justification would be that no other way will work. It is very clear, on the other hand, that no such justification can be claimed in the present instance.

After having looked into the question thoroughly, therefore, I am proceeding to steam ahead without any intention of spending further time or effort on integrating new mounting panel techniques into PDP 6-1.

RD:ASJ
CC
H Anderson
R L Best
G Bell
E Harwood
L Prentice
R Wilson

digital MEMO

DATE 2/29/64

TO A. ANDERSON FROM JIM BURCLEY

ANDY—

IT SEEMS A LONG TIME SINCE I'VE EVEN SEEN YOU — MUCH LESS TALKED SHOP. THE ATTACHED COVERS SOM POINTS I SHOULD HAVE BEEN DISCUSSING WITH YOU, KEN AND THE REST OF MGT. COMMENTS SOLICITED.

DEC is growing at a rapid rate and, understandably, experiencing some growing pains. For the purposes of minimizing these pains and that of solving some of my own problems, I feel it my responsibility to record my ideas and attitudes, even though they may, at times, differ from those of management. Naturally, this report will be confined to management.

Because of the importance of the customer to DEC and its ultimate realization of profit, I shall no doubt slant this report to the advantage of the salemans' contact with the customer and the picture presented to the customer by the company in aggregate. I admit to having a minimum of direct interest in the problems of advertising, production, quality control, etc., other than how aspects of their performance may influence customers' purchasing our equipment at a profitable price. The importance of these other functions are accepted and unchallengable but their problems need be aired by people most familiar with these departments. I shall confine my report to the problems as they affect me.

Since I am blessed with such a vast territory possibly some problems appear to me magnified as compared to how they would be viewed by a multiple-man office. Nevertheless, this gives me an opportunity to possibly look a bit closer at these problems since I share them with no one. I also have some seven years selling experience in the electronics field and have seen the good and bad sides of some 25 manufacturers, and experience which I feel arms me with reasonable judgement to make recommendations.

By not having a very clear line of responsibility, our company forces each employee to go through a mental shakedown on virtually every task he becomes involved with. He must run through a mental storage of memos which he has received over his tenure in office to recall who should logically get a memo on some particular event that took place in his responsible area. It seems that virtually any employee at the plant who desires to set up his own "empire" can command that he receive memos on any and all field happenings that involve his area of activity. On the surface this appears to solve the old communications problem. However, if the system performed as each person expected it to, individually, then doubtlessly the field salesman would be strictly a paper generator. The information explosion from the field would make a beautiful picture at the plant of nice reports, memos, etc., coming in at some impressive rate. Unfortunately, the field salesman would become less and less involved with the customer and sales would suffer. One viewpoint, though extreme, is that a salesman can either sell his products to customers or sell himself to his company. There is a lot of truth in this.

Presently we have quite a few methods for informing plant personnel of customer action and reaction. These are listed below.

Sales Lead Report
Call Report
Sales News Letter Report
Bi-Weekly Report
Daily Job Ticket Report
Office Diary (Peculiar only to DCO)
Expense Report
Daytimer Report
Special-Interest-Group Report
Letterhead Letters
Interoffice Memos
Scratch Pad Memos
Snap-out Form Memos
Duplicated Memos
TWX Memos
Phone Calls
Miscellaneous

The above are those communications that field salesmen are expected to originate for one reason or another. Many are established, accepted channels of communications and of great importance to DEC, some are more recent additions of varying degrees of importance and others are established for keeping the salesman himself informed. A growing list of reports is that Special-Interest-Group Report category. Into this area falls those people with special responsibilities at the plant such as, Jones for nuclear, Lane PDP-6, Gerald Moore for medical, etc., This group requests and deserves to hear about customers' interests and activities as they pertain to their area. In addition to this consider the requests we get for memos and reports on new module applications from advertising, the logic diagrams and designs we generate for customers, the reports and suggestions we often feel compelled to write (such as this one) and you'll see that we are becoming less and less field engineers and more and more desk engineers.

As important as it is to generate all of the aforementioned reports, papers, etc., I do not subscribe to the theory that we are necessarily committed to all of them or that our system cannot be improved. Frankly, too much is expected of the people in the field and there is not a balanced workload in the sales department from man to man. (This probably is a presumptuous assumption on my part but I think it is a valid one.) Which brings me to my own area.

My specific problem can be defined simply that I haven't enough people to do the work demanded by a territory this size. This also, I'm sure, is no news to anyone watching inquiry activity. At present I have some 45 specific interested prospects waiting to be called on. Interest runs the full spectrum from logic kit and module interest to PDP-6 interest. The dollar volume of business this group represents would be in the range of four million dollars if we could turn them all into customers. Understand that this list does not include any of the "qualified" sales leads that I have received from advertising for the past six months. (For at least six months now I have not bothered to even look at the leads I receive from advertising as, in general, I have had to make the gross assumption that only those people who call and ask to be called on should be called on. A priority of some type had to be established and this was the most obvious one. It seems a bit tragic to me that our excellent advertising department should work so unceasingly to generate interest and see this interest go unattended by lack of field followup.)

One of my primary concerns is finding a way to turn these prospects into customers. Quite obviously it is more than one man can hope to handle along with all the other chores of running an office. Although I have been looking for another man for the D.C. Office for well over a year now, the paltry pickings of the D.C. area haven't turned up much. Even my advertisements haven't turned up anything of interest which we can afford, nor have the agencies been able to help much. In the meantime, I should like to borrow a module man from the plant such as, Mort Ruderman or Jack O'Connell for two or three weeks to attempt to help these module prospects decide to buy from us. Time is running short on us since the IEEE Show is coming up and our problems will be even more compounded with the leads and interest we generate there. If Jack, for instance, could concentrate on module prospects in the area, which are overflowing, then possibly we could make some inroads in a month or less. As usual with modules it's an educational problem and I need someone with good sound module experience in working with customers since there isn't time to train anyone for this job. In the meantime, I will continue interviewing other people between my own calls. I don't have to have new modules to increase module sales - only to sell the ones we now have.

Another assist for people in the field would be to have plant sales people visit the territory offices and help reduce many leads to a few sales periodically. No matter how urgent the work these people are doing in the office it is my contention that an hour spent before the customer is far more valuable to the company than most any other hour he can contribute to the company. This needn't be a formal exaggerated program, but one that would adapt itself to particular needs

of a sales office and the particular capabilities of the plant sales department.

Another area in which we can show considerable improvement and help maximize selling time is the collection and dispersement of information from the plant. Typically, most groups at the plant are reasonably conscientious on issuing information about their products and activities. Nevertheless, we get these reports in every conceivable form from formal reports, to notes in Bi-Weekly, to Sales Newsletter, to tech bulletins, to price changes in twx's, to price lists, to phone calls, to every other conceivable avenue one can imagine. This makes up a rather ponderous potpourri of bits and pieces of paper and information that "should" be compiled to make up the story about some product area. Rarely is it ever reasonably compiled, certainly not by myself. I think it only reasonable that the responsible person, project engineers or project managers, generate periodically, reports that list the products they have to sell, or, the programs that they have available, or, the present policy that they have on <u>not</u> selling items etc. In other words, they should occasionally <u>reinform</u> the field sales people and anyone else involved in selling. Again, this need not be a formal thing, but product or area managers should realize that the better they describe and "sell" their products and services to their own sales people the more successful their whole sales program will be. (This applies also to field sales people for, only by reporting and "selling" their territory to people at the plant can they hope to get enough enthusiasm out of plant people to really help in future sales activities.)

I should like to at least cut in half the existing number of reports we now make. There is an excessive amount of duplication in these reports and completely unnecessary. I think much of it can be standardized on one given form or format which should be satisfactory to all of the many people now receiving their own special reports. We needn't fear standardization of reports of this type. The company is run by the managers, essentially, and if they don't like the "standard" form then they can change it to another type of form or go back to the old system, but lets make an effort! My report on streamlining reports and communications will follow at a later date. Suffice it to say that it will be a grand improvement over the existing system and one which will take much less time on the salesmans' part and possibly be even more informative to those people interested at the plant.

Jim Burley

	NAME	SUBJECT
1.	NATIONAL ARCHIVES, GSA	PDP-5
2.	UNIVERSITY OF TEXAS	MODULES
3.	JOHNS HOPKINS HOSPITAL	PDP-5 & SPECIAL INTERFACE
4.	NAVAL RESEARCH LAB	PDP-6 INTEREST
5.	PHILCO CORPORATION	PDP-6 INTEREST
6.	NASA-HUNTSVILLE	PDP-5 & MODULES
7.	THIOKOL	PDP-5 & INTERFACE
8.	NASA-GODDARD	PDP-5 & MODULES
9.	NASA-MARSHALL SPACE FLT CTR	MODULES
10.	UNIVERSITY OF ALABAMA MED SCH	MODULES
11.	NATIONAL INSTITUTE OF HEALTH	PDP-4 & MODULES
12.	NATIONAL BUREAU OF STANDARDS	LINC COMPUTER
13.	NAVAL WEAPONS LAB	PDP-1 & OPTIONS
14.	NAVAL ORDNANCE LAB	PDP-5 & MODULES
15.	NATIONAL SECURITY AGENCY	PDP-4 & 340

	NAME	SUBJECT
16.	BUDD ELECTRONICS	MODULES
17.	SUN OIL COMPANY	PDP-1
18.	Du PONT - TENNESSEE	PDP-5
19.	Du PONT - DELAWARE	PDP-5 & MODULES
20.	AFTEC	PDP-6 & OPTIONS FOR PDP-1
21.	FARRINGTON ELECTRONICS	PDP-5 & MODULES
22.	DAVID TAYLOR MODEL BASIN	A-to-D CONVERTERS
23.	OAK RIDGE	PDP-4 & PDP-5
24.	FAA	MODULES
25.	PHILCO CORP.	MODULE TESTER
26.	WESTINGHOUSE	MODULES
27.	NASA-GODDARD	MODULES
28.	HOWARD RESEARCH CORPORATION	PDP-6
29.	CONTINENTAL OIL COMPANY	PDP-5 & INTERFACE
30.	GENERAL ELECTRIC - VALLEY FORGE	A-to-D CONVERTER
31.	BENDIX - BALTIMORE	A-to-D CONVERTER

	NAME	SUBJECT
31.	BOWMAN GRAY SCHOOL OF MEDICINE	INTERFACE FOR LINC COMPUTER
32.	WESTERN ELECTRIC	MODULES, VHF
33.	U.S. ARMY, GEORGIA	MODULES
34.	UNIVERSITY OF MARYLAND	PDP-5, PDP-4, PDP-1, MODULES
35.	WASHINGTON ENGINEERING SERVICES	MODULES
36.	GLENN ENGINEERING	PDP-5
37.	DEFENSE INTELLIGENCE AGENCY	PDP-5 & OPTIONS
38.	AID	PDP-5 & OPTIONS
39.	U.S. COAST GUARD, ALEXANDRIA	MODULES
40.	NOL	5 MEGACYCLE
41.	Univ. of Maryland	PDP-4
42.	G.S.A. ST. LOUIS	PDP-5
43	COMRES	PDP-1 or -4
44.	KAPPA SERVICES	PDP-1 or -4
45.	LITTON IND.	PDP-4
46.		

Ken Wakeen
February, 1964

Market Survey for Film Reading Devices

Purpose:

The purpose of this survey is threefold.

1. Investigate the potential market areas that may exist for film readers.
2. If markets do exist, devise means by which DEC can take full advantage of these markets.
3. To inform our Sales personnel of potential sales resulting from inquiries made during this survey.

Market areas can be divided into several broad categories.

Nuclear physics, oceanographic studies, biomedical applications: other miscellaneous items include "A" scope radar presentation, filter design studies, antenna radiation patterns, map making, vocal cord studies, ionospheric data and atomic blast studies.

1. Nuclear Physics:

Bubble chamber studies are being performed in most cases by one of two methods. System number one is the Hough Powell device, which is a photo-optical system by which the flying spot scanning is accomplished by means of a rotating disc. It also makes use of diffraction grating and two photo-multiplier tubes. System number two is the "PEPR"system. PEPR is the name of an electro-optical system under construction at MIT, which is designed to assist in the classification of data obtained by photographs of sub atomic particles paths in a Bubble Chamber. This system employs flying spot scanning techniques using an optical system along with a display unit. Both these systems are designed for high speed and high accuracy and are quite expensive.

The following people are working in this field:

Brookhaven National Laboratory -- This system employs the Hough Powell device and is not adaptable to any new means of scanning that we may devise. There are, however, continuities for logic which can be supplied by DEC.

At MIT, the Pless-Rosenson are working on the PEPR device. This system presently employs the PDP-1, a $100,000 PEPR controller built by DEC, and a display unit. When completed 1 - 500,000 events per year can be recorded and evaluated with one operator. Present indications are that this system will be complete in approximately six months.

Rutgers University is contemplating a PEPR system and Dr. Plano, who is in charge of the project, has indicated that funding has been approved for a PDP-1 and display system. He intends to duplicate the Pless-Rosenson system, if it works; so we are in a position to pick up another $100,000 for the controller. Dr. Plano also indicated that work was being done on Bubble Chamber studies at Columbia, Princeton, Berkeley, Wisconsin, Cornell, and CERN in Europe.

At Yale University, Dr. Taft has also shown interest in PEPR. He intends to get in touch with DEC early this spring or summer. He is interested in duplicating, to great extent, the Pless-Rosenson system and will not consider any alternative approach.

Dr. James Cronin at Princeton University is building the Deutsch system, which is used for spark chamber studies. Professor O'Neill is in charge of the construction of the system. They are planning to use a home-made scanning

technique for angular measurement employing a Digital shaft encoder, and a variable staging. Typical experiments can involve up to 250,000 pictures. Dr. Cronin indicated that Leon Letterman at Columbia and Richard Wilson at Harvard are also using a similar approach. Princeton owns a PDP-1 and a display.

Other potential PEPR customers include LRL in Berkeley, University of Wisconsin, Cornell University, University of Michigan, Harvard and CERN which is the European equivalent of PEPR.

Spark Chamber Studies:

The requirements for accuracy in spark chamber studies are not as rigid as they are for PEPR device. Dr. Deutsch at MIT along with Wadsworth and Kasnitz are doing most of the spark chamber work going on at MIT. In addition to these people, Drs. Benoit and Cronin at Princeton, Len Letterman at Columbia, Richard Wilson at Harvard and Bert Rictar at Stanford are involved in spark chamber work.

2. Oceanographic Studies

The Coast Guard oceanographic survey located in Washington, D.C. is headed up by Lt. Commander Richard Morse. Commander Morse has been looking for a method by which information gathered on the Richardson type current meters and the Geodyne current meters can be reduced and fed into computers for analysis. The Coast Guard is looking for a record of time versus current information and velocity of underwater currents. Commander Morse is aware of the Information International system and his comment is that it is too expensive for the job to be done. Some of the problems encountered in reading the Richardson and Geodyne current meters are a result of unaccountable random motions which cause erroneous recording of data. As far as Lt. Commander Richard Morse is concerned, the Richardson rotor type current meter is not an improved system. Therefore, it would be unwise for DEC to become involved in such a system for this application.

Dr. William Richardson of the University of Miami Marine Observatory is working to improve his current metering device. Further work is done by Phil Taylor at the University of Washington and Dr. Ratray, Jr. This system is a take-off on the Richardson system using a strobe method of data entry rather than a continuous streak. Dr. Foffonoff is instrumenting a buoystring for testing these devices. They are presently building their own read out system to read directly into mag. tape. They have thus far avoided the use of computer but have recently been considering the PDP-5.

