INTEROFFICE MEMORANDUM

DATE June 27, 1963

SUBJECT Lettering Drawings

TO Ken Olsen
Harlan Anderson
Dick Best
Gordon Bell
Tom Stockebrand

FROM Roger Melanson

A time consuming operation in the Drafting Department is lettering drawings. A number of various drawings require many hours of lettering, they are:

1. Block Schematic
2. Module Location
3. Utilization Module List
4. Circuit Schematic
5. Extensive Notes on Drawings

Sometime ago, it became apparent that quality lettering was a necessity to insure adequate intermediate vellums and hard copies from microfilm. Existing freehand lettering drawings showed approx. 20% of all draftsmen could letter adequately. From expirements it was found that template lettering, of prescribed sizes would answer one of our most pressing problems, namely inadequate lettering on drawings. A re-education of lettering drawings was initiated to insure consistent height, form and style with the use of lettering templates. Our problems of this nature soon disappeared. As time went on, I found that draftsmen were taking an extremely long time to finish a drawing. In my research, I found lettering was a contributing factor to time consuming drawings. I then proceeded to have all draftsmen, capable of lettering freehand adequately, not use the template. Unfortunately, the 20% falls in the mechanical section and not in the electrical section where it's needed.

An expirement using a VariTyper has shown very good results and is an answer to reducing time and cost.

A Block Schematic, template lettered by a draftsman consumed 4 hours. A typist using a VariTyper consumes only 1¼ hours; a savings of 71% in time.

EXPIREMENT

Draftsman average hourly rate	=	$ 2.30
Clerk typist average hourly rate	=	1.65
$2.30 X 4 hrs.	=	9.20
$1.65 X 1¼ hrs.	=	2.09
Savings	=	7.11

RESEARCH FACTS

1. Average time per dwg., template lettering	=	8 hrs.
2. Average time saved per drawing	=	5 5/8 hrs.
3. Average cost saved per drawing	=	$14.48
4. Approx. amount of drawing per year requiring considerable lettering (excluding dwg. with extensive notes)	=	800 - 1000
5. Approx. amount saved per year	=	$11,584 - $14,480
6. Two clerk typist in place of two draftsmen, Savings per year	=	$2,000
7. Average time per dwg. freehand lettering	=	4 - 5 hrs.

COST OF VARITYPER & ACCESSORIES

1. Model 350 Engineering Lettering Machine	=	$1,645.00
2. Type Fonts (each style & size)	=	35.50
3. Roll of Tape (1000 feet)	=	4.50

4. 90 Days free service and replacement of parts.

5. Delivery: 30 - 45 Days.

6. There is a possibility that a second hand VariTyper can be purchased for $500 - $800 from Atwood & Morrill Co., in Salem, Mass.

SPECIFICATIONS OF THE MODEL 350

The VariTyper can write a continuous line 23.1" in length. The variable spacing control has four settings yielding a choice of 10, 12, 14 and 16 characters to the inch. The inter-linear spacing control can be set for 9, 6, 4½, 3 3/5 and 3 lines per inch. The machine operates from either AC or DC current, 110 or220 volts. Special open-end basket for paper or masters has an extended carriage release and feed-roller lever to accommodate drawings larger than carriage width.

A three day schooling program free of charge is given to a clerk typist to acquaint her in the use of a VariTyper.

Roger Melanson
Chief Draftsman

RM/db

KEN OLSEN

dec INTEROFFICE MEMORANDUM

COMPANY CONFIDENTIAL

DATE June 27, 1963

SUBJECT Visit to DEC on Tuesday, July 2, 1963 by Don McCoy and George McCesky, U.S.Steel.

TO
Nick Mazzarese
Stan Olsen
Gordon Bell
Ken Olsen
Harland Anderson

FROM R. L. Lane

Please be advised that Don McCoy and George McCesky of U. S. Steel, Pittsburgh, Pa. will be visiting DEC on Tuesday, July 2, 1963. Their interest will be a PDP-6 with the following equipment:

1. C.P.U.
2. Fast Memory (16 word)
3. Main Memory (32 K)
4. Card Reader-Punch
5. Line Printer
6. Tape Channel (2)
7. Tape Units (8)
8. I-O Typewriter
9. Micro Tape
10. Micro Tape Controller
11. Display

Based upon the above configuration, we gave them an estimate of $748,000 excluding maintenance. Maintenance for one year was estimated at $37,000.

Please plan to be available Tuesday to meet with these gentlemen. The exact time will not be determined until late Monday.

6/25/63
Q.C.

PROCEDURE FOR ELECTRICAL AND MECHANICAL ASSEMBLY INSPECTION

DEFINITION:

THE MECHANICAL ASSEMBLY INSPECTION INCLUDES, CHECKS FOR PROPER MECHANICAL ASSEMBLY, CORRECT USE OF HARDWARE AND OVERALL GOOD WORKMANSHIP ACCORDING TO INSPECTION PROCEDURE # 7. THE ELECTRICAL ASSEMBLY INSPECTION INCLUDES INSPECTION FOR PROPER WIRING AND SOLDER JOINTS ACCORDING TO INSPECTION PROCEDURE # 6. THE MARGINAL CHECKS AND ANY OTHER ELECTRICAL TEST AT THIS STAGE, WILL BE DONE ENTIRELY BY PRODUCTION OR ENGINEERING.