Also widely being used at the present time and potentially where our greatest market area lies, Bathytherm (BT) slides. These are depth-temperature recordings made by scribing a curve onto a glass plate which has been coated with gold. There are presently many groups taking to this type of data and are relying on the Navy Oceanographic Data Center in Washington, D.C. headed up by Bob Ochinero. For data reduction Ochinero is presently processing two to four thousand slides per month and receiving them at the rate of 8,000 per month. Needless to say the back-log is getting to be ridiculous. The Ochinero group is presently reducing data for Phil Taylor at the University of Washington, Bill Richardson at the University of Miami, Betty Schroder at Woods Hole, Commander Morse of the Navy.

The process being presently used is the photo-projection BT slides onto a 3 x 5 ozalid. The data is being reduced by hand by a battery of 10 girls in which the X and Y coordinates as referenced to a curvilinear scale are recorded on the back of the 3 x 5 ozalid. The Ozalid must then be used as a secondary data source for producing punched cards or other media of data entry into computers.

The NODC is run by an advisory board of eight agencies that contribute to its budget. Quarterly meetings are held to decide policy and provide financing. At the September 1st meeting it was decided that NODC would not consider any unsolicited proposals since they had looked at five approaches all of which were quoted on an R & D control basis. They have $100,000 available to sink into a system for data reduction of the BT slides. Ochinero

feels that since the data on the BT slides is so poor as evidenced by scratches, finger prints, etc. on the slide itself, that the operator must be kept in as a necessary part of the operation. Automatic scanning techniques seem impractical here because of the tremendous amount of programming that would be required to filter out the noise. Ochinero further stated that he liked the idea of using a light pen and a display unit or modifying and entering data.

Charles Sauer of the Canadian Oceanographic Institute in Ottawa, Canada indicated that he would like to end up with a system similar to what Bob Ochinero settles on. Similarly he is convinced that the type of data is such that the operator cannot be removed from the system. Sauer visited DEC last month and was very much impressed with the company. He is contemplating a PDP-4 with a Type 30 Display. He indicated that the one thing that is swaying him away from the SDS-900 is the Type 30 Display. He further indicated that other companies are beginning to get interested in the display area and that perhaps we should be considering some means of data entry into the display. Sauer is presently processing 1,000 per month of the BT slides using pretty much the same procedure as B. Schroder at Woods Hole and Bob Ochinero at Washington, D.C. They are all interested in gathering data to 900 ft. levels in 10 ft. increments implying that they want a 1% system.

On the West Coast Scripts Institute of Oceanography out of the University of California in Lajolla, California are processing their own BT slides. The main problem

at Scripts is digitizing of the information on slides. They anticipate a volume of 10,000 per year and presently have four to five hundred thousand negatives in back-log. They have developed a Frankenstein type system which employs a pantograph with a curvilinear radius. They hope to go directly into mag. tape with this system. The electronics for the mag. tape and mag. tape control have not been worked out yet and Margaret Robinson can provide the names of the people involved in the electronic portion of this system.

In addition to the above data gathering and data reduction centers there are others which should be considered as potential market areas and are as follows:

Marine Observatory in Kobe, Japan. Mr. Hidaka is responsible for this project. At the University of Cape Town in South Africa, Carl Schütte is reducing slides and may be interested in a PDP-5. At the Institute of Fürmeerskunde in Hamburg, Germany is also producing BT slides. France also has a program of BT slide data acquisition and reduction.

3. Bio-Medical Application

Dr. J. Macey from the Albert Einstein College of Medicine has expressed an interest in reading X-ray film to be used for early cancer detection. He is interested in 3-5 bit gray scale information. There is no possibility of our doing anything here.

The National Institute of Health is sponsoring a program studying the effects of anti-biotics along with the bacteria in a culture on a glass plate and evaluating the effects on each anti-biotic on the bacteria by

measuring the ring of protection around the anti-biotic. This measurement is presently being made by technicians and doctors using calipers. We should be able to help out here with a direct projection scheme on the Type 30 Display and light pen data entry. Jim Burley and Ken Wakeen will pursue this one further.

At presbyterian Medical Center in San Francisco, California, Dr. Olive Ericson is studying the effects of drugs on protein balance. A density measure is required for data reduction here and it is unlikely that we can help since it would involve a flying spot scanning system.

Argonne National Laboratories is producing a flying spot scanning system for use in bacterialogical studies. They have requested from DEC information on the Type 30, 31 and 340 Displays.

4. Miscellaneous Applications

At LRL in Berkeley, California an attempt is being made to evaluate photographs taken of the EG&G type traveling wave oscilloscopes. The information recorded has a dynamic range of 40-1. They record blast information from atomic explosions. This program has not gone well at all for LRL, the main problem being the lack of film contrast in certain areas placing a tremendous strain on any type flying spot scanning system. Present methods of data reduction employs projection with the image traced out on India ink rephotographed. Then an attempt is being made to read this in with flying spot scanner into computing system. LRL is presently looking for A-D and D-A systems and there is a possibility we can do something here where direct projection and light pen technique.

Phil Lieberman at CRL in Bedford has been involved with the checking of high speed movies of vocal cords. He has a mechanical system for data reduction and we may possibly be able to interest him in some faster means of data entry into computer.

Ionospheric Data Reduction

Presently there are four centers producing ionospheric data, the Defense Communications Agency in conjunction with Granger Associates in Palo Alto, California, the Defense Research Board of Canada, the World Data Center in Boulder, Colorado, and NSA at Wallups Island, Virginia. The problems in all four centers are quite common. The information recorded on 35 mm film and is virtually surounded with noise. They are presently using photographic projection and are manually recording X, Y coordinates from which punch cards are made up and converted to mag. tape, and then fed into a computer for analysis. The Defense Research Board of Canada has expressed a strong interest in using a PDP-5 Display and projecting the data on the face of the CRT using a light pen. They will then enter the tape into core memory for the reduction and evaluation. They insist that Oscars & Boscars are too slow and costly. DRTE, a division of DRB, in Canada has a different form of ionospheric data on 35 mm film. It shows up as a noisy trace with three peaks. They are interested in getting the X-Y coordinates of the peaks and performing on-line calculations before storage. Another natural for PDP-5, Type 30 and light pen.

Mr. Zipes of ITT in Nutley, New Jersey had inquired about display units for the purposes of reducing polar

coordinate and data of antenna radiation patterns. He has developed a system which has no dependency on computers or displays using a photo-form technique to reduce the polar to cartesian coordiantes. Nothing for us here.

At Lincoln Laboratories, Joe Salerno who has been involved in the A scope data presentation has informed us that Holliman Air Force Base, who has purchased the Information International film reader will be the main or personal center for data reduction for all A scope film produced in the United States. We can find no application here.

At Cambridge Research Laboratories in Bedford, Captain Balzer of the Air Force has purchased a color and a black and white Type 31 Display for evaluation of data resulting from analysis of filter networks. He is using the displays for presentation only and can see no immediate need for re-entry of data into the computers.

At Suffield Experimentation Station in Suffield, Alberta, Canada, Mr. Jay Besso is presently engaged in research involving explosives. His data is being recorded on film and there is some need here for data reduction. Denny Doyle is going to investigate this further and see if we can provide a Type 30 Display with light pen for data entry.

Also in Canada, the National Research Council in Ottawa, Mr. E. E. Funke has an SDS-920 and is presently taking 360° photographs of the night sky. They are looking for Northern Lights and meteor tracks. This is a natural for direct entry via projection and light pen. They are presently using a scaler device but find it too slow. Denny is following up on this one.

INTEROFFICE MEMORANDUM

DATE 2 January 1964

SUBJECT PDP-4 Course Convening 6 January 1964

TO K. Olsen
H. Anderson
S. Olsen
N. Mazzarese
R. Beckman
R. Wilson
All Sales Personnel
District Offices

FROM R. Bernier

The following individuals are scheduled to attend a two week course on the PDP-4 convening 6 January 1964:

NAME	COMPANY
L. Knezz	Nabisco Company, Chicago
Mr. von Loeseche	Foxboro Company, Natick
D. Zereski	Digital Equipment Corporation

****

H. Anderson

dec INTEROFFICE MEMORANDUM

DATE January 2, 1964

SUBJECT

TO Computer Guidance Committee FROM J. Smith

Tuesday afternoon I met with Jim Hastings and Don Vonada, who were representing the Computer Guidance Committee. The subject discussed was the possibility of manufacturing (10) 555 tape drivers per month starting in February. Present activity in the Micro Tape program and the steps necessary to manufacture (10) drivers per month are outlined below.

Mechanical drawings for the tape driver chassis were signed off by Engineering and released to Production on December 2, 1963. A lot of ten chassis was sub-contracted to speed up mechanical fabrication. Our in-house shop could not meet our required delivery. Mechanical fabrication was completed and the chassis delivered December 24, 1963. Assembly and wiring of the lot of (10) drivers started December 27th. I expect this lot to be completed and off-line tested by the first week in February. In addition, four drivers are being returned from Kie Corporation Friday. These drivers will be modified and made available to Don Vonada for testing the end of next week. These drivers when tested can be used on our in-house PDP-4.

There are enough motors in stock to complete the current lot of (10) drivers undergoing construction. Heads have been on order for some time, and promised delivery is the last week in January. These heads will take care of our February requirements. In addition, there are enough heads and motors on order to complete (10) more drivers, which will take care of our March requirements.

It is my understanding that the heads presently being used are not meeting our skew requirements. Also the bearing on the motors is not holding up. If this is the case and the problem cannot be rectified by our present supplier, new manufacturers must be evaluated within three weeks. Within this three week period, purchase orders for heads and motors must be placed, if we are to meet our April requirements. If new suppliers cannot be located, we must place orders with our present suppliers.

Wiring diagrams for the 550 Control have not been released by Engineering to date. It will take (8) working days from the date of release to complete the first control. One unit each (8) working days thereafter can be completed with our present in-house capabilities. If more Controls are required, they can be sub-contracted quite readily.

If we are to meet the above schedule, the below listed areas should be expedited as soon as possible:

1. Release of 550 Control wiring diagrams

2. Evaluation of new suppliers of motors

3. Evaluation of new suppliers of heads

INTEROFFICE MEMORANDUM

DATE January 2, 1964

SUBJECT Overdue Computer Systems and Options.

TO K. Olsen
H. Anderson
S. Olsen
G. O'Dea
W. Hindle
D. Best
D. Hills
M. Sandler
R. Beckman
R. Savell
B. Stephenson
E. Harwood
J. Shields
J. McKalip
J. Smith
S. Lambert
T. Stockebrand
J. Rutschman
P. Greene
J. Myers
F. Gould

FROM N. Mazzarese

The following is a list of overdue computer systems and options. The engineer responsible for the project's completion is indicated in each case.

Customer	Item	Quantity	###	Original Date Due	Reason for Delay	Acceptance Expected	DEC Order Number & Price	Engineer in Charge
AEC Princeton University	16K Memory	1	2554	6/30/63	Shipped and being installed.	1/6/64	04793 $30,400.00	B. Beckman
AECL	Mul. & Div. 10	1	2610	8/15/63	Installed not accepted. Contingent upon micro-tape.	1/24/64	04982 $5,150.00	B. Beckman
AECL	Micro Tape 555	3	2611	8/15/63	Customer requested we hold off on installation until 1/20/64.	1/23/64	04982 $19,536.00	T. Stockebrand
AECL	Micro Tape 550	1	2612	8/15/63	Customer requested we hold off on installation until 1/20/64.	1/23/64	04982 $9,400.00	T. Stockebrand
AECL	16 Channel	1	2613	8/15/63	Installed not accepted. Contingent upon micro-tape.	1/24/64	04982 $15,300.00	B. Beckman

Customer	Item	Quantity	SMT	Original Date Due	Reason for Delay	Acceptance Expected	DEC Order Number & Price	Engineer in Charge
AEC Harvard Univerasity	16K Memory	1	2655	9/15/63	Engineering difficulties.	1/20/64	05111 $30,400.00	J. Shields
BB&N	PDP-1C-45	1	2649	12/1/63	Delivered and being install-ed.	1/15/64	05109 $153,000.00	G. Moore
BB&N	16K Word Core Module Model 2650	1	2650	12/1/63	Delivered and being install-ed.	1/15/64	05109 $60,000.00	G. Moore
BB&N	4K Word Ex-pandable Memory Mod-ules.	2	2651	12/1/63	Delivered and being install-ed.	1/15/64	05109 $60,000.00	G. Moore
BB&N	Memory Controls	3	2652	12/1/63	Delivered and being instal-led.	1/15/64	05109 $36,000.00	G. Moore
BB&N	32 Field Drum System	1	2653	12/1/63	Delivered and being instal-led.	1/15/64	05109 $73,400.00	G. Moore
BB&N	16 Line Tele-type Interface Modules	2	2654	12/1/63	Delivered and being instal-led.	1/15/64	05109 $73,400.00	G. Moore

Customer	Item	Quantity	BBN	Original Date Due	Reason for Delay	Acceptance Expected	DEC Order Number & Price	Engineer in Charge
BB&N	16 Channel Sequence Break System Model 120	1	2665	12/1/63	Delivered and being installed.	1/15/64	05109 $	G. Moore
BB&N	Modification to Memory Extension Control	1	2667	12/1/63	Delivered and being installed.	1/15/64	05109 $	G. Moore
BB&N	Special Instructions for Control Processor.	1	2668	12/1/63	Delivered and being installed.	1/15/64	05109 $	G. Moore
BB&N	32 MS & 1 Minute Clock	1	2769	12/10/63	Delivered and being installed.	1/15/64	05109 $	G. Moore
BB&N	Trap Buffer (18bit)	1	2785	12/20/63	Delivered and being installed.	1/15/64	05109 $	G. Moore
Columbia	Mag-Tape Control Type 57A	1	2758	12/15/63	Crated Dec. 16 No purchase order.	?	NONE	S. Lambert

Customer	Item	Quantity	[illegible]	Original Date Due	Reason for Delay	Acceptance Expected	DEC Order Number & Price	Engineer in Charge
Columbia	Interface Logic Type 520	1	2759	12/15/63	Crated Dec. 16 No purchase order.	?	NONE $	S. Lambert
Columbia	PDP-4C-20	1	2797	12/24/63	Crated Dec. 16 No purchase order.	?	NONE $	E. Harwood
Columbia	Extra 4K Memory Type 134	1	2798	12/24/63	Crated Dec. 16 No purchase order.	?	NONE $	E. Harwood
Columbia	Extended Arithmetic Element Type 18	1	2799	12/24/63	Crated Dec. 16 No purchase order.	?	NONE $	E. Harwood
Columbia	[illegible] Printer keyboard and Control Type 65	1	2800	12/24/63	Crated Dec. 16 No purchase order.	?	NONE $	E. Harwood
Columbia	Perforated Tape Punch & Control Type 75	1	2801	12/24/63	Crated Dec. 16 No purchase order.	?	NONE $	E. Harwood

Customer	Item	Quantity	EM#	Original Date Due	Reason for Delay	Acceptance Expected	DEC Order Number & Price	Engineer in Charge
Columbia	Data Interrupt Multiplexer Type 133	1	2802	12/24/63	Crated Dec. 16 No purchase order.	?	NONE Loan	E. Harwood
Columbia	Tape Transport Type 50	1	2803	12/24/63	Crated Dec. 16 No purchase order.	?	NONE $	E. Harwood
DEC (Sales)	Micro-Tape Control 550	1	2638	9/1/63	Late acknowledgment of order.	2/20/64	NONE $	T. Stockebrand
DEC (Sales)	Micro-Tape Unit 555	1	2639	9/1/63	Late acknowledgment of order.	2/20/64	NONE $	T. Stockebrand
DEC PDP-4 Prototype	Micro-Tape Control 550	1	2719	10/14/63	Engineering hold while prints are being updated.	2/27/64	NONE $	T. Stockebrand
DEC PDP-4 Prototype	Micro-Tape Transports 555	3	2720	10/14/63	Complete contingent upon Micro Tape Control 550 EM#2719.	2/27/64	NONE $	T. Stockebrand

Customer	Item	Quantity	EN#	Original Date Due	Reason for Delay	Acceptance Expected	DEC Order Number & Price	Engineer in Charge
DEC (Production)	Micro-Tape Trans-port 555	1	2755	12/10/63	Complete contin-gent on Micro-Tape 550 EN#2756.	3/4/64	NONE $	T. Stockebrand
DEC (Production)	Micro-Tape Control 550	1	2756	12/10/63	Design noise problems.	3/4/64	NONE $	T. Stockebrand
Ft. Meade	Holly Line Printer	1	2498	6/15/63	Original printer did not work.	1/17/64	04289 $28,900.00	B. Savell
Ft. Meade	Micro-tape Control 550	1	2604	6/15/63	Program-ming in-complete.	1/17/64	04289 $	T. Stockebrand
Ft. Meade	Micro-Tape Trans-port 555	1	2609	6/15/63	Completed delivery contingent on Micro-Tape 550 EN#2604.	1/17/64	04289 $7,400.00	T. Stockebrand
Harvard University	Printer Keyboard & Control Type 65	1	2786	12/30/63	Being in-stalled.	1/3/64	05885 $2,520.00	A. Ross

Customer	Item	Quantity	EWT	Original Data Due	Reason for Delay	Acceptance Expected	DEC Order Number & Price	Engineer in Charge
Harvard University	Output Relay Buffer	1	2787	12/30/63	Being installed.	1/3/64	05885 $7,755.00	A. Ross
JPL	Paper Tape Punch Teletype	1	2784	12/30/63	Delay in delivery.	1/10/64	05809 $1,050.00	B. Newell
MIT - Project MAC	Light Pen Type 32	1	2475	11/1/63	Awaiting logic change to allow light pen to work with symbol generator display.	1/14/64	05483 $1,300.00	J. Shields
MIT - Project MAC	16K Memory for PDP-1C-40	1	2540	11/1/63	Installed and not working properly.	1/14/64	05483 $40,000.00	J. Shields
MIT - Project MAC	High Speed Channel Control Type 19	1	2727	11/1/63	Delivered contingent on system acceptance.	1/14/64	05483 $9,000.00	J. Shields
MIT - Project MAC	Data Control Type 131	1	2730	11/1/63	Delivered contingent on system acceptance.	1/14/64	05483 $10,500.00	J. Shields

Customer	Item	Quantity	EBW	Original Date Due	Reason for Delay	Acceptance Expected	DEC Order Number & Price	Engineer in Charge
MIT - Project MAC	Micro-Tape Control Type 550	1	2731	11/1/63	Programming incomplete.	2/1/64	05483 $9,400.00	T. Stockebrand
MIT - Project MAC	Micro-Tape Transport 555	1	2732	11/1/63	Programming incomplete.	2/1/64	05483 $9,400.00	T. Stockebrand

INTEROFFICE MEMORANDUM

DATE January 3, 1963

SUBJECT Micro-Tape System

TO H Anderson

FROM D Vonada

Steps taken to insure that a Micro-Tape System will be installed on the DEC prototype are as follows:

1. Set of prints and wiring lists to be given to Jack Smith on Friday morning (3 Jan 64). Control to be complete by 15 Jan 64.

2. Four Micro-Tape transports are to be replaced at KIE Thursday evening, 2 Jan 64. Present KIE transports will be taken to Production Friday morning, 3 Jan 64. Modification expected to take approximately one week. The work is to be on the drives simultaneously. Completion date is therefore 10 Jan 64 for drives.

3. Assembly of Cabinet with accessory equipment can be assembled and completed in 4-5 hrs. This will be done after drive modification.

4. The Engineering PDP-4 has been scheduled for the 20th to the 24th of Jan 64 for checkout purposes.

5. Jack Shields has been contacted concerning IOT wiring on the Prototype.

DV/dhw

INTEROFFICE MEMORANDUM

DATE January 7, 1964

SUBJECT

TO J. Atwood

FROM Gordon Bell

cc: K. Olsen
H. Anderson
S. Olsen
R. Best
N. Mazzarese

Individually our 6 literature is great. Put it all together, give it to a field office, G. B., the average Maynard Sales Engineer, or engineer and it becomes at best slightly chaotic with various sized art forms, etc. filed in piles.

Hopefully there is some committee (or better yet, a person) dealing with the subject, but in lieu of progress then, I would like to bring it before the Computer Guidance Committee to specifically look at:

1. Hardware Information To Sales

   There must be some routine procedure for documenting new designs introduced to the market. Can things be alike, similar, or the same size?

2. Programming Information To Sales

   Programs need to look as though they are part of what we provide.

3. Standards

   Standardize on only 2 or 3 notebook types and have the literature pre-punched to fit.

   A note with the advertising literature with some useful information (including the chatty stuff about with whom we lunched at NEREM or birthdays, etc.) as to what the specific literature's goal is, who it is for, whether it supersedes anything, which pile of literature it is to go in (such as module specs by Sales Dept., module specs by Engineering, module specs by T.P., a program, a program note, specs by engineering, by someone in Sales, or T. P., a permanent memo to be used as useful data, an application note for customers, etc.

4. Filing System for Literature

I propose a filing system based on problems which breaks things into:

(a) Circular file

(b) All hardware computers and computer options (regardless of origin)

(c) All module data of size 1

(d) Module data of size 2 (current drivers)

(e) Pat Greene's hardware

(f) A file for interesting proposals who make the best applications notes .....(wow! if these could only be printed so as to be useful to field personnel and others with similar interest instead of just stacked somewhere.

(g) Programs for software

(h) Programs for maintenance

(i) Maintenance manuals

(j) Useful application notes

(k) On line -- which seems to have the most interesting application notes for computers

(l) DECUS

(m) Miscellany (the largest of all)

(n) Everything else that just won't fit in (m).

The above system represents a tremendous improvement over present sytems and could be set up. In recent visits to some field offices I found they are in need of suggestions, with a system to allow facile updating of their files which would save much of their time, and they could also be better informed.

5. Module Catalogue

The Digital Module Catalgoue is wonderful. I'm continually impressed with thenumber in circulation. (My only complaint as a dynamic user is that, of course, it can never be quite up to date.) I feel its title should be changed to "Designing With Digital Modules", maybe it should be given authors, and then it should be published legitimately in the same form as the RCA Tube Manual, the GE Transistor Handbook, etc. Maybe the applications portion could be "souped up" a bit, and the thing should be printed on thiner paper, and sold for $1.50 (of course if you know a Digiital salesman you can get them free). The market for the book at college bookstores etc, should be fantastic because here in one volume is theoretical plus real like circuits, not just the nonsense you get in a book (probably the best though), "Bartree, Lebnow, etc. of Lincoln Laboratory called DESIGN OF DIGITAL MACHINES. When they use circuits that are fictitious, and it is an unrealistic game.

The book "Designing With Digital Modules" is potentially a college level reference book and should be put there. (This might help sell those funny looking modules with the interesting faces and symbology)

6. Procedures for Customer Handling Sales Call Reports

I know that S. Piner worked on a program to handle the mailing list, and also mag tapes maybe working on PDP-4-1. Do they Sales Call Report Jact Atwoods mailing list, Sales mailing list, the 2 letters to/from customers and the cards customers send back go anywhere or do they just terminate in a closed file somewhere? I talked with a couple of field sales engineers about their filing system for customers, etc. and found that agent R19 has a procedure for handling customers that is every bit as good as agents with higher and lower R numbers. In fact, they didn't know what happened to the above filed people. There must be a system but I get no instructions as an agent except to see other agent numbers, as to what I'm to do, when all this paper goes, and what will happen to a poor bloke (Australian or Anglican for guy, etc.) if I just drop his request card into "The Mill". Could the Mill flow chart be drawn and distributed?

7. New Number for R19

Can agent R19 have a lower number? I'd like 007 if possible.

dec INTEROFFICE MEMORANDUM

DATE January 7, 1964

SUBJECT EMPLOYMENT AGREEMENT

TO H Anderson
K Olsen
W Hindle
R Best

FROM J P Hastings

After the Works Committee discussion on the proposed Employment Agreement, I talked with Bob Cesari about the questions raised by the Committee. Specifically, Bob saw no reason why we could not remove the word "pertinent" thereby claiming rights to all inventions regardless of how much they are related to our business. Furthermore, we may eliminate the three month period as stated on Page 2. Bob merely inserted this limitation to remind us that we must take action on any disclosures in any reasonable time. He has suggested we institute a disclosure procedure and has agreed to send several forms to us for consideration.

I revised the enclosed draft in keeping with the Committee's instructions (Paragraph 2 only). Will you please review and return to me so that Bob Cesari may make his final determination on the legality of the form.

JPH:ASJ
Encl

EMPLOYMENT AGREEMENT

Maynard, Massachusetts

In consideration of my employment hereafter by Digital Equipment Corporation, a Massachusetts corporation, (the "Corporation") I hereby agree as follows:

1. I will make full and prompt disclosure to the Corporation of all inventions, improvements, modifications, discoveries and developments (all of which are collectively termed "developments" hereinafter), whether patentable or not, made or conceived by me or under my direction from the date of this agreement until I leave said employment, whether or not made or conceived during normal working hours or on the premises of the Corporation.

2. Upon request of the Corporation, I agree to assign to the Corporation all developments covered by paragraph 1 which are useful to the Corporation and any patents or patent applications covering such developments and to execute and deliver such assignments, applications for letters patent and other documents for use in any and all countries whatsoever as the Corporation may direct and to cooperate fully with the Corporation in prosecuting such applications and in otherwise securing to the Corporation full protection of the same. I understand that the Corporation will determine whether or not the development is pertinent or useful to the business of the Corporation, which determination shall be binding on me.

3. I will also assign to the Corporation any and all copyrights and reproduction rights to any material prepared by me in connection with my said employment.

4. During the course of my employment by the Corporation, I may learn of confidential information relating to the Corporation, such information including matters not generally known outside the Corporation, such as various developments, inventions, improvements, methods, etc., relating to the products and services marketed or used by the Corporation, and also general business operations of the Corporation (e.g., relating to sales, costs, profits, organization, customer lists, pricing methods, etc.), and I agree not to disclose any such information to others or to make use of it, whether or not such information is produced by my own efforts, except as expressly permitted by the Corporation. Also, I may learn of apparatus, methods, way of business, etc., which in themselves are generally known but whose use by the Corporation is not generally known, and I agree not to disclose to others such use insofar as the Corporation has indicated that it considers it confidential, whether or not such use is due to my own efforts.

5. The requirement for disclosure under Paragraph 1 and the provisions of Paragraphs 2, 3 and 4 shall survive the termination of my employment with the Corporation regardless of the manner of such termination, and shall be binding upon my heirs, executors, administrators and assigns.

Witness my hand and seal

Signature _____(Seal)

Date:_____

Witness_____

digital MEMO

DATE 1/8/64

TO H. Anderson FROM R. Lane

sent to Library 1/23

Thank you for the loan of the "Data Processing" magazine (October 1963 issue).

Attached is a copy of a memorandum which was distributed to all sales personnel regarding pages 46 thru 49 of the above.

dec INTEROFFICE MEMORANDUM

DATE January 3, 1964

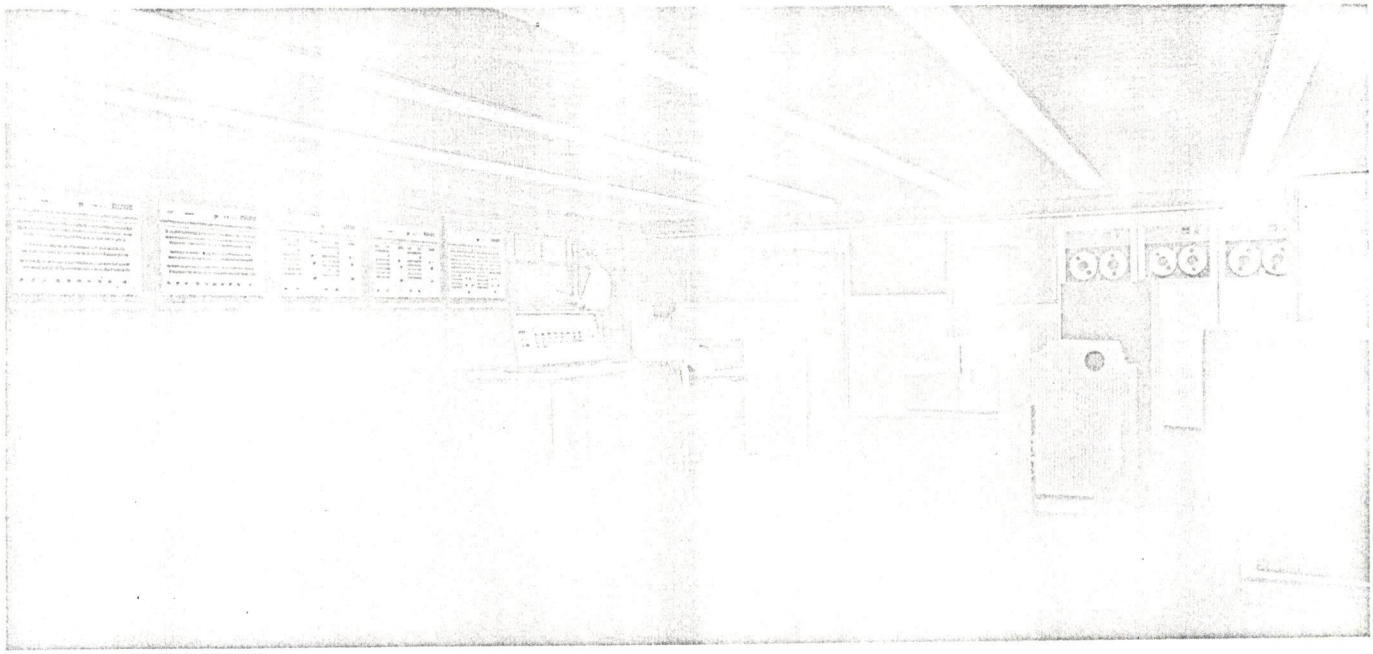
SUBJECT Burroughs D825, GE 235, PB 440, REAC 500 & LGP 30.

TO All Sales Personnel FROM Pat Murphy

Attached are Xerox copies of pages 46 through 49 of the "DATA PROCESSING for Science/Engineering" magazine which describe the above systems.

EQUIPMENT ROUNDUP

Continuation of a complete review of hardware systems started in charter DPS/E issue.



BURROUGHS D825

Developed for command and control operations, the Burroughs D825 computer system uses independent computer, memory, and I/O control modules linked by a switching interlock and controlled by a master program.

The D825, a military system, must provide some service all the time and full capability most of the time. The multiple computer, memory, and control unit system is designed to insure against total system failure and to provide expansibility and maintenance without downtime.

System hardware may consist of: up to four computer modules, up to 16 memory modules, up to ten I/O control modules, one or two I/O exchanges, and one to 64 I/O devices per I/O exchange. I/O devices may be selected from operating or system status consoles, magnetic tape transports, magnetic drums, magnetic disk files, card punches and readers, paper tape perforators and readers, supervisory printers, line printers, data converters, special real time clocks, and intersystem links.

Each memory unit is accessible by all computer and I/O control modules. Queuing and priority operations to coordinate this data exchange are handled by a switching interlock consisting of a crosspoint switch matrix and a bus allocator.

All system and task control functions are performed by the automatic operating and scheduling program (AOSP). The AOSP includes its own executive program and calls out routines as needed. It is stored in totally shared memory.