A. INTERMEDIATE ELECTRICAL AND MECHANICAL ASSEMBLY INSPECTION

THIS IS DONE BY Q.C. INSPECTION RIGHT AFTER ASSEMBLY AND BEFORE CHECKOUT. THE SPECIAL SYSTEMS DEPT. IS RESPONSIBLE FOR HAVING THIS INSPECTION PERFORMED ON THEIR SYSTEMS, AND THE PRODUCTION DEPT. ON ALL OTHERS (PDP'S, MAG. TAPES, DISPLAYS, ETC.). THE INSPECTOR ASSIGNED TO THE JOB BRINGS WITH HIM FROM QUALITY CONTROL, THE TEST AND INSPECTION ENVELOPE WHICH CONTAINS TWO SETS OF ALL THE NECESSARY INSPECTION FORMS (DF22-13, DF22-14, Q.C.-9). THE FIRST SET WILL BE USED FOR THE "INTERMEDIATE," THE SECOND ONE FOR THE "FINAL" ASSEMBLY INSPECTION. THE ENVELOPE STAYS WITH THE MACHINE.

THE WHITE COPY OF THE INSPECTION REPORT GOES TO THE PERSON IN CHARGE OF THE SYSTEM, WHO WILL BE RESPONSIBLE FOR HAVING NECESSARY REWORK AND TOUCH-UP PERFORMED. THE YELLOW COPY STAYS IN THE ENVELOPE WITH THE SYSTEM SINCE THE PEOPLE WHO DO THE REWORK HAVE TO SIGN IT OFF. THE INSPECTOR KEEPS THE GREEN COPY.

THE INSPECTOR WILL BE CALLED UP FOR REINSPECTION AFTER ALL THE REWORK HAS BEEN TAKEN CARE OF. HE SIGNS OFF THE YELLOW INSPECTION COPY. A SYSTEM CANNOT LEAVE FOR CHECK-OUT WITHOUT HIS APPROVAL.

B. FINAL ELECTRICAL AND MECHANICAL ASSEMBLY INSPECTION

THIS IS DONE BY Q.C. INSPECTION RIGHT AFTER CHECK-OUT (WHICH INCLUDES MARGINAL CHECKING AT 72°F AND 105°F, AIR BLAST AND VIBRATION TEST DONE BY THE CHECK-OUT TECHNICIANS) AND BEFORE ACCEPTANCE TEST. THE PERSON IN CHARGE OF THE SYSTEM IS RESPONSIBLE FOR HAVING THIS INSP. PERFORMED.

THE PROCEDURE FOR REWORK AND REINSPECTION IS THE SAME AS FOR "INTERMEDIATE." THE COMPUTER FINAL CHECK RECORD, MADE OUT AT LEAST IN DUPLICATE, IS ADDED TO THE INSP. FORMS AND THE TOP PAGE IS SIGNED OFF BY THE INSPECTOR AND ALSO BY THE Q.C. ENGINEER WHO GIVES THE MACHINE A LAST CRITICAL LOOK. HE AUTHORIZES THE MACHINE TO BE MOVED TO ACCEPTANCE TEST BY INITIATING THE FORM FOR THE Q.C. MGR. THE FINAL CHECK RECORD WILL ALSO BE SIGNED BY THE ENGINEER OR TECHNICIAN IN CHARGE OF THE SYSTEM, THE PROJECT AND CHIEF ENGINEER, AND THE PRODUCTION AND Q.C. MGR.

IF ANY WORK HAS TO BE DONE TO THE SYSTEM DURING OR AFTER ACCEPTANCE TEST, THE RESPONSIBILITY FOR HAVING IT INSPECTED RESTS WITH THE ENGINEER IN CHARGE. HE WILL ALSO AUTHORIZE CRATING.

ONE COPY OF THE COMPUTER FINAL CHECK RECORD GOES TO SALES (R. BECKMAN), THE OTHER ONE, PLUS ALL YELLOW ASSEMBLY INSPECTION FORMS, GO TO THE Q.C. OFFICE WHERE THEY WILL BE PUT ON FILE.

dec INTEROFFICE MEMORANDUM

DATE June 21, 1963

SUBJECT Finance Briefing Session - American Management Association, June 18, 1963
Statler Hilton Hotel, New York City

TO Ken Olsen
Harlan Anderson
Stan Olsen
George O'Dea
Win Hindle

FROM Dick Mills

Introduction:

On June 18, I attended a Finance Briefing Session of the AMA, in New York, where the final Internal Revenue Service, Treasury Department Corporate Tax Rules and Guidelines were discussed with an introductory speech made by Mortimer M. Caplin, Commissioner, Internal Revenue Service. The primary subject matter was Travel and Entertainment Expenses, Guidelines for Computing Depreciation Allowances, Investment Tax Credit, Foreign Tax Credit and Self-Employment Retirement Contributions. I attended the Travel and Entertainment Expense Session, Investment Tax Credit and the Foreign Tax Credit Sessions.

Travel and Entertainment Expenses:

The Three panelists were, two from the Internal Revenue Service and one from the U.S. Treasury Department, who stated that the final regulations on Travel and Entertainment Expense will be out this week. The emphasis of their discussion was on the atmosphere attendent to the entertainment being conducive to a business discussion. They state, that if the entertainment were socially motivated, it would not be allowable as an entertainment deduction, however, legal counsel from the U.S, Treasury Department, stated that in some cases, home entertainment would not be socially motivated and thus would be subject to deduction. This conversation went on for seventeen minutes around the point of the atmosphere surrounding the business discussion. The net result of all this was, that it would be a difficult job for a person to differentiate between a social or a business oriented entertainment, where the entertainment was for customers of long standing who are friends. This in effect set

the tone of the entire meeting and was somewhat of a disappointment to me and many others, since we expected more of the philosophy of the Government in their attitude towards business in taking T&E deductions.