The system control function of the AOSP consists mainly of bookkeeping operations for: programs being run, programs occupying memory, I/O commands being executed, I/O commands waiting, external data blocks to be received and decoded, and program activation to handle such data. Program scheduling is also handled by the AOSP and it permits program segmentation with parallel processing at the programmer's discretion.

As a task control, AOSP keeps records on the condition and availability of each I/O device. It evaluates each request from computer modules for I/O action, determines whether the proper device is available, and either initiates the action or places the request in a program queue to await action.

Computer modules of the D825 are identical arithmetic and control units. They are digital, parallel binary devices using 48-bit words and each has 15 index registers and 128 words (fixed length) of magnetic thin film memory with 0.25 microsecond read/write cycle time. Average execution times (in microseconds) are: *binary add*, 1.67; *binary multiply*, 36.0; *floating point add*, 7; *floating point multiply*, 24.0.

Memory modules have a 4,096-word capacity. Up to 16 may be used for a total capacity of 65,536 words.

Each I/O module is available to every computer module and takes complete control of I/O operations after computer module initiation.

Circle no. 112 on reader service card.

GE 235

Third and newest in the General Electric computer family, the GE 235 is a general purpose, single address, parallel binary system. It is upwardly compatible with the GE 215 and 225 computers and executes their programs at increased speeds.

The 235 central processor executes commands at rates of (microseconds): *branch*, 6; *add*, 12; *multiply*, 24-138; *divide*, 156-174. It has logic for address modification and programmed initiation of input/output operations. Arithmetic speeds may be increased with an auxiliary arithmetic unit, (AAU) to normalized floating point rates (microseconds) of: *add*, 29.6 to 35.6; *multiply*, 35.6 to 77.0; *divide* 71.1 to 77.0; *load/store*, 17.8; *general instructions*, 5.93; *test instructions*, 11.8.

Instructions for the GE 235 (more than 300) consist of three functional

groups. First are basic internal arithmetic and logical instructions, including an optional *move* command; second, a general instruction whose operand address field is decoded to provide internal register transfer, test and branch, shift, and card input/output instructions; third, floating point instructions, including mode selection and AAU register test instructions. The GE 235 instruction set is bit compatible with the GE 225 and 215 machine languages.

Core memory for the 235 consists of 4,096 or 8,192, or 16,384 twenty-bit words and has a minimum read/write cycle time of six microseconds.

The entire GE computer family program library is available to 235 users. Some of the generally used programs are: GECOM, a general compiler to translate a mixture of COBOL and TABSOL functions plus a report generator language into machine code; FORTRAN; WIZ, a one pass algebraic compiler; BRIDGE II, an executive tape routine for program tape maintenance and run collection; ZOOM, a macroassembler; Forward Sort and Merge Generator; Card Program Generator, for transition from punched card to stored program systems; and GAP, a symbolic assembly program.

Available peripherals include: 400 and 1,000 cards minute card readers; 100 and 300 cards/minute card punches; a 120 column, 900 lines/minute buffered printer; magnetic tape controllers handling up to eight tape transports; mass random access data storage providing 34 million numeric digits or 18.8 million alphanumeric characters of storage per unit with one controller for every four units; 250 or 1,000 characters/second perforated tape readers; 110 characters/second tape punches; a 1,200 documents/minute, 12 pocket MICR document handler; and a 15 characters/second console typewriter with input and output modes.

Circle no. 113 on reader service card.

PB 440

Using dual memory stored logic, the PB 440 digital computer can design and interchange command lists for specific problems, utilize FORTRAN I and II program libraries designed for other computers without reprogramming, and duplicate command lists and formats of other computers and run their machine language programs.

Dual memory of this Packard Bell Computer Division machine consists of a five microsecond main core memory expandable from 4,096 to 28,572 words and a one microsecond biax logic memory expandable from 256 to 4,096 words. One to four memory modules of 4,096 words each may be shared with another PB 440 computer or with peripherals.

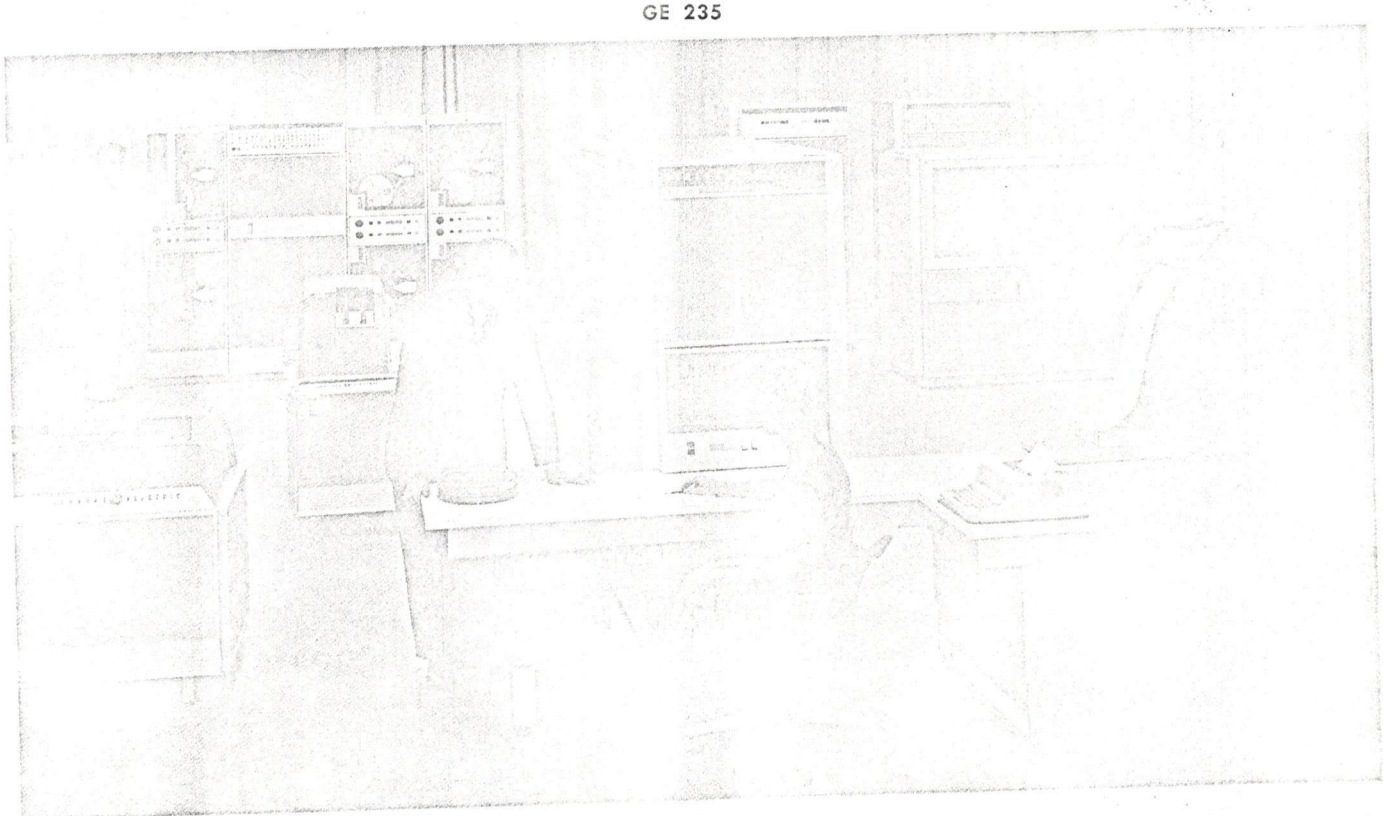
Selectable instruction lists and formats for the PB 440 include floating or fixed point and sign magnitude and base complement arithmetic, decimal or binary modes (may be mixed), and single or multiple address logic. Format register configurations, word lengths, and command lists are variable and controlled through microprogramming.

Input/output activity in the PB 440 is handled through a bus at a standard speed of 400,000 characters/second; optional, 800,000 characters/second. Peripherals are connected to the bus through a controller. Each controller handles up to eight I/O units and the system accepts up to 128 controllers.

Currently available equipment for the PB 440 includes magnetic tape units, card read/punch stations, line printers, paper tape reader and punch, and electric typewriters. An off line paper tape preparation center is also available. Future equipment will include disk files and cathode ray tube display units.

Circle no. 114 on reader service card.

GE 235



REAC 500

The standard Reac 500 analog computer, manufactured by Reeves Instrument Corporation, is housed in a four bay cabinet. It uses: 58 operational amplifiers, including 28 integrators, 20 summers, and 18 inverters; 80 scale factor potentiometers; four power supplies; one reference supply; a 4,986 hole patchbay; control panel; component oven; and overload light panel.

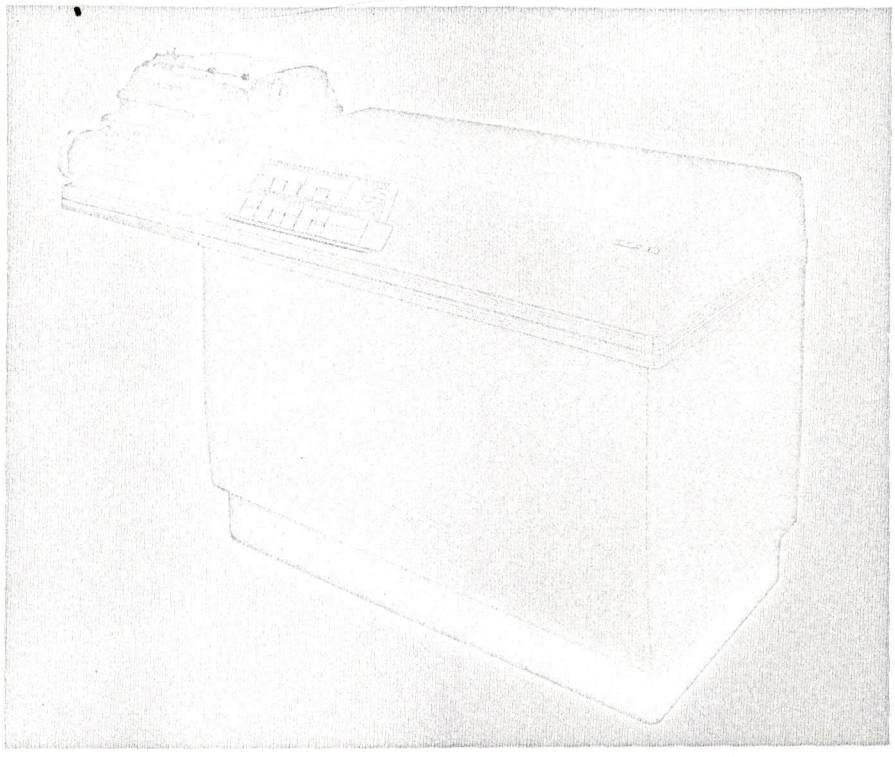
The standard system is prewired and powered to accept the following plug in components: four diode multipliers; four diode function generators; one D.F.G. control panel; eight assigned amplifiers; one problem check module; and one digital voltmeter.

Expansion area is provided and preformed wire harnesses are available for the simultaneous addition of: four diode function generators; 14 DPDT relays; 26 operational amplifiers; 40 scale factor potentiometers; one time scale check module; and a total of six of the following—six servo multipliers and two servo resolvers.

With an expansion rack and use of all standard expansion facilities, the Reac 500 may be brought to a total system capacity of: 160 amplifiers, including 20 convertible integrators, 30 summers, 10 convertible inverters, 24 inverters, and 76 amplifiers assigned to nonlinear equipment; 160 servo or hand set scale factor potentiometers; 20 diode multipliers; 20 diode function generators, eight multiplying servos; four resolving servos; two free diode packages; noise generators; and digital printer.

Providing all necessary elements for controlling and monitoring computer operations, the Reac 500 control panel includes pushbutton mode switches for balance, check, operate, hold, and reset; a vacuum tube voltmeter with six ranges, reading from ± 10 millivolts to ± 200 volts; an audible overload and unbalance alarm; amplifier overload light panel; signal selector connecting the voltmeter with all major computer points and patchbay; and a selector switch power supply monitor.

Circle no. 115 on reader service card.



LGP 30

Desk-sized and mobile, the LGP 30 produced by Royal Precision Corporation is a serial, single address, fixed point, binary, stored program digital computer. It is designed for use by non-technical personnel, is self cooled, and plugs into standard wall socket currents.

Memory for the LGP 30 is drum type with total storage of 4,096 thirty-two bit words. It provides for 81 recording channels, each equipped with one or more read/record heads. Main memory is in 64 channels of 64 words each. Three recirculating channels provide temporary storage for accumulator, instruction, and control counter register usage.

LGP 30 access time per instruction ranges from two to 17 milliseconds with a transfer time of one to 17 milliseconds. Command execution times, excluding access time, are 0.26 milliseconds for addition/subtraction; 15 milliseconds for multiplication/division.

Input/output for the LGP 30 is an electric typewriter with paper tape punch and reader. Tape may be prepared concurrently with computer operation. Entries made in decimal form are converted to binary for computation and back to decimal for readout by a subroutine. The typewriter operates at 10 characters/second.

This system employs tubes and solid state components and is equipped with automatic standby warmup equipment and manual standby equipment to extend tube life.

Circle no. 116 on reader service card.

SDS 9300

Designed for scientific computation and for systems integration applications such as PCM telemetry, Scientific Data Systems' SDS 9300 is a transportable digital computer priced at $215,000.

Using a binary system with two's complement arithmetic, the SDS 9300 central processor has capabilities of multiprecision and byte-precision, multilevel indexing, indirect addressing, and optional floating point operations.

Typical SDS 9300 execution times, including access and indexing, with overlapped memory are (microseconds): *add,* 1.75; *double precision add,* 3.5; *multiply,* 7.0; *divide,* 19.25; and *shift,* 1.75. Optional floating point add and multiply operations are performed in 14 microseconds.

Memory consists of up to eight random access magnetic core modules of 4,096 words each. Four modules, selected by a program activated switch in 1.74 microseconds, may be accessed by the computer. Independent electronics in each module allow instructions and operands to be stored in different modules and overlapped so that two cycle instructions are executed in one cycle time.

Up to eight buffered automatic data channels may be used with the SDS 9300. They may operate in IBM character format or on words at the programmer's discretion and have a maximum transfer rate of 2,285,000 characters/second. A single word

(continued on next page)

INTEROFFICE MEMORANDUM

DATE January 8, 1964

SUBJECT VAN DYCK CORPORATION PRESENTATION TO THE COMPUTER GUIDANCE COMMITTEE

TO Gordon Bell FROM Scott Miller

cc: Ken Olsen
Loren Prentice
Paul Rawson, Van Dyck Corporation

I propose that Paul Rawson of Van Dyck Corporation be added to the agenda of the Computer Guidance Committee meeting on February 5th.

In his talk, Paul will introduce Van Dyck Corporation and its services that are available to Digital Equipment Corporation. He will also describe the significance of the appearance of the company's products as well as overall corporate identity as used by this company as well as some of their other clients. It is hoped that this talk will familiarize the computer guidance people with industrial design and that we do have a consultant designer. Paul's talk will probably take a little bit of time, it is hoped that enough time will be set aside for this particular purpose.

Loren Prentice and I will also attend this meeting, not only to hear the reaction of the committee to Paul, but also offer any ideas on our own if we think it necessary.

dec INTEROFFICE MEMORANDUM

DATE January 9, 1964

SUBJECT Summary of DEC Insurance Program

TO Ken Olsen
Harlan Anderson ✓

FROM Dick Mills

The attached is a summary of DEC's insurance coverages which gives you total coverages by type and total annual cost.

We review our fire and business interruption insurance every six months in July and January. This review will be completed early next week at which time required adjustments will be made.

In addition, we now have under review the policies on your lives to see if we can get more protection for less cost.

SUMMARY OF DIGITAL EQUIPMENT CORPORATION INSURANCE PROGRAM

Type of Coverage and Carrier	Amount of Coverage	Annual Premium	Comments
Fire Insurance (Home Office) (Factory Ins. Assoc.)	$3,000,000	$6,100. Act.	Property Damage for Fire and Lightning and Extended Coverage, included in the face value are Inventories, Capital Equipment, Leased Equipment and our Finished Goods Inv. at Sales Value. This contract includes a 10% co-insurance clause.
Fire Insurance (Field Sales Office) (Liberty Mutual)	Various	400. Act.	Furniture and Fixtures - actual cost base.
Business Interruption (Factory Ins. Assoc.)	$4,000,000 Gross earnings and $380,000 of ordinary payroll for 90 days.	7,400. Act.	This contract includes a 20% co-insurance on both Gross earnings and Ordinary payroll coverage.
Domestic Transportation (Royal Globe)	$400,000 per shipment	2,400. Est.	Coverage to customer extends to United States, District of Columbia, and Dominion of Canada. Coverage is specifically endorsed to cover Consignments, Loans and Exhibitions including transportation to and from exhibitions or customers. For foreign shipments see Foreign Transportation.
Foreign Transportation (Royal Globe)	$500,000 per shipment	500. Est.	This policy is on a trip transit ticket basis, each individual shipment is issued a separate endorsement. Protection is provided DEC for 30 days after arrival at the customers plant, or is cancelled in less than 30 days after arrival because the risk of DEC as an unpaid vendor has been satisfied. The Foreign Transportation Policy covers Foreign Trade Show Transportation and exhibitions.

SUMMARY OF DIGITAL EQUIPMENT CORPORATION INSURANCE PROGRAM

Type of Coverage and Carrier	Amount of Coverage	Annual Premium	Comments
Crime Insurance (Liberty Mutual)	Dishonesty $200,000 Money & Securities $5,000 Depositors forgery $200,000 Forgery of Credit Cards $10,000 Open Stock burglary and Theft $25,000	$ 750. Act.	Coverage is extended to cover all Domestic DEC employees.
Motor Vehicle Insurance (Liberty Mutual)	$300,000 per accident $100,000 per person $25,000 Property Damage	175. Act.	This contract includes an employers non-ownership liability clause.
Travel and Accident Insurance (American Casualty Ins.)	$500,000 per accident $100,000 per person	880. Act.	Coverages are for accidental death, dismemberment and loss of sight indemnity. Included in the above coverage are, "all full time employees of policy-holder", Foreign or Domestic. Twenty-four hour coverage - all risk - world wide.
Executive Life Insurance (John Hancock)	$50,000 each	2,400. Act.	Ordinary Life Contracts on Kenneth Olsen and on Harlan Anderson with an annual increase in the cash surrender value over a 20 year period of approximately $800.00 per year per contract.
Comprehensive Liability (Liberty Mutual)	Bodily injury: $250,000 per person 500,000 per accident 500,000 aggregate products Property Damage: $100,000 per accident 300,000 aggregate operations 300,000 aggregate protective 300,000 aggregate products 300,000 aggregate contractual	3,000. Est.	This coverage is extended to cover the Home Office and all Canadian and all domestic Field Sales Offices. The German Sales Office has products coverage only. This policy is specifically endorsed to include Independent Contractors, Elevator Liability and Water Damage Liability. Includes liability coverage for executives, officers, directors or stockholders while acting in an official capacity.

SUMMARY OF DIGITAL EQUIPMENT CORPORATION INSURANCE PROGRAM

Type of Coverage and Carrier	Amount of Coverage	Annual Premium	Comments
Workman's Compensation (Liberty Mutual)	Various. Depends on State of Office.	$12,000. Est.	Standard coverage as prescribed by State of Office. Workman's Compensation Policy has no coverage in Foreign Offices.
	Sub-Total	$36,000.	
Group Insurance (John Hancock)	Various (Co-portion)	48,000. Est.	We have made a study of the group plans being offered in this area and ours is as liberal a plan as any. We have excellent coverages in comparable B/C and B/S areas. Accident and Sickness benefits are extended on our plan beyond the normal 13 week period to a total of 26 weeks.
	TOTAL	$84,000. per annum	

dec INTEROFFICE MEMORANDUM

DATE January 10, 1964

SUBJECT PROGRESS OF MICRO TAPE

TO H. Anderson FROM J. Smith

Wiring lists for the 550 Control were released 1/6/63. In keeping with my original estimate of completion in 8 working days, the unit will be available for testing 1/15/63.

Four drivers were returned from Kie Corporation on 1/3/63. Two of the four have been modified, tested and are running. The third unit will go under test Monday.

Everything is on schedule per our original schedule.

INTEROFFICE MEMORANDUM

DATE January 10, 1964

SUBJECT ITT Visit, Monday

TO K. Olsen
H. Anderson
H. Mills
M. Mazzarese
S. Olsen
D. Best
W. Hindle
G. Bell
J. Cudmore
R. Hughes

FROM R. Lane

I have been advised by Mr. John Hart of ITT that the following ITT representatives will be visiting DEC on Monday, January 13, 1964, at 9:00 A.M. The purpose of the trip is to discuss current PDP-6 proposals.

T. A. Dmochowski	-	K. Olsen, H. Anderson
A. Stewart	-	H. Mills
D. Palmer	-	M. Mazzarese
H. Mills	-	G. Bell
E. T. Rhein	-	R. Lane
E. Force	-	"
J. Hart	-	"
M. Johnson	-	J. Cudmore or R. Hughes
W. Hedman	-	R. Lane

Listed opposite each name are DEC representatives best suited to individual discussions with each of the personnel and are in respective areas of responsibility within companies. If the DEC personnel will please stand by on Monday until an Agenda is determined, I will advise each where and when to meet. It is not necessary to prepare any material for this meeting until the nature of their visit is clear.

dec INTEROFFICE MEMORANDUM

DATE January 13, 1964

SUBJECT ITT Visit - Monday, Jan. 13, 1964

TO Ken Olsen
Harlan Anderson
Bob Lane

FROM Bob Hughes

At my meeting with Marius Johnson, the subject was "Attachment "C" pertaining to the documentation in ITT's invitation for bid.

We discussed Items F, G, H, and I.

Item F concerned the DEC in-plant specifications and test reports. ITT said they would insist on a Q.C. person in attendance at the acceptance test that we do in our plant during our checkout by customer relations. I told them that we would be willing to do this, but that it would cost more money since it was an unusual procedure for us. They suggested that we add this into the price of our bid.

Item G includes all drawings, installation and technical memos required for the design, test and manufacture of the equipment. They declared that these drawings could not be considered proprietary and that they wanted masters of all drawings. At this point we held some discussion on whether micro-photographs would be adequate. They declared that they would not be adequate. I suggested that we may have to get additional money, since it would entail considerable drafting expense (it is possible for us to have our drawings photo-copied commercially and is not too expensive, but is a big job.)

Item H - all documentation required for installation - this includes such information as power requirements, air conditioning requirements and floor loading.

Item I - Instruction and Maintenance manuals. We had much discussion on this because the FAA spec. requires photographs of wave forms on every connector pin. I objected to this and they suggested they might have their people make photographs or that we might charge more money for this.

One item which we covered which was not on their documentation schedule, was that we supply their resident inspector with change notices on the modules that they use.

INTEROFFICE MEMORANDUM

DATE January 13, 1964

SUBJECT

TO Harlan Anderson
Gordon Bell

FROM Ken Olsen

Here are a few notes on the visit that Bob Lane and I made to ITT. The proposal is due February 21, 1964 and an invitation to bid will be sent out in April to those who are technically qualified. There will be no prices on the February bid but prices in April will be on all the variations which people make technical bids on in February. The contract will probably be issued in June and the first system will be delivered in 18 months and will stay in the shop of the contractor. The next system will be delivered 27 months after the contract issue and then the others will be delivered 2 month intervals after that. The contract will be issued strictly on price and so the game is to bid the minimum system which will technically do the job.

The peak information rate for one center will be 70,000 bits per second for 200 line system for a 12 second period. The system must be able to tolerate the average rate of 58,000 bits per second for sustained 24 hour period. Although they are only talking about 200 line system maximum, the repitition rates are so high that the ADX system is far from filling the job.

They must have immediate access to all information for a 24 hour period which means 30 IBM tapes if the maximum rate is sustained for a 24 hour period. We should consider a bulk tape storage system something like Tom Stockebrand made at MIT. This system doesn't have to have the same reliability one needs in making a wiring list because it is only carrying communication type information.

I think the system will need 45,000 to 65,000 words of core memory and an additional large drum or disk.

This system must pass military specs. There will have to be military inspectors during the assembly. They are considering sending one of their control people to watch the assembly of the system. There will be added cost in doing this and they are thinking of paying for that separate from the normal bid. I am not as afraid of this as I might have been sometime before because I don't think we are careful about reliability as we should be.

We should tell them that we will be able to offer Silicon circuits after a certain date because I think this might be important to their bid.

It is obvious that our drafting room cannot meet the military specifications for drafting so I think they will draw them all over again.

To: Harlan Anderson
Gordon Bell

We should be prepared to discuss our quality and design policies. We should also be able to discuss the component derating and circuit derating.

We promised to send them the price of 2 & 4K memory and a 2 - 3 microsecond speed. We also promised to send them preliminary prices this week.

The contract insists on our having a pert scheduling system so it will be important that we are set up to give pert type information to ITT. I don't think that we will have to have pert scheduling system for our part.

Ken Olsen

KHO:ech

cc: Bob Lane
Nick Mazzarese

dec INTEROFFICE MEMORANDUM

DATE Januasy 14, 1964

SUBJECT DEC Computer History Reports.

TO
H. Anderson ✓
K. Olsen
N. Mazzarese
S. Olsen
B. Beckman
E. Harwood
J. Smith
J. Shields
J. Rutschman

FROM A. L. Fortin

Attached are the DEC Computer History Reports. These reports will be published on a monthly basis. Please notify A. L. Fortin of any errors or changes.

These reports have a COMPANY CONFIDENTIAL classification.

HISTORY OF PROGRAMMED DATA PROCESSORS - 1.

PDP-1-0	III	7/63
1B-1	BBN	11/60
1C-1	ITEK	5/61
1C-3	CRL	6/62
1C-4	CRL	6/62
1C-5	MIT	9/61
1C-6	CRL	10/61
1C-7	BBN	11/61
1C-8	ADX-1	1/62
1C-9	GEOTECH	1/62
1C-10	ADX-2	7/62
1C-11	NEVER BUILT	
1C-12	LRL	6/62
1C-13	JPL	1/62
1C-14	ADX-3	10/62
1C-15	BECKMAN	2/62
1C-16	BECKMAN	4/62
1C-17	SRL	4/62
1C-18	ADX-4	6/62
1C-19	ADX-5	5/62
1C-20	DEC	6/62
1C-21	ADX-6	8/62
1C-22	RUTGERS	6/63

HISTORY OF PROGRAMMED DATA PROCESSOR - 1 (CONT'D)

1C-23	ADX-7	9/62
1C-24	UNITED AIRCRAFT	12/62
1C-25	MINN. HONEYWELL	9/62
1C-26	MIT	9/62
1C-27	ASCL	11/62
1C-28	ADX-8	11/62
1C-29	JPL	1/63
1C-30	SDC	9/63
1C-31	NEVER BUILT	
1C-32	NEVER BUILT	
1C-33	ADAMS-returned-being shipped to Univ. of Mich.	
1C-34	DEC SALES	9/62
1C-35	NSA	7/63
1C-36	CRL	4/63
1C-37	LINCOLN LABS.	3/63
1C-38	RAYTHEON	2/63
1C-39	STANFORD	4/63
1C-40	MIT	4/63
1C-41	HARVARD	10/63
1C-42	YALE	6/63
1C-43	PRINCETON	6/63
1C-44	III	8/63

HISTORY OF PROGRAMMED DATA PROCESSOR - 1 (CONT'D)

1C-45	BBN	12/63
1C-46	BECKMAN	10/63
1C-47	BECKMAN	10/63

ON ORDER:

1C-48	STANFORD	2/64

COMPANY CONFIDENTIAL

HISTORY OF PROGRAMMED DATA PROCESSOR - 4.

PDP-4-1	DEC	8/62
4-2	NABISCO	9/62
4-3	DEC SALES LA	9/62
4-4	CORNING	8/62
4-5	MASS. GEN.	11/62
4-6	DEC SALES	-----
4-7	FOXBORO INT.	2/63
4-8	JPL-DAS	4/63
4-9	DEC-MOD.-TEST	6/63
4-10	DEC ENG.	5/63
4-11	JPL - TPS	6/63
4-12	KIE	5/63
4-13	HARVARD	6/63
4-14	JPL	6/63
4-15	FOXBORO	6/63
4-16	JPL	6/63
4-17	UNIV. of MICHIGAN	12/63
4-18	AECL	12/63
4-19	DEC ENG.	9/63

ON ORDER:

4-20	COLUMBIA	1/64
4-21	FOXBORO	1/64

HISTORY OF PROGRAMMED DATA PROCESSOR - 5.

PDP-5-0	DEC - Prototype	-------
5-1	UCLA	10/63
5-2	AECL	12/63
5-3	DEC - FOREIGN	8/63
5-4	DEC - SALES	11/63
5-5	WESTINGHOUSE	12/63
5-6	DEC - SALES PHYSICS	11/63
5-7	BELL LABS	1/64
5-8	LRL	12/63
5-9	AECL	1/64
5-10	COAST GUARD	1/64

COMPUTERS PRESENTLY ON ORDER:

5-11	WESTINGHOUSE	1/64
5-12	DEC - ENG.	2/64
5-13	DECAN (DRTE)	1/64
5-14	UNIV. MINNESOTA	4/64
5-15	DEC - LA	1/64
5-16	APPLIED DYNAMICS	Letter of intent.
5-17	DECAN - SALES	2/64
5-18	WESTINGHOUSE	3/64
5-19	UNIV. MICHIGAN	Letter of intent.
5-20	DATA TRENDS INC.	Letter of intent.
5-21	UNASSIGNED	

INTEROFFICE MEMORANDUM

DATE January 14, 1964

SUBJECT PNP Silicon Transistors

TO Ken Olsen

FROM Bob Hughes

cc: H. Anderson
S. Olsen
D. Best
B. Scudney
D. White
R. Doane
J. Cudmore
U. Skowronek

When we received our first 2N2894 transistors from Fairchild, we checked them for the old MA90 and MA89 VCE Sat. specs on our Teradyne tester. We have two test circuits in the tester. The one for the MA90 calls for an I_C of 16.8 ma and I_B of .773 ma and a base to emitter resistor of 2996 ohms. We then measure VCE Sat and it must be less than 125 mv. The silicon transistors that pass that test we would call DEC 2894-1 and color code them yellow. The test circuit for the MA89 requires an I_C of 38.9 ma and I_B of 1.84 ma and a base to emitter resistor of 957 ohms. Under these conditions VCE Sat must be less than 150 mv. The silicon transistors that pass this test were called DEC 2894-2 and color coded white.

When we asked Fairchild to supply these transistors as the 2894-1 and 2, they complained of low yields to the VCE Sat spec. and suggested that the base to emitter resistances were not really in our test circuits. When we looked into our Teradyne tester, we discovered that this resistor really wasn't in the circuit during the VCE Sat test, but was in the circuit during the VBE sat test. (This was somewhat upsetting.)