Robert F. Hannan of the Internal Revenue Service stated that, what the Internal Revenue Service was really after, were those people who are abusing Travel & Entertainment Expense Regulations. He stated, that the acid test would be to show that the entertainment was directly related to business with the following three hurdles to get over:

1. It must have more than a general business purpose.
   The words "general business purpose" were meant to mean a sort of missionary work on the part of a company, versus entertainment directly related to a firm business discussion as regards a contract or an order for business.
2. It must be proven that an actual business discussion took place.
3. The tone of the meeting must be business rather than social.

The next major area of discussion was entertainment facilities, which meeting I passed up, since we have no facilities, such as hunting lodges, yachts, golf courses, rest homes, etc.

I passed up the rest of the Travel & Entertainment Session until the afternoon session at 4 O'clock, where the questions resulting from the groups from the morning session getting together, would be asked of the panel and I hoped that this would be a real meaty session, but it was far from it. The first question to be asked was, " I am down here at this session, which is a business connected meeting, If I went to a night club tonight, would this be an allowable entertainment expense?". This question took eleven minutes to dispose of and it never should have come up at all. The next three questions were oriented toward the types of business discussions necessary to qualify with the emphasis on specific order entertainment rather than general entertainment of a good customer.

Summary:

The net overall effect of this entire session was that entertainment expenses, in order to be deductible, must have a closer relationship to the conduct of the business; With emphasis on a business discussion preceding or following the expenditure and with nightclubs, theaters, sporting events, cocktail parties, hunting or fishing trips and yachts, being considered outside of entertainment expenses, unless the taxpayer can clearly show that this was necessary for him to obtain this business and that it could not be obtained any other way.

Travel Allocation Rules:

A significant item of change is the allocation of the personal portion of travel expense on business trips which are combined with vacations. This expense will be disallowed if, 1) the trip lasts more than a week; 2) the personal portion accounts for 25% or more of the total time on the trip; 3) the traveler had substantial control arranging the business trip; 4) a major consideration in deciding to make the trip was to have a vacation.

Accounting Treatment of Investment Tax Credit:

This discussion was led by Andrew Barr, who is chief Accountant for the Securities and Exchange Commission, and revolved around the Balance Sheet treatment of the Investment Tax Credit. The preferred treatment is to show the Investment Tax Credit. The preferred treatment is to show the Investment Tax Credit as deferred income rather than netting it out against the tax liability, which will facilitate adjustments in the event of sale. The SEC will accept the opinion issued by the Accounting Principles Board of the American Institute of American Certified Public Accountants, which was arrived at after considering the following:

1. Subsidy by way of a contribution to capital
2. Tax reduction

a) The basis of the property will be reduced for tax purposes by the amount of the Investment Credit

b) The 48 - 52% method, which in effect means that only 48% of the Investment Credit would be reflected in income, being that portion which would normally reside as an increase in that income and that 52% would be the tax expense to be deferred to subsequent accounting periods, to be written off over the lives of the assets.

3. Cost Reduction:

This involves a direct credit to an expense normally depreciation within the year of the Investment Tax Credit.

The conclusions of the AIA:

1. The allowable Investment Credit should be reflected in net income over the productive life of acquired property.

2. Alternative choices for recording the credit are available with their recommendation of reducing the cost of the asset - thereby reclaiming to income the Investment Credit over a reduced depreciation charge.

Another treatment is to set it up as deferred income with credits being made in each year appropriate to the life of the property. The P&L treatment to reflect the credit against income tax is considered proper, provided that a corresponding charge is made to the provision for depreciation or some similar account of a deferred nature.

Further discussion was made of the reserve ratio test and that the fact that fully depreciated assets must be included. This test is to determine whether or not the lives used in depreciation are reasonable since a rising ratio of reserve to total cost will indicate that the lives used are short, where a declining ratio will show the opposite. Rate of growth figures are also developed in computing this test and this would appear to be the place to make a stand. It will be three years before there are any problems regarding application of the reserve ratio test.

Foreign Tax Credit:

This session was used primarily to work thru the Form - 1118, which is a statement to support the claiming of foreign taxes as a credit against U.S. Taxes. The primary difference between the previous code and the 1962 Code, is that previously, only dividends withdrawn from the foreign corporation and brought to the United States were taxable in the U.S. ..... under the 1962 law, all income of the foreign subsidiary is taken into income of the U.S. Parent Corporation in the year earned, rather than the year withdrawn as dividends.

INTEROFFICE MEMORANDUM

DATE June 20, 1963

SUBJECT Digital Equipment G.m.b.H.
Month of May 1963

TO
Ken Olsen
Harlan Anderson

FROM George O'Dea

cc: Stan Olsen
Jon Fadiman
Dick Mills
Guenter Huewe

The attached trial balance indicates that Munich has started modestly enough by recording expenses of $1,405 against no income for a net loss of the same amount. Since their expenses are on a cash basis the true loss is probably somewhat higher. This will flush out in June.

Guenter did book his first piece of business, an order for $120 (before duty, etc.) for 2 modules. In June he will receive a credit of $2,600 from Jon's System profit for services rendered in installing the Siemens unit and for standing by against the need for in-warranty repair.

He has not as yet taken up the old DEC Bank Balance of $2,300, no doubt to defer the payment of the 2 1/2% Capital Transaction Tax.

Guenter gave us a Sales forecast of $165,000 in new business for his first year which should convert to approximately DM 770,000 after adding on the export expenses. In the Prospectus dated June 18 we made the assumption that the billings through 7/31 would approximate 10% of the year's income. At this writing there is no reason to assume the forecast results are unlikely to be realized.

George

GO'D:ncs
Attachment

Digital Equipment GmbH
from Trial Balance at 5/31/'63

Balance Sheet	DM	# at 1/4 DM
Cash	DM 15320	# 3830
Deposit	185	46.25
total assets	15505	3876.25
Current liabilities (Payroll Tax)	1124	281
Net Worth	DM 14381	# 3595.25
Authorized Stock	DM 80000	# 20000
less unpaid	60000	15000
paid in Capital	20000	5000
less deficit	(5619)	1404.75
Shareholders Equity	DM 14381	# 3595.25
Profit & Loss		
Income	DM -	# -
Expense		
Salaries	4000	100000
Payroll Taxes	58	1450
Supplies	390	9750
Travel	1058	26450
All other	113	2825
total expenses	5619	140475
Net Loss	DM 5619	# 140475

INTEROFFICE MEMORANDUM

DATE June 20, 1963

SUBJECT #24 Serial Drum Prices

TO
K Olsen
H Anderson
S Olsen
N Mazzarese
R Maxcy
J Atwood
S Grover
W Hindle
R Mills
R Beckman
R Best
G Bell
E T Johnson

FROM Arthur Hall

Several weeks ago, the Computer Guidance Committee considered serial drum price changes which would make the price relationship between drums more consistent. It was agreed that the prices would be changed and that H Anderson and A Hall would decide upon the exact figures.

H Anderson has approved the following prices which shall be effective July 1st. Unless comment or complaint concerning these prices is received by A Hall by June 26th they may be quoted to all and sundry starting June 27th.

16 K drum	$36,200
32 K drum	$38,680
64 K drum	$43,400

In contrast to the previous situation, all of these drums may be field retrofitted to 64 K without replacing the drum itself.

Cost of field retrofit is the cost of parts (see below) plus labor at $20 per hour (per any number of men) plus travel and living expenses.

Additional drum heads	$20/head	64 per 16K
Additional diode boards w/diodes	$210/board	4 per 16K
Additional modules	$84/module	2 per 16K

Estimated time for field retrofit

16K to 32K	32 calendar-hrs. 48 man-hrs.
32K to 64K	40 calendar-hrs. 60 man-hrs.

AH:ASJ

K. Olsen

INTEROFFICE MEMORANDUM

DATE June 19, 1963

SUBJECT OBSOLETE STOCK ROOM MODULES

TO Whom It May Concern

FROM Bill Farnham

ITEM	QUAN	MODEL
1.	2	601
2.	1	602
3.	10	775
4.	10	1103
5.	23	1141
6.	59	1151
7.	24	1546
8.	35	1549
9.	30	1553
10.	22	1555
11.	10	1569
12.	8	1606
13.	3	1608
14.	2	1667
15.	35	1673
16.	29	1682
17.	40	1683
18.	1	1919
19.	11	1950
20.	22	1974
21.	12	1975
22.	32	1977
23.	16	1980
24.	152	1984
25.	4	1985
26.	10	1987
27.	15	3112
28.	2	3201
29.	12	3202
30.	9	3406
31.	16	3601
32.	10	4117
33.	12	4128
34.	9	4157
35.	98	4203
36.	14	4217
37.	6	4406
38.	1	4407
39.	35	4700D
40.	1	5401
41.	4	6101
42.	13	6160
43.	1	POWER CORD
44.	1	POWER CORD AND
	20	BATTERIES ENCLOSED IN LEATHER CASING.

The above is a list of modules that are in the Obsolete Stock Room. They will be distributed to anyone who wants them on a first-come, first-served basis. Please contact Bill Farnham, extension 377, when you want to use any of the above obsolete stock.

dec INTEROFFICE MEMORANDUM

DATE June 18, 1963

SUBJECT COMPUTER SCHEDULING

TO COMPUTER USERS

FROM Sandy Moore

Requests for computer time should be as accurate as possible. The computers are in great demand, and in order to provide time to all those who need it, it is important not to over-schedule.

When you use the computer always sign the log book. This is important for maintenance records, and to determine the needs of different groups of people for computer time. Requests for computer time will be compared with entries in the log books.