We then checked a few hundred Philco transistors with the base to emitter resistor in the test circuit and discovered that they would pass this test. We also made many measurements of VCE Sat in the silicon transistors already installed in modules in the module test area. We found that they passed our specs rather well having VCE Sats. less than 110 mv. We also sort these transistors for the DEC 2894-3 which we color red. The (3) is tested for a BV_{CEO} of 22V. We asked Fairchild what they can do about reducing VCE sat and they are thinking about it.

Motorola has supplied us with samples of their PNP silicon transistors and they have a little different approach to the problem. In their geometry for the 2894-1 and 2, they leave off the epitaxial layer. Without the epitaxial layer they have breakdown voltages of about 7 to 10 V. (Our spec is 6 volts.) When they do this they have

a lower VCE sat than Fairchild which is determined by the resistivity of the collector substrate. These devices pass our VCE sat tests, but due to the fact that they are using a slightly larger geometry than Fairchild, their f_t is lower (250 mc at 1.5V, 7 ma vs. 300 mc at 1.5V, 7 ma). We set the f_t spec at 300 mc because this was very close to the Philco MD94 f_t spec. The result of using this geometry would be an additional 1 nsec added to the rise time and 1 nsec added to the fall time, and when we pulse sampled an emitter load connected to a flip-flop output, we would have a slightly larger negative meniscus. The tests we have run indicate that this is insignificant.

When Motorola wants to make our DEC 2894-3, they simply add an epitaxial layer to this device and that brings the BV_{CEO} up, thereby increasing the VCE sat slightly. We use the 2894-3 as a pulse amplifier transistor so higher VCE sat doesn't hurt us.

We have also requested a 2894-4. This transistor would replace the 2N1754. The main difference between this device and a DEC 2894-1 is that we have a lower frequency limit on f_t of 100 mc and an upper frequency limit of 250 mc. We also allow stored charge to be 150 picocoulombs/ma on the (4) vs. 81 picocoulombs on the 2894-1. Motorola makes this device simply by diffusing the base deeper. This slows the transistor down considerably and yet they maintain the same VCE sat.

Fairchild is reluctant to slow the 2894 geometry down by diffusion techniques and instead wants to change geometries to supply the DEC 2894-4. Since they would be using a larger geometry, they would inherently have less yield per wafer than with the 2894-1, so they want about four cents more for the 2894-4, and this is our highest volume transistor.

Motorola hasn't given us price quotes yet, but we expect them to be competitive with Fairchild on hermetically sealed units; however, they have no intention at this time of making this transistor in plastic and that is an area where there are real savings.

We are continuing to buy 2N2894's and sort them into the three categories by testing them without the base to emitter resistors. In addition to this we have also ordered 1000 transistors from Motorola to be divided into the various categories.

Attached are two curves showing VCE Sat. for the 2894-1 and the MA90 as measured on our automatic module tester. This data shows the transistors to be quite similar.

Enc.

K&E PROBABILITY SCALE 359-23
X 90 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

2894-1

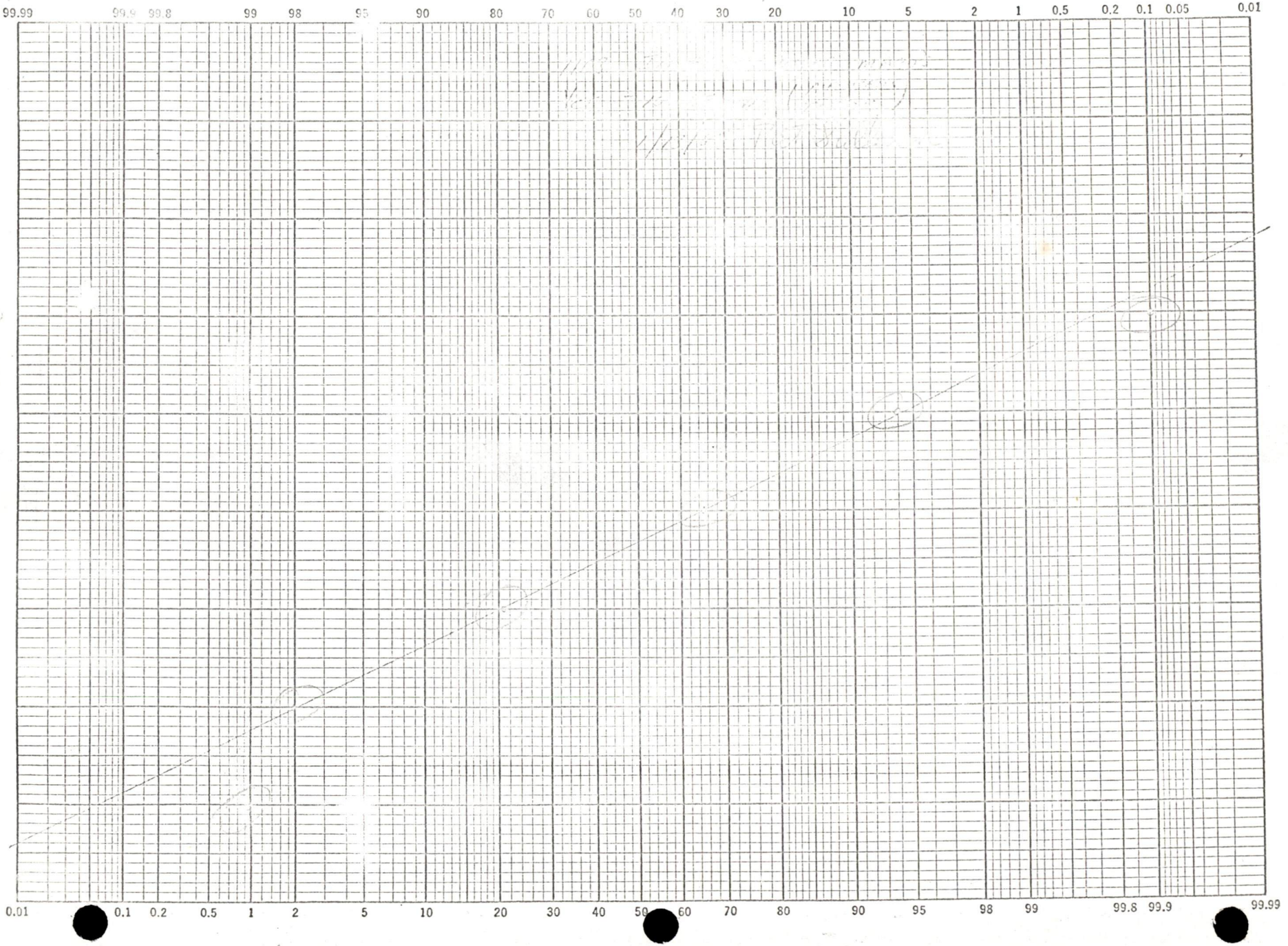
99.99 99.9 99.8 99 98 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01

110
100
90
80
70
60
50

0.01 0.1 0.2 0.5 1 2 5 10 20 30 40 50 60 70 80 90 95 98 99 99.8 99.9 99.99

K+E PROBABILITY SCALE 359-23
X 90 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

MA90



dec INTEROFFICE MEMORANDUM

DATE January 16, 1964

SUBJECT Overdue Computur Systems and Options

TO

K. Olsen
H. Anderson
S. Olsen
G. O'Dea
W. Hindle
D. Best
D. Mills
M. Sandler
R. Beckman
R. Savell
B. Stephenson
E. Harwood
J. Shields
J. McKalip
J. Smith
S. Lambert
T. Stockebrand
J. Rutschman
P. Greene
J. Myers
F. Gould
J. Fadiman

FROM N. Mazzarese

The following is a list of overdue computer systems and options. The engineer responsible for the project's completion is indicated in each case.

Customer	Item	Quantity	EB#	Original Date Due	Reason for Delay	Acceptance Expected	DEC Order Number & Price	Engineer in Charge
AECL	Mul. & Div. 10	1	2610	8/15/63	Installed not accepted. Contingent upon micro-tape.	2/12/64	04982 $5,150.00	B. Beckman
AECL	Micro Tape 555	3	2611	8/15/63	To Be Shipped Feb. 6/64.	2/12/64	04982 $19,536.00	T. Stockebrand
AECL	Micro Tape 550	1	2612	8/15/63	To Be Shipped Feb. 6/64.	2/12/64	04982 $9,400.00	T. Stockebrand
AECL	16 Channel	1	2613	8/15/63	Installed not accepted. Contingent upon micro-tape.	2/12/64	04982 $15,300.00	B. Beckman
AECL	PDP-5-9	1	2779	1/5/64	Shipped 1/14/64	1/21/64	05507 $	E. Harwood
AECL	Extra PDP-5 Cabinet with one piece table across both cabinets.	1	2862	1/5/64	Shipped 1/14/64	1/21/64	05507 $	E. Harwood

Customer	Item	Quantity	EW#	Original Date Due	Reason for Delay	Acceptance Expected	DEC Order Number & Price	Engineer in Charge
AEC Harvard University	16K Memory	1	2655	9/15/63	Engineering difficulties.	2/12/64	05111 $30,400.00	J. Shields
BB&N	PDP-1C-45	1	2649	12/1/63	Delivered and being installed.	2/15/64	05109 $153,000.00	G. Moore
BB&N	16K Word Core Module Model 2650	1	2650	12/1/63	Delivered and being installed.	2/15/64	05109 $60,000.00	G. Moore
BB&N	4K Word Expandable Memory Modules.	2	2651	12/1/63	Delivered and being installed.	2/15/64	05109 $60,000.00	G. Moore
BB&N	Memory Controls	3	2652	12/1/63	Delivered and being installed.	2/15/64	05109 $36,000.00	G. Moore
BB&N	32 Field Drum System	1	2653	12/1/63	Delivered and being installed.	2/15/64	05109 $73,400.00	G. Moore
BB&N	16 Line Teletype Interface Modules.	2	2654	12/1/63	Delivered and being installed.	2/15/64	05109 $73,400.00	G. Moore

Customer	Item	Quantity	MM#	Original Date Due	Reason for Delay	Acceptance Expected	DEC Order Number & Price	Engineer in Charge
BB&N	16 Channel Seq. Break System Model 120	1	2665	12/1/63	Delivered and being installed.	2/15/64	05109 $	G. Moore
BB&N	Modification to Memory Extension Control.	1	2667	12/1/63	Delivered and being installed.	2/15/64	05109 $	G. Moore
BB&N	Special Instructions for Control Processor.	1	2668	12/1/63	Delivered and being installed.	2/15/64	05109 $	G. Moore
BB&N	32 MS & 1 Minute Clock	1	2769	12/10/63	Delivered and being installed.	2/15/64	05109 $	G. Moore
BB&N	Trap Buffer (18 bit)	1	2785	12/20/63	Delivered and being installed.	2/15/64	05109 $	G. Moore
Columbia	Mag-Tape Control Type 57A	1	2758	12/15/63	Shipped.	1/16/64	NONE	S. Lambert

Customer	Item	Quantity	EM#	Original Date Due	Reason for Delay	Acceptance Expected	DEC Order Number & Price	Engineer in Charge
Columbia	Inter-face Logic Type 520	1	2759	12/15/63	Shipped.	1/16/64	NONE $	S. Lambert
Columbia	PDP-4C-20	1	2797	12/24/63	Shipped.	1/16/64	NONE $	E. Harwood
Columbia	Extra 4K Memory Type 134	1	2798	12/24/63	Shipped.	1/16/64	NONE $	E. Harwood
Columbia	Extended Arithmetic Element Type 18	1	2799	12/24/63	Shipped.	1/16/64	NONE $	E. Harwood
Columbia	Printer Keyboard & Control Type 65.	1	2800	12/24/63	Shipped.	1/16/64	NONE $	E. Harwood
Columbia	Perforated Tape Punch & Control Type 75.	1	2801	12/24/63	Shipped.	1/16/64	NONE $	E. Harwood

Customer	Item	Quantity	EM#	Original Date Due	Reason for Delay	Acceptance Expected	DEC Order Number & $ Price	Engineer in Charge
Columbia	Data Interrupt Multiplexor Type 133	1	2802	12/24/63	Shipped	1/16/64	NONE Loan	E. Harwood
Columbia	Tape Transport Type 50	1	2803	12/24/63	Shipped	1/16/64	NONE $	E. Harwood
DEC (Sales)	Micro-Tape Control 550	1	2638	9/1/63	Late acknowledgment of order	3/20/64	NONE $	T. Stockebrand
DEC (Sales)	Micro-Tape Unit 555	1	2639	9/1/63	Late acknowledgment of order	3/20/64	NONE $	T. Stockebrand
DEC PDP-4 Prototype	Micro-Tape Control 550	1	2719	10/14/63	Engineering hold while prints were being updated	2/27/64	NONE $	T. Stockebrand
DEC PDP-4 Prototype	Micro-Tape Transports 555	3	2720	10/14/63	Complete contingent upon Micro Tape Control 550 EM#2719	2/27/64	NONE $	T. Stockebrand

Customer	Item	Quantity	EWK	Original Date Due	Reason for Delay	Acceptance Expected	DEC Order Number & Price	Engineer in Charge
DEC (Production)	Micro-Tape Transport 555	1	2755	12/10/63	Complete contingent on Micro-Tape 550 EWK#2756	3/4/64	HOME $	T. Stockebrand
DEC (Production)	Micro-Tape Control 550	1	2756	12/10/63	Design noise problems	3/4/64	HOME $	T. Stockebrand
Ft. Meade	Holly Line Printer	1	2498	6/15/63	Original Printer did not work	Undetermimable	04289 $28,900.00	B. Savell
Ft. Meade	Micro-Tape Control 550	1	2604	8/15/63	Design noise problems	2/4/64	04289 $	T. Stockebrand
Ft. Meade	Micro-Tape Transport 555	1	2609	8/15/63	Completed delivery contingent on Micro-Tape 550 EWK#2604	2/4/64	04289 $7,400.00	T. Stockebrand
Harvard University	Printer Keyboard & Control Type 65	1	2786	12/30/63	Being designed so as to be a standard option		05885 $2,520.00	A. Ross

Customer	Item	Quantity	EWK	Original Date Due	Reason for Delay	Acceptance Expected	DEC Order Number & Price	Engineer in Charge
Harvard University	Output Relay Buffer	1	2767	12/30/63	Design problem being corrected	1/30/64	05885 $7,755.00	A. Ross
Kie Corporation	Additional clock in interface for 60 WPM speed.	1	2869	1/10/64	Shipped and installed	1/29/64	06139 $350.00	D. Smith
MIT - Project MAC	Light Pen Type 32	1	2475	11/1/63	Awaiting logic change to allow light pen to work with symbol generator display	2/5/64	05483 $1,300.00	J. Shields
MIT - Project MAC	16K Memory for PDP-1C-40	1	2540	11/1/63	Had to be removed. Expect delivery from eng. 1/30/64	2/5/64	05483 $40,000.00	J. Shields
MIT - Project MAC	High Speed Channel Control Type 19	1	2727	11/1/63	Delivered contingent on system acceptance.	2/5/64	05483 $9,000.00 0	J. Shields

Customer	Item	Quantity	FMT	Original Date Due	Reason for Delay	Acceptance Expected	DEC Order Number & Price	Engineer in Charge
M.I.T. - Project MAC	Data Control Type 131	1	2730	11/1/63	Delivered contingent on system acceptance	2/5/64	05483 $10,500.00	J. Shields
MIT - Project MAC	Micro-Tape Control Type 550	1	2731	11/1/63	Man-power shortage	2/1/64	05483 $9,400.00	T. Stockebrand
MIT - Project MAC	Micro-Tape Transport 555	1	2732	11/1/63	Man-power shortage	2/1/64	05483 $9,400.00	T. Stockebrand

dec INTEROFFICE MEMORANDUM

DATE January 15, 1964

SUBJECT 4221

TO Harlan Anderson FROM Mort Ruderman

The Models A, B, and C of the 4221 that are now in customer's hands have the same problem as those that are in the LINC. The Type B being the Model that was in the LINC Computer. However, we have been recommending to those customers that contacted DEC concerning the 4221 that the appropriate correction is to reduce the collector load on the read-in pulse inverter from 1500 ohms to 750 ohms. Therefore, in answer to your question, yes, there are 4221's in customer's hands that are the Models 4221 A, B, C. I also feel that there may be customers that have 4221's that could be experiencing the same problem but are not aware that problem is in the 4221. I do not know how many 4221's we have delivered to date.