TECHNICAL PUBLICATIONS KEY PROJECT LIST - 6/17/63

Job No.	Job Title	Review Week	Due Week	Now Due
	Public Relations			
1509	1963 Annual Report	7/1+7/8	8/26	
1511	June ON LINE	6/10	6/17	
1512	July ON LINE	7/1	7/15	
	Sales Promotion			
3329	May-June General Mailing	6/10	6/17	
3335	July General Mailing	6/24	7/22	
3415	WESCON Display	7/1	7/29	
3416	APA Display	7/8	8/4	
3417	ACM Display	7/8	8/4	
3418	INEL Display	7/8	8/4	
3419	ISA Display	7/22	8/19	
3523	MICRO TAPE Bulletin	6/10	6/24	
3542	One MC Module Bulletins	6/10	6/24	
3543	Revised PDP-4 Brochure	7/1	7/15	
	Technical Information			
5505	CRT 30C Manual	--	6/17	
5506	CRT 31A Manual	6/17		
5507	Card Punch 40 Manual	6/17		
5508	Card Reader 41B Manual	NS		
5509	PDP-1 In-Out Manual	NS		
5510	Memory Tester 1521 Manual	--	7/1	
5513	Mag Tape 50-51-52 Manual	6/17	7/1	
5529	New DECAL Manual	NS		
5530	New MACRO Manual	NS		
5536	Tape Control 57 Short Form Manual	--	6/24	
5538	Core Tester 2115 Manual	NS		
5539	Memory Tester 1516 Manual	--		
5541	Core Tester 2110 Manual	6/10		
5549	CRT 31 Manual	6/24		
5559	NSA A/D/A Manual	6/10	6/24	
5561	New PDP-1 Short Form Manual	6/10	7/1	
5562	Data Channel 123 Description	--	6/24	
5563	Line Printer 64 Manual	--	6/24	
5566	Controls 131/510 Manual	6/17	6/24	
5567	PDP-5 Short Form Manual	7/1	7/15	
	Graphic Arts Services			
8027	Digital Quotation Form	6/10	7/15	

INTEROFFICE MEMORANDUM

DATE June 13, 1963

SUBJECT Lab. modules returned from MIT

TO Bob Hughes

FROM Klaus Doering

cc: D. Caboury
C. Kendrick
K. Olsen
S. Olsen
J. Myers
M. Sandler

Problems:

1. The configuration of the holes in the back panel was off specifications so that the module could not be plugged into the mounting panel.
2. The retaining screws (C) that hold the card in the housing were loose or missing.
3. Handles (D) were missing.

Analysis of problems:

1. The layout of back panel was that "A" was on the right of the center line and holes 1 through 5 on the left and inverted, i.e. the panel was turned around by 180°. (refer to enclosed pictures)

2. Two causes are possible: a) The retaining screw hole of the housing is off center by 1/64 one way and the mounting hole of the circuit bracket is off by 1/64 the other way which is within the drawing tolerance. Thus the retaining screw will start to engage tilted. One now has to use quite some pressure to turn the screw further in. Result: the press nut which the screw is to be turned into, is pushed out of the circuit bracket and no further tightening is possible.
b) Or somebody uses too much pressure even when the thread and mounting hole do line up-- thus causing the same damage.

   The screw then either stays in half engaged or can fall out if shaken often enough.

3. The handle was added to the module recently and it was decided that only modules built from then on would have it.

Action taken to solve the problems:

a. Finished goods room reinspected immediately. Result: 8 rejects out of 379 pieces (4 for(1), 1 for(2), 1 for improper hole line-up, 2 for paint defects. Parts were sent to production for repair, will be reinspected and if OK, will go back to finished goods.

b. 268 modules in finished goods marked with a code as having no handle to allow sales to distinguish between the two kinds.

c. 4 returned modules from MIT sent to production for repair. Same procedure as above. Customer received new modules.

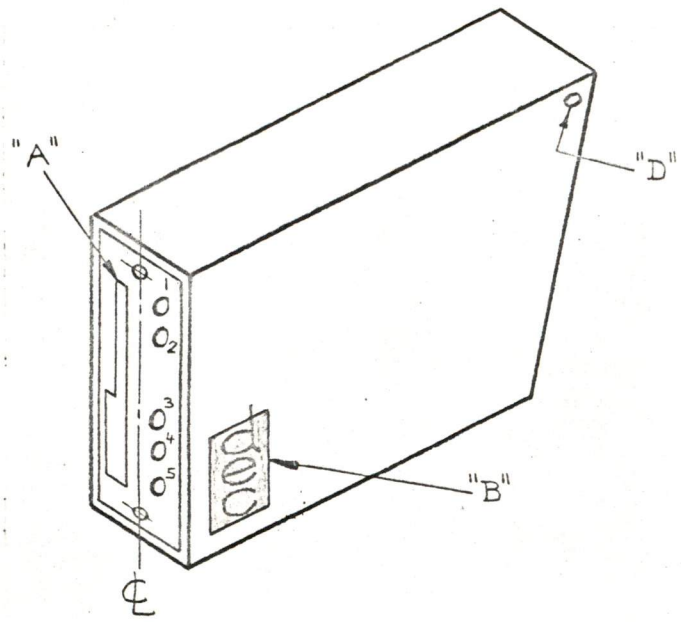
d. Enclosed pictures with written procedure initiated 5/7/63, made up and distributed to production and Q.C. inspection to put even more emphasis on the importance of inspecting certain features.

e. Production cautioned to follow enclosed inspection procedure initiated and agreed on on 4/16/63, as approximately 30 modules entered finished goods without mechanical inspection.

Further action on next production run of lab modules:

Checking whether housing and circuit bracket tolerances will add up significantly often and if so tighten tolerances.

MECHANICAL INSPECTION CRITERIA FOR ASSEMBLED LAB MODULES



MAKE SURE THAT:

A) DEC SYMBOLS ("B") ARE AT THE LOWER END OF THE HOUSING AS SHOWN AND THAT COMPANY NAME AND ADDRESS "A" ARE ON THE LEFT SIDE OF THE CENTER LINE AS SHOWN.

C) IF CONDITION A) EXISTS, THE HOLES "3", "4", AND "5" HAVE TO BE AT THE BOTTOM END OF MODULE AS SHOWN.

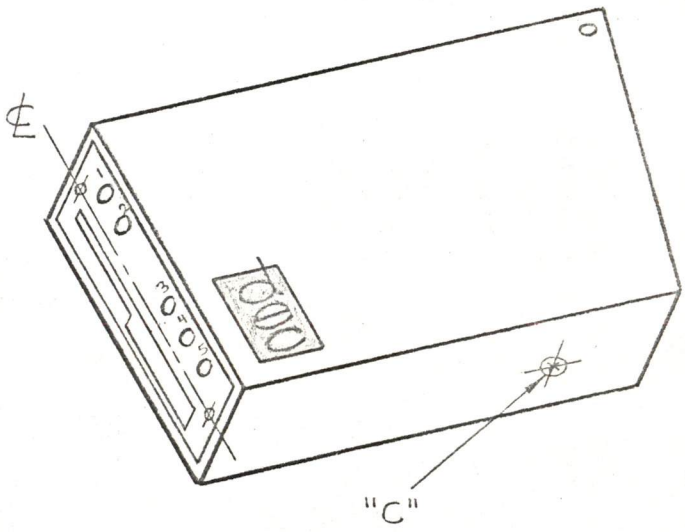
D) HOLES 1 THROUGH 5 ARE CORRECTLY LINED UP, SPACED AND OF PROPER SIZE.

USE SPECIAL INSPECTION FIXTURE SUPPLIED BY Q.C. ENGR.

E) HANDLE BAR "D" IS ASSEMBLED IN LOCATION AS SHOWN, BUT FLUSH WITH HOUSING SURFACE AND COVERED WITH PAINT.

F) PAINT CONFORMS WITH DEC PAINT STD. # 1.

G) OVERALL ASSEMBLY AND APPEARANCE CONFORMS WITH GOOD WORKMANSHIP STANDARDS.



B) LOCK SCREW "C" IS PUT INTO CORRECT LOCATION, CENTERED AS SHOWN AND TIGHTENED.

5-7-63 dbs

4/16/63
Q.C. bb

SUB ASSEMBLY INSPECTION PROCEDURES

POWER SUPPLIES

AFTER ASSEMBLY, THEY GO THROUGH MECH. INSPECTION, DONE BY Q.C. (D. GABOURY). IF ACCEPTED, THOSE POINTS OF THE TWO TEST DATA SHEETS THAT INCLUDE THE MECH. INSPECTION FEATURES WILL BE MARKED OFF AND THE SHEETS RECEIVE THE INSPECTOR'S STAMP AT THE BOTTOM RIGHT-HAND CORNER.
THE POWER SUPPLIES THEN GO TO PRODUCTION (PAUL GREEN) FOR ELECT. TEST. IF ACCEPTED, THE ELECTRICAL TEST POINTS OF THE TEST DATA SHEETS WILL BE MARKED OFF AND THE TESTER'S STAMP ADDED AT THE BOTTOM RIGHT-HAND CORNER.

MOUNTING PANELS

AFTER ASSEMBLY, THERE ARE TWO COURSES OF ACTION POSSIBLE:

1) THE GIRLS IN PRODUCTION DO THE ELECT. TEST. THAT MEANS IF PARTS ARE ACCEPTED, THE POINTS OF THE TWO TEST DATA SHEETS THAT INCLUDE THE ELECT. TEST FEATURES WILL BE MARKED OFF AND THE TESTER'S STAMP ADDED AT THE BOTTOM RIGHT-HAND CORNER.
   THE PANELS GO TO Q.C. FOR MECH. INSPECTION WHERE, IF ACCEPTABLE, THE MECH. POINTS OF THE TEST DATA SHEETS ARE MARKED OFF AND THE INSPECTOR'S STAMP ADDED AT THE BOTTOM RIGHT-HAND CORNER.
2) OR THE PANELS GO FROM ASSEMBLY TO Q.C. FOR MECH. INSPECTION BEFORE ELECT. TEST. THEN THE MECH. INSPECTION WILL BE DONE FIRST AND THE ELECT. TEST--DONE BY PROD. (PAUL GREEN)--WILL FOLLOW. TWO TEST DATA SHEETS ARE FILLED OUT AND STAMPED AS DESCRIBED IN 1).

LAB MODULES, CLASSROOM MODULES, CURRENT DRIVERS, CURRENT CALIBRATORS

AFTER ASSEMBLY, THEY GO TO Q.C. FOR MECH. INSPECTION WHERE, IF PARTS ARE ACCEPTABLE, THE MECH. INSP. POINTS ON THE BACK SIDE OF THE TEST DATA SHEETS ARE MARKED OFF AND THE INSPECTOR'S STAMP ADDED UNDERNEATH THE INSPECTION CHECK LIST. THEN THE PARTS GO THROUGH ELECT. TEST AND SOLDER INSPECTION, DONE BY PRODUCTION (HERB NORTON). IF PARTS ARE ACCEPTABLE, THOSE POINTS OF THE TWO TEST DATA SHEETS THAT INCLUDE THE ELECT. TEST AND SOLDER INSPECTION FEATURES WILL BE SIGNED OFF AND THE TESTER'S STAMP ADDED AT THE RIGHT BOTTOM CORNER.