INTEROFFICE MEMORANDUM

January 14, 1964

SUBJECT: Some Fine Comparisons for PDP-6 vs 7090

TO: PDP-6 LIST FROM: H MORSE and H HYMAN

The PDP-6 is faster than the 7090 !

Average times:

Operations	7090	PDP-6
fixed x	25	11.7
fixed /	30.5	23.7
floating x	25	13.7
floating /	28	19.7
fixed p.A add	4.36	3.6
subtract	4.36	4.2
one step of matrix inversion	79.4	31.7

PDP-6 time assumes both instruction and one oporand in slow memory (2μs), and one index cycle. (On indirect addressing 7090 loses .18 μs on each indirect cycle vs PDP-6.)

The matrix inversion takes n^3 steps for an nxn matrix, and requiring some not significant index manipulation overhead.

INTEROFFICE MEMORANDUM

DATE January 17, 1964

SUBJECT DECUS Symposia And Particularly For The PDP-5

TO Robert Beckman FROM Elsa Newman

1. The PDP-4 Symposium on January 21 at Foxboro has crystalized as a result of careful planning and seed planting. I think it will be a success. Interest is gathering and the Meetings Chairman has arranged for a room at Armand's Beacon Terrace which is on Route 9 across from the Shoppers World.

2. Lew Clapp, 1963-64 DECUS President, has taken for granted that the Spring Symposium is a national affair. I do not think that this was my intent when I organized the M.I.T. (May 1963) Symposium, for I visualized regional meetings (West Coast, Southern and International) taking place in the Spring in addition to the DECUS Annual Meeting in the Fall. The Symposia were not to be very formal affairs.

3. DECUS has received three tentative invitations for "the next DECUS Meeting": one from NSA, one from Atomic Energy of Canada and the other from ITT at Paramus. (The Delegate from United Aircraft Corporation also spoke to me about the possibility of a meeting.) It looks like Lew Clapp is in favor of a Washington meeting on April 24, 1964 so that it will dovetail with the Spring Joint Computer Conference. Joe Lundy, Meetings Chairman, is working on this with Major Scott of NSA. NSA will not sponsor it but is getting the Washington Users to do it.

4. Denzal Doyle was anxious to get DECUS to meet with the Canadian Data Processing Society. I am particularly interested in following through the Canadian invitation but would like to steer attention to the PDP-5. It's not too soon to sow seeds for a PDP-5 Symposium. Three or four papers (or talks) would make a good adjunct to the Meeting of the Computing and Data Processing Society of Canada, or since the AEC of Canada will no doubt want to contibute to the Canadian Program, the PDP-5 Symposium could be considered part of the Canadian Data Processing Society's program. Thus Digital and DECUS would be contributing to the Canadian Conference. (DECUS would thus incur no expense and Digital get the benefit of the publicity in the Canadian market.)

5. Would it be feasible for Digital to sponsor a PDP-5 Symposium. (This is a little different from the PDP-6 Coming-Out Party but could be equally effective.)

EN:ajc

INTEROFFICE MEMORANDUM

DATE January 20, 1964

SUBJECT Module Production - Forecast Revision January 1964

TO Ken Olsen
Harlan Anderson
Stan Olsen
Maynard Sandler
Dick Best

FROM Dick Mills

After seeing the complete sales forecast for the calendar year 1964, the question of module production came to mind and the following figures substantiate an 8,600 per month figure which, on the basis of current plans of 9,000 production units per month, would be an increase in inventory of 12K per month:

Module Sales to Customers

Domestic	$3,600,000
Foreign converted to 100% value	168,000
Total	$3,768,000

Divide this by 3 in order to get the cost, $1,256,000 then divide by $30 per module which is the average cost, 41,900 modules for the twelve month period, January through December 1964 required for customer sales.

Systems and Computers

Domestic Total	$6,504,700
All foreign converted to 100% sales value non-discounted	870,000
Total	$7,374,700

Then divide by 2 which is $3,687,350 as the cost, then by 2 again to get the content of modules estimated $1,843,675 then divide by $30, the average cost per module, that leaves modules required 61,456 modules.

Summary

For period January through December 1964, as per revised forecast, module requirements:

Customers	41,900
Internal Systems and Computers	61,456
Total	103,356

Divide by 12, 8,613 per month.

Since this works out to be only 113 modules over our standards of 8500, I do not feel that this requires any consideration for a master revision of our standards at this time.

INTEROFFICE MEMORANDUM

SUBJECT: JOB ALLOCATION, MECHANICAL DESIGN DATE: January 17, 1964

TO: All Engineers
K. Olsen
S. Olsen
H. Anderson
N. Mazzarese
M. Sandler
J. Smith
R. Maxcy
R. Maroney
K. Peirce
H. Crouse
B. Brackett
W. Hindle

FROM: Loren Prentice

To better acquaint all engineers and management with job responsibility within the mechanical design department, a memo will be issued periodically as required.

ENGINEER	JOB NUMBER OR EN NUMBER	DESCRIPTION	% COMPLETE
Scott Miller	1022	Power supply labels	75%
	1023	Mounting panel labels	75%
	1023	1906 Redesign	25%
	1064	Eye ball unit	10%
	1088	Module pouch and package	80%
	1177	PDP-5 arithmetric option	5%
	1201	PDP-6 showroom	30%
	1211	Light pen 370	75%
	1282	PDP-7	10%
		Product Identification	---
Phil Backholm	1196	M3000 tape transport Prototype type 570	95%
	1185	Automatic silk screen	20%
	1191	PDP-5 Prototype	80%

ENGINEER	JOB NUMBER OR EN NUMBER	DESCRIPTION	% COMPLETE
Ken FitzGerald	1023	Additional assembly jig for 1914 mounting panels	75%
	1000	Paint adhesion on steel components	30%
	1053	Welding jigs for standard computer cabinets	99%
	1253	Sheet metal, cabinet assembly and carpenter shop supervision and administration	--
	1254	Machine shop supervision and administration	--
	1178	PDP-6 console mechanical design and prototype fabrication	95%
	1208	DEC paper tape reader (Stepping motor drive)	30%
	1000	"Plastic" doors and end panel research	0%
	1254	Programming tape controlled milling machine	--
	1288	Automated module production	15%
	2740	Mechanical parts for "Havoc" computer	95%
Ron Cajolet	1178	PDP-6	90%
	1236	Display 340	97%
	1027	Stability test stand	50%
	2667	PDP-1D	95%
	1180	Camera mount type 372	50%
	1023	Mounting panel development	--
	1177	PDP-5	--
	1000	Plastic cover panels	--
	100.00	Dynasert fixture plates	25%

ENGINEER	JOB NUMBER OR EN NUMBER	DESCRIPTION	% COMPLETE
Loren Prentice	1136	555 Tape Unit E.C.O.'s	95%
	1000	Building layout	--
	1196	Tape transport type 570	95%
	1072	Engineering standards	0.5%
	1237	555-A tape unit Solid State Dev.	30%
	2609	Micro Tape 555	85%
	1252	Security	--

JOBS PENDING - UNASSIGNED		ASSIGNED ELECTRONIC ENG.
1151	Large Tape Storage - Hold	T. Stockebrand
1165	Projection display	R. Savell
1181	Camera Equipment for 31 Display	R. Savell
1086	Holley printer	R. Savell
1182	Electrostatic display development	R. Savell

H Andersen

INTEROFFICE MEMORANDUM

TO: PDP-6 LIST
FROM: H HYMAN
SUBJECT: RIM LOADER, TAPE FORMATS, etc.

, RIM LOADER

```
LØC 2Ø
        CONO PTR, 6Ø
        CONSO PTR, 1Ø
        JRST, .-1
        DATAI PTR, 4Ø
        CONSO PTR, 1Ø
        JRST, .-1
        XCT,4Ø
        JRST, .-7
PTR = 1ØØ
END
```

RIM FORMAT ON TAPE CONSIST OF
PAIRS OF BINARY WORDS;

WORD 1: DATAI PTR, Y
WORD 2: data to be loaded into C(A)

The final word pair on the tape is:

WORD 1: JRST 4, GOADDR,
WORD 2: Z
GOADDR is the starting address of the program

INTEROFFICE MEMORANDUM

DATE January 22, 1964

SUBJECT File Declarations in Fortran and other languages from H_3

TO H. Morse
H. Hyman
D. Fellows
S. Piner
L. Portner
P. Samson
✓H. Anderson
G. Bell
B. Lane
A. Kotok

FROM H. R. Morse

Attached is a copy of some notes I have received from Bill Briggs - Marathon Oil, concerning File Declarations.

To clarify the notes, file declarations are intended to permit use of program or data interrupt with I/O devices, and essentially allow the programmer to specify which devices he wishes to buffer and how many levels.

Background - those guys have a B5000 and a SDS 920.

As a footnote, the file declarations are from the B5000 ALGOL 60 I/O, which looks useable enough in general it will probably be worth implementing for PDP-6 FORTRAN. I/O is the one part of FORTRAN which varies drastically from machine to machine, and must be looked at carefully for any programs which are used on more than one FORTRAN. The outstanding characteristic of the B5000 ALGOL'S I/O is that one puts a 'picture' of the I/O format desired, rather than a specification.

some suggestions for an extended FORTRAN

<file declaration> ::= FILE <integer> (<buffer specs>)
FILE CARDS (<buffer specs>)
FILE PRINTER (<buffer specs>)

<buffer specs> ::= <number of areas>, <words per area>

<number of areas> ::= <integer>
<words per area> ::= <integer>

when the compiler comes across a FILE declaration statement it sets up a buffer area particularly for that file — a tape would be a tape unit, card reader, line printer etc. The extension to drums or discs is obvious.
A file not named would be handled in the standard FORTRAN manner.
Two things ought to be included along with this — REREAD and REWIND and also possibly an EOF procedure

REREAD unnum, <list> would cause the material currently in the top buffer to be read again — no tape movement. Nice for allowing the data to control the format.

The executive system should allow file definitions to be changed at run time — define a tape unit to be a line printer for example

Another useful thing would be a DEFINE declaration:

<define declaration> ::= DEFINE <identifier> = (any well-formed FORTRAN constructs)

examples:

```
DEFINE X=(XABC(I+J)-XABR(K))
DEFINE RD=(READ INPUT TAPE)
```

any time the <identifier> is seen the defined construct is substituted in its place. This not only can save a lot of writing but can be real useful for defining functions.

I am enclosing an ASSOC listing which uses the DEFINE and the FILL declarations. The listing has some keypunch errors.

Note from the ENF that DIMENSIONS can be written as X(-7/10), Y(10,-3/6)

DO's can count backwards and/or increment floating variables

I would also suggest the following syntax for statement numbers

<statement number> ::= <integer> | <identifier>

both would be limited to 5 characters or less and you might have to watch the C in col 1.

Another thing:

A=B=C=0 ought to be a valid form

All of these things can be included keeping FORTRAN II as a subset.

The DEFINE declaration might be expanded into allowing the coding of a set of machine language statements (or symbolic assembly language statements)

Harlan Anderson

INTEROFFICE MEMORANDUM

DATE 1-22-64

SUBJECT SJCC DEMONSTRATION

TO Nick Mazzarese

FROM Don Smith

CC: Ken Olsen
Harlan Anderson
Stan Olsen
Dick Best
Gordon Bell
Howie Painter
Jack Atwood
Bob Lane
Bob Savell
Dit Morse

If a pamphlet or card containing the context of the following statements was passed out following a unique demonstration of the 340 Display we could draw huge crowds. This would be a much discussed demonstration.

MESSAGE

"You have just PARTICIPATED" in the demonstration of our 340 Display. During the period you were observing the various configurations and abilities of our display, a few suggestive words were displayed. The words were not persistent enough for your active mind to retain. If you coughed, sneezed, scratched, stretched, smiled, stopped smoking (some of these may cause problems) you may have received our subliminal message.

We might mention that we did not suggest buying Digital products by this means. Such deceptive methods are not required to sell our products. We will be glad to assist you in solving your problems in the computer, module, teletype interface, display magnetic tape, A-D D-A lines etc.

"Do you know what else we suggested? Complete this inquiry card. We will send you the answer."

(End of Message)

I do not know if the above statement would cause hostility. The answer could be "Keep Smiling, THINK, DIGITAL, etc.

What would your reaction be if you were handed a card containing the above statements after a display demonstration.

H. ANderson

INTEROFFICE MEMORANDUM

DATE January 22, 1964

SUBJECT Competitive File

TO All Sales Personnel, Administration, & Engineering

FROM A. L. Fortin

A recent revision of the sales competitive file has been made. Any new literature concerning computers, systems, peripheral equipment, or modules will gladly be accepted by Pat Murphy in the Sales Department. The file itself is being run on a library basis, and all users are asked to sign for any material which they plan to use.

Complete cooperation would be appreciated.

Harlan Anderson

INTEROFFICE MEMORANDUM

DATE January 23, 1964

SUBJECT LINC Computer

TO Ken Olsen
Harlan Anderson
Stan Olsen
Nick Mazzarese

FROM Mort Ruderman

The situation at present seems to be as follows: Wes Clarke has indicated that documentation on the LINC Computer is to be available no later than March 1, 1964. Documentation initially will consist of eight packages listed as follows:

1. Frames and Cables - (Electrical)
2. Power Supply
3. Circuit Plug-ins, (DEC packages plus 7 of CDO's own design packages)
4. Memory Stack
5. Console and Keyboard
6. Tape Unit
7. Scopes
8. Terminal Frames and Terminal Boxes

These packages will essentially be referenced to manufacturer's part numbers. The reason for this being that there is not sufficient time to give detailed specifications for all the packages.

We can, therefore, assume that no later than March 1 we will have the 8 packages of documentation that will specify a LINC in a manner that will call out vendor and their part numbers. At this time software packages will not be available nor will maintenance manuals or debugging procedures.

The present LINC activity directly relative to DEC appears as follows: Wes Clarke indicates as soon as a decision has been made as to where CDO will be physically located he intends building from 4 to 6 LINC's. These undoubtedly will be in kit form and we will receive only the order for modules. Dr. Cox at Washington University in St. Louis is acting as the go-between for Professor Shipton at Iowa State University, School of Medicine and Professor Colter at Ohio State University. He is signing the contract agreement as the initial step for ordering these three complete sets of LINC Modules. I have spoken previously with Dr. Cox concerning the possibility of building our first LINC for him. He is open for discussion and will discuss this possibility. However, he feels very strongly that our first attempt at a LINC should be an exact copy and if this be the case he would definitely consider buying the first LINC from DEC. Other definite areas where LINC's are to be delivered as soon as documentation is available are at CBL at MIT. Here Bob Brown is our contact and has been instrumental in developing the LINC system at Mass. Eye and Ear. He also would entertain thoughts of buying the first LINC that DEC builds. His major concern is the old story of crying, "Wolf, Wolf", He feels he could not discuss having a LINC built until documentation is truely available. (And CDO has been threatening since Sept. 1963) Ken Larsen from Palo Alto tells me and I have also heard from CDO that there are at least three to five LINC's going to the West Coast as soon as documentation is available. Another definite LINC is scheduled at Lincoln Lab; Don Malpass is our contact here. Therefore, if we add up there are approximately 11 LINC's that will be ordered as soon as documentation is available. Now these previous mentioned possibilities are only people that we have come in direct contact with. I am sure there are many more that have been in contact either to CDO or NIH or to people that now have existing LINC's and are contemplating their shopping activity to begin when documentation becomes available.

Areas concerning the LINC where DEC has to make decisions before deciding to build LINC's are:

1. Physically will it be in two cabinets or in the existing cabinet.

2. Will the 30 ft. cables that go between the main frame and the console boxes exist. (Which if you speak to anybody that has a LINC feel it is an absolute necessity and would not even consider

having a system without this flexibility). These cables can also be priced as an option, thus discouraging some individuals.

3. What will be done concerning micro tape. Will the LINC tape be copied or will we redesign our micro tape.

Other immediate considerations that should be decided are: Will DEC construct the first LINC such as Dr. Cox suggested as an exact copy just for the advantage of building a LINC and thus educating ourselves to the LINC so that we can make a decision as to what modifications will be made.

The steps that are being taken to aid our decision concerning LINC's are as follows:

1. Charting a pert diagram for the construction of a complete LINC system.

2. Discussing with customers like Dr. Cox, Washington University, Bob Brown, CBL and Don Malpass, Lincoln Lab. on the possibility of working together with these people on having us build a LINC for them.

3. Considering initiating purchase orders on some major items: Soroban Keyboard, Tektronix Rack Mounted Scope, Type 561A, Memory Stack, Special Connectors etc. This would put us in a position when documentation becomes available the major items would be on hand to start assembly of the system.

We should also start thinking of our mechanical and physical design of the system.

Some thoughts after speaking to a number of people that have the first LINC's are as follows:

They are tremendously pleased with the LINC and they themselves are the greatest advertizement for the LINC Computer. Many things can be learned from these people concerning the building of LINC's. We should definitely discuss their thoughts with them. In doing so our position would be greatly influenced. These people definitely have the answers. Also, you will find after talking with people who have been to a number of the existing LINC Installations

that the typical laboratory where these people perform their work is quite limited in physical space. Therefore, one of the prime areas of concern for these people is to have the capability to operate "on line" having all controls at their fingertips with the further ability to control all experiments. If the main frame could be put out in a corridor where it would not take up valuable laboratory space, they would be quite happy.

Hopefully we will have worked out a schedule by the end of this week which will give us a realistic view of when we might be able to deliver, or have for display, our first LINC computer. Once this is completed we have to sit down immediately and make decisions on some of the previously stated areas of concern.

In summary, it can be stated that there exists (or there will exist) a very substantial market for LINC's. An approach that would aid DEC tremendously in the decision concerning LINC's would be to immediately make contact and visit one or two of the existing locations where LINC's are now in operation. This would fulfill two very important areas:

1. We would be able to physically see representative laboratories where these systems are being used.

2. To meet with individuals that are using them to get first-hand information directly from these people on their appreciation for the LINC systems.

INTEROFFICE MEMORANDUM

DATE January 27, 1964

SUBJECT PDP-5 Maintenance Course Convening 27 January 1964
PDP-1 Maintenance Course Convening 3 February 1964

TO
K. Olsen
H. Anderson
S. Olsen
N. Mazzarese
R. Beckman
All Sales Personnel
District Offices

FROM R. Bernier

The following individuals are scheduled to attend the designated course:

PDP-5 - One Week - Convening 27 January 1964

NAME	COMPANY
P. Von Loeseke	The Foxboro Company, (Sales Dept) Foxboro, Mass.
F. Polucha	Digital Equipment Corp., (Field Service) Maynard

PDP-1 - Two Weeks - Convening 2 February 1964

NAME	COMPANY
S. Bielby	University of Michigan
A. Hartwig or E. Hicks	Beckman Instruments, Huntsville, Alabama
E. Gilbert	Bolt, Beranek & Newman, Cambridge, Mass.
B. Jarnagan (Mrs.)	Massachusetts General Hospital, Boston, Mass.
C. Diamantis (Miss)	Massachusetts General Hospital, Boston, Mass.
	Digital Equipment Corporation, Ottawa
	Digital Equipment Corporation, Ottawa

****

H. Anderson

OPERATION OF PDP-5 FORTRAN SYSTEM

NAME: Larry Portner
DATE: January 24, 1964

Compiler:

1. Load the compiler using existing binary loader.
2. Console switch Ø up for source input via high speed paper tape reader.
3. Start the compiler.
4. Compiler will read the Source Language Tape, producing a Run Tape in object time binary format and containing an overlay table to fix forward references.
5. Compiler will type out source language diagnostics.

Object System:

1. Load the object time system using existing binary loader.
2. Start object system.
3. Object system loader will load the Run Tape, fix forward references.
4. Press continue to be execution of object program.

It appears that the system will provide about 1000-1500 words for storage to contain data and program. Since the program is densely packed, this works out to be a comparatively reasonable FORTRAN program. As an example; the expression A=B+C* (D**2/E) will occupy only 10 computer words (not including the data).

PDP-5 FORTRAN SCHEDULE

1)	Status reports bi-weekly beginning	February 14, 1964
2)	Preliminary Users' Manual	March 20, 1964
3)	Limited operation demonstration	June 19, 1964
4)	Operational compiler	July 24, 1964
5)	Final version of Users' Manual	August 7, 1964
6)	Maintenance documentation	August 21, 1964

dec INTEROFFICE MEMORANDUM

DATE January 23, 1964

SUBJECT PDP-6 Demonstration

TO K. Olsen
H. Anderson
S. Olsen
D. Best
G. Bell
H. Painter
B. Lane
J. Atwood
H. Hyman
A. Kotok

FROM Don Smith & Dit Morse

If the context of the following statements were distributed during the SJCC and included in the May issue of Datamation our sales would increase. This would be an outstanding first in the computer field.

It is also suggested that a demonstration using 7 in-house lines and 1 TWX line be part of our show at the SJCC.

If we start now, programs and equipment can be ready for the demonstration on May 15. Fortran and Fortran editor not available by SJCC.

May Datamation Advertisement Passout at SJCC

You are invited to participate in Digital's time sharing demonstration. On May 15 between the hours of 9:AM EST and 5:PM EST the PDP-6 will be interfaced to 24 TWX lines. By dialing on your TWX, the number ____ _____ _____ you will be assigned to one of the 24 lines. The programs available are: Kalah, NIM, Desk Calculator, Mail List --- (Describe method of using each). Time limited to 5 minutes. If you do not have a TWX at your disposal during the above period, please feel free to visit one of our Branch Offices where a TWX will be available.

(Branch Offices)

If you will be in the Boston area you are welcome to observe the demonstration at our Main Office in Maynard, Mass.

The "Who Are You" name could be used to generate a mailing list of good contacts. Branch offices would be placed in contact with prospects.

P.S. If this could be demonstrated before the SJCC then persons would make it a point to see the PDP-6 during the SJCC

INTEROFFICE MEMORANDUM

DATE January 27, 1964

SUBJECT Type 342 Character Generator
Per Type 340 Display

TO Ken Olsen

FROM Allan Titcomb

cc: H. Anderson
G. Bell
H. Morse
H. Hyman
R. Savell
W. Long
N. Mazzarese
C. Stein
A. Kotok
L. Hantman
S. Olsen

The type 342 Character Generator is available in two sizes, 64 or 128 characters. All of these are not printing characters, however, the Programming Department, as represented by H. Hyman, has agreed that ← (77) and \ (74) will be used for Escape to control mode and carriage return, respectively.

In addition, the 128 character version probably will use (73) for shift to upper case and (75) for shift to lower case. Shifts of either type may be given while in either mode. It is not necessary to "remember" which case was last being used.

H. Anderson

INTEROFFICE MEMORANDUM

DATE January 27, 1964

SUBJECT

TO Computer Guidance Committee Members
R. Boisvert
R. Savell
L. Hantman
H. Morse
R. Mills
M. Sandler
J. Shields
D. Zereski

FROM Arthur Hall

Six weeks ago the Computer Guidance Committee asked me to publish some information on the use and status of the PDP-4 Service Center (Prototype) computer. Sufficient time has now passed to present useful information.

For six weeks the tape units have worked with almost no trouble that can be repeated. No important delays have occurred due to tape troubles. The card reader shuffles cards and should have the new stacker installed as soon as practical.

	Week Beginning				
	12/16	12/23	12/30	1/6	1/13
Total hours logged for all purposes (inc. maint.)	93	72	70	84	44
%of prime time (10-12; 12:45 -7:00 Mon.-Fri.) used for all purposes	93	56	63	80	66
% of times computer was used without adverse comment in log.	72	67	71	69	73
Hours used by: Field Service (Pren. Maint., Repair & Install.)	38	15	22	31	12
H. Morse's group (for Systems Prog.)	45	23	31	37	13
L. Hantman's group (for Maint. Progr.)	1	0	0	5	7
Accounting	0	0	1	0	0
Production	2	0	0	1	1
PDP-6 Wire List	8	17	12	6	7
Other	0	0	3	0	4

INTEROFFICE MEMORANDUM

DATE January 30, 1964

SUBJECT Software

TO Computer Guidance Committee

FROM John Allen Jones

As the computer sales of this company continue to expand we are going to acquire users who are less and less savvy in the art of computer programming. This we have seen already as we have moved from the era of selling computers with virtually no programs to our present stage of supplying (for example) a very excellent Fortran on certain of our machines. The time to go the next step has definitely arrived.

It was once said that a set of computer programs do not become "software" until a set of writeups is developed that permit a user to run them. We need software.

Specifically my concern is with the lack of operating manuals to go with our major programming systems. There is no doubt that an adequate amount has been written concerning the philosophy of our assemblers and compilers, and how to write in their language, but when it comes to actually operating these systems the user needs folk-lore and luck because the operating details are hard to come by.

This is not too objectionable to our MIT-type customers, but we are starting to sell to those who think of the computer only as a tool; not an object of fascination. They expect to be able to pick up a program tape and a clear book of operating instructions and run.

It is not unheard of for a small computer firm to offer detailed program instructions. The SDS Fortran manual has two parts: 1. Writing programs. 2. Operating the system. We offer a lot of information on part 1, but virtually nothing on part 2.

Our own position is costing us money, and probably sales. We are presently spending a great amount of one programmer's time trying to acquaint two customers with the operation of our

Fortran for the PDP-4. Clear operating manuals might have avoided this. As for sales, the word is getting around: "DEC has wonderful systems, if you can figure out how to use them."

Therefore, if we are going to expand our sales to the market place of "users" we must develop understandable operating manuals for our programming systems. This must be done as soon as possible for systems that we already offer, and on a continuing basis for new systems to come. It is not apparent that the manpower resources exist within the company to do this which makes this a matter of even greater urgency for the Guidance Committee.

dec INTEROFFICE MEMORANDUM

DATE January 30, 1964

SUBJECT Software

TO Computer Guidance Committee

FROM John Allen Jones

As the computer sales of this company continue to expand we are going to acquire users who are less and less savvy in the art of computer programming. This we have seen already as we have moved from the era of selling computers with virtually no programs to our present stage of supplying (for example) a very excellent Fortran on certain of our machines. The time to go the next step has definitely arrived.

It was once said that a set of computer programs do not become "software" until a set of writeups is developed that permit a user to run them. We need software.

Specifically my concern is with the lack of operating manuals to go with our major programming systems. There is no doubt that an adequate amount has been written concerning the philosophy of our assemblers and compilers, and how to write in their language, but when it comes to actually operating these systems the user needs folk-lore and luck because the operating details are hard to come by.

This is not too objectionable to our MIT-type customers, but we are starting to sell to those who think of the computer only as a tool; not an object of fascination. They expect to be able to pick up a program tape and a clear book of operating instructions and run.

It is not unheard of for a small computer firm to offer detailed program instructions. The SDS Fortran manual has two parts: 1. Writing programs. 2. Operating the system. We offer a lot of information on part 1, but virtually nothing on part 2.

Our own position is costing us money, and probably sales. We are presently spending a great amount of one programmer's time trying to acquaint two customers with the operation of our

Fortran for the PDP-4. Clear operating manuals might have avoided this. As for sales, the word is getting around: "DEC has wonderful systems, if you can figure out how to use them."

Therefore, if we are going to expand our sales to the market place of "users" we must develop understandable operating manuals for our programming systems. This must be done as soon as possible for systems that we already offer, and on a continuing basis for new systems to come. It is not apparent that the manpower resources exist within the company to do this which makes this a matter of even greater urgency for the Guidance Committee.

H. Anderson

MEMO TO: COMPUTER GUIDANCE COMMITTEE
Ron Wilson
Dave Fellows

FROM: H. R. Morse

SUBJECT: PDP-7 Software Considerations

The PDP-7 is well under way conceptually, and certain decisions will be made soon concerning which approach to take in its design. This memo is designed to clarify the software considerations which affect those decisions.

A basic aim was to save programming system costs by making the computer compatible with the PDP-4. However, this may be done at two levels, and as one of two functions of time.

To clarify: the four ways of designing the PDP-7 are:

1) identical in all respects with the present PDP-4, except faster. In this case all programs (of software nature) may be run on either machine.

2) Design a machine which has as a 'proper subset' of the PDP-4 order code at the hardware level. In this case all PDP-4 programs will run on the PDP-7, but not vice versa.

3) Design a machine which has a 'logical subset' of commands identical to those of the PDP-4 . This means the symbolic programs we now have for the PDP-4 can with some reworking be made to run on the PDP-7. For example, if the PDP-7 were a 20 bit machine certain parts of PDP-4 program would not work, but most parts would. The PDP-4 and the PDP-5 are compatible in this fashion. Unfortunately, the chronology was in the wrong, so no good came of it.

4) Design an entirely new machine.

The short term results:

1) We immediately have a complete programming system for both machines!

2) as 1)

3) We very quickly have a complete programming system for the PDP-7. "Translation"time would probably be a month from machine availability.

4) Normal software development time.

The long range effects:

1) Only one software development and maintenance activity.

2) This path diverges into two development and maintenance activities, since eventually the programs on the PDP-7 will be modified to take advantage of greater machine capabilities. As a result, the long range savings will be very little over the cost of 4) if any. Initial savings are high however.

3) Same as 2).

4) Two separate and independent development programs. No software advantage can be gained.

SUMMARY:

To save software development lead time, the present PDP-4 programs must be able to be made to run on the PDP-7 (1,2,or 3 satisfy this aim. To save long range expense and duplication of effort, binary programs must be interchangeable between the two machines (only 1) satisfies them). From a hardware point of view, 3) has great advantages over 2) if we wish to extend the capabilites of the PDP-4 in the PDP-7.

I realize there are other influencing areas, and I also have other opinions. This memo was intended to clarify software consideration only.

COMPANY CONFIDENTIAL

dec INTEROFFICE MEMORANDUM

DATE January 31, 1964

SUBJECT Clarification of Minutes of Computer Guidance Committee Meeting of January 23, 1964.

TO Computer Guidance Committee

FROM H. R. Morse

The minutes do not indicate the fact that a decision to make the PDP-7 operationally identical to the PDP-4 was made at that meeting. It should be noted that Ron Wilson actually came to the meeting to present alternatives and obtain a decision on which approach to follow. It should also be noted that this decision dictates the path of computer development at DEC for at least the next couple of months and probably longer.

Unfortunately, the meeting notes do not indicate the decision, nor the reasons for it.

Meeting notes should clearly state any decision made, and the basis on which such decisions were made.

Dist:

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HRM: tw