DISPOSITION

FINALLY, ALL THE DIFFERENT SUB ASSEMBLIES ARE PACKED OR NOT--DEPENDING ON WHETHER THEY ARE SOLD OR INTERNALLY USED--AND GO DIRECTLY TO "FINISHED GOODS." IN ANY CASE, BOTH TEST DATA SHEETS HAVE TO ACCOMPANY THE MATERIAL. NO PART MAY ENTER (EXCEPT SYSTEM MODULES) "FINISHED GOODS" WITHOUT BOTH THE MECH. AND ELECT. INSPECTOR'S STAMP ON THE TEST DATA SHEETS. SYSTEM MODULES MAY ENTER "FINISHED GOODS" DIRECTLY FROM PRODUCTION TEST.
AT RECEIPT IN "FINISHED GOODS," THE 2ND TEST DATA SHEET IS TAKEN OFF THE PARTS, STORED AND SENT TO THE Q.C. OFFICE BY THE END OF EVERY WEEK.

INTEROFFICE MEMORANDUM

DATE June 10, 1963

SUBJECT PDP-4 FOR THE UNIVERSITY OF WASHINGTON

TO K. Olsen

FROM G. Moore

cc: H. Anderson
S. Olsen
N. Mazzarese

Dr. Allen Scher of the Department of Physiology and Biophysics at the University of Washington in Seattle is going to purchase a small computer. His initial application will be to reduce data for subsequent further processing on the University of Washington's 7090. Eventually he will use it for other applications, including on-line applications. Dr. A. C. Young, also of the Department of Physiology and Biophysics, will possibly be contributing some of his grant funds toward the computer, and will also be using it. Dr. Theodore Kehl, a young post doctorate, will be working with Scher and Young on the computer.

Dr. Scher is presently considering CDC, SDS, 3-C, ASI, and Packard-Bell computers in addition to DEC's PDP-4 for his installation. He thinks PDP-4 is one of the strongest contenders in the area of in-out processing.

The PDP-4 configuration which he would most likely be interested in and the corresponding prices are as follows:

Basic PDP-4	$56,500	
Printer Keyboard	5,000	
Perforated Tape Punch	4,000	
4096 Word Core Memory Module	14,500	
Extended Arithmetic Element	6,300	
New Tape Control	24,000	(estimate)
Midwestern Tape Transport	24,000	(estimate)
A-D Converter	5,000	(estimate)
8-Channel Multiplexer	4,450	
Total System Price	$143,750	

Scher expects to have his specifications ready for bidding by the end of June.

I believe the discount that is offered Scher will be a large factor in his selection of a supplier. I further believe that it is sufficiently important for us to get a PDP-4 into his department

to justify our offering a sizable discount. My judgment of the importance of selling Scher a PDP-4 is based on two criteria:

1) What stature does Scher and his department enjoy?

2) How intelligently would Scher use a small computer?

The University of Washington appears to have one of the most highly regarded physiology departments in the country. According to Dr. Kehl, it is the largest department in the country in terms of the number of post doctoral fellows (Ph.D. and M.D.). A majority of the post doctoral fellows both in and out of the department take Dr. Young's course in biomedical instrumentation. Dr. Kehl is teaching a course in digital techniques and will be developing a series of courses to follow it. This particular course is a special training course presented under a research methods training grant from N.I.H. It is required of the participants in the research methods program who are primarily medical school students. However, nearly an equal number of post doctoral fellows and faculty members attend the course. Present policy is to develop the training program into a degree course in five years.

Dr. Young is a Ph.D. in physics. According to Dr. Kehl, Young has worked with all the great names in physiology of the present day, including Bronck, Hartline, and Fenn. Dr. Scher is reputedly internationally known for his work on systems analysis of the cardiovascular system. These two men both contributed to the "Textbook of Medical Physiology and Biophysics", which, according to the publisher, Saunders and Co., is the largest selling and most widely used physiology textbook in the country. The book was edited by Ruch, Chairman of the Department of Physiology and Biophysics at the University of Washington, and by Fulton at Yale. Parts of it were contributed by eminent men in the field from all over the country. As I examined the books, it appeared that the largest number of contributors were from the University of Washington.

Dr. Kehl received his Ph.D. in Zoology from the University of Wisconsin. He has had considerable computer experience. He has programmed the 7090, 650, 704, 1620, 160A, and 1604. He taught a programming course at the University of Wisconsin. Last summer he assisted Ross Adey at UCLA in teaching a course on the use of digital computers in biological research. (Ross Adey is at UCLA's Brain Research Institute and has a CDC 160A of his own.)

I have a suspicion that the University of Washington is slightly prejudiced in favor of a 160A, if only for the reason that Kehl has had more experience with CDC equipment. I expect that their prejudices will show in their specs when they are sent out at the end of June. Therefore, it would be a good idea to bend their prejudices towards a PDP-4 by offering a discount before the specs are completed. I suggest that we offer a 30% discount.

GTM:vg

dec INTEROFFICE MEMORANDUM

COMPANY CONFIDENTIAL

DATE June 10, 1963

SUBJECT

TO Ken Olsen

FROM George O'Dea

cc: Harlan Anderson
Stan Olsen
Dick Mills

You can't do something like this without being real arbitrary - so I was real arbitrary.

Using Stan's estimate for allocation of Sales expense, Atwood's estimate for Technical Publications, and c/s for the rest, I get

Modules earned 21% on the Billing dollar after taxes
PDP-1's (Incl.ADX & Accessories) earned 13% after taxes
Jon's systems are earning 6% after taxes.

The culprit is the PDP-4. We've only billed three of these all year. Their gross profit isn't enough to offset the development cost of this year - let alone prior year development - and current SG&A.

I'm sure we could argue about the specific percentages - but probably would agree about the rank.

When you consider that the PDP-4 is only half the price of the PDP-1 you'd expect it to do better - yet it's only had one customer - Foxboro-with some interest on the part of JPL.

George

GO'D:ncs
Attachments

DEC PRODUCT P & L

1st 10 Mos., Fiscal '63

	Net Sales	Mfg. Cost	Gross	Expenses	Pre-Tax Profit	Tx.	Profit	%
PDP-1's	$4,257	$1,953	$2,304	$1,099	$1,205	$663	$542	13%
PDP-4's	161	83	78	405	327 Loss	180 Cr.	147 Loss	Loss
PDP-5&6	-	-	-	42	42 Loss	23 Cr.	19 Loss	Loss
Sub Total Computers	$4,418	$2,036	$2,382	$1,546	$ 836	$460	$376	8%
Special Test Systems	957	618	339	216	123	67	56	6%
Modules	2,862	924	1,938	715	1,223	673	550	21%
DEC Total	$8,237	$3,578	$4,659	$2,477	$2,182	$1,200	$982	12%

Numbers of Transactions During the Period

	Transactions	Profit per Transaction
PDP-1 & Accessories	65	8K
PDP-4	3	-
Systems	35	2K
Modules ($2,862 ÷ 80 = 35,750 units or about 360 transactions)	360	2K

Computers	Net Sales	Cost of Sales	Gross Profit	Selling	Tech Pub	Admin	Co Sponsored Engrg	Other Expense	Pre Tax Net	Tax	Net	% Net to Sales
PDP-1 Sales	1592	663	929									
Rentals	69	31	38									
Reserve for Warranty	70 cr	-	70 loss									
Field Service	5	64	59 loss									
	1596	758	838	119	31	126	192					
PDP-4 Sales	163	71	92									
Reserve for Warranty	3 cr	-	3 loss									
Field Service	1	12	11 loss									
	161	83	78	119	31	126	129					
Accessories Sales	2663	1171	1492									
Reserve for Warranty	4 cr	-	4 loss									
Field Service	2	24	22 loss									
	2661	1195	1466	119	31	126	313	42				
New Products							42					
total computers	4418	2036	2382	357	93	378	676	42	836	460	376	8%
Special Test Systems	957	618	339	-	35	115	66	-	123	67	56	6%
Lab Modules	177	59	118				10					
All other Modules + Misc	2685	865	1820				191					
total Modules	2862	924	1938	238	105	171	201	-	1223	673	550	21%
Grand Total	8237	3578	4659	595	233	664	943	42	2182	1200	982	12%

Notes (written vertically beneath columns):

- Selling: Per Stone — 60% Computers, 40% Modules, 0 Systems
- Tech Pub: Per Atwood — 45% Modules, 40% Computers, 15% Systems
- Admin: as a % of Cost of Sales — Computers 56.9%, Mod 25.8%, Systems 17.3%
- Co Sponsored Engrg: from work order totals

COMPANY CONFIDENTIAL

INTEROFFICE MEMORANDUM

DATE: 6/6/63

SUBJECT: Computer Sales Forecast

TO: K. Olsen
H. Anderson
G. O'Dea
W. Hindle
D. Best
D. Mills
S. Olsen
M. Sandler

FROM: N. Mazzarese

Computer Orders (0-3 Months)

Customer	Quantity	Type	Value	Probability
BBN	1	PDP-1	400K	90%
Raytheon (Wayland)	1	PDP-1	120K	80%
Beckman Instruments	2	PDP-1	200K	90%
Holloman AFB	1	PDP-1	150K	50%
Michigan University	1	PDP-1	150K	90%
Harvard University (Psychology)	1	PDP-4	75K	75%

Computer Orders (3-6 Months)

Customer	Quantity	Type	Value	Probability
Univ. of Rochester	1	PDP-1	150K	50%
MIT	1	PDP-1	200K	75%
Bell Labs.	1	PDP-4	80K	50%
JPL	2	PDP-4	200K	75%

Less than 50% (0-6 Months)

Customer	Type	Value
Sylvania	PDP-1	Rental
Raytheon Co.	PDP-1	120K

Less than 50% (0-6 Months) Cont'd.

Customer	Type	Value
Maryland University (Physics Dept., Psychology)	PDP-1, PDP-6	120K
Rutgers Univ. (Physics Dept.)	PDP-1	120K
Harvard University (Physics Dept. CEA)	PDP-1	120K
Wisconsin (Chemistry Physics)	PDP-1	120K
Minn-Honeywell (Brighton)	PDP-1	300K
Litton Systems	PDP-4	80K
V.P.I.	PDP-4	50K
Northwestern Univ. (Dearborn Observatory)	PDP-4	253K
Washington University (Physics & Physiology)	PDP-4	100K
Technical Measurements Corp.	PDP-5	40K
Beckman Instruments (Navy)	PDP-4	70K
Duke University	PDP-4	80K
IEC - Paramus	PDP-4	80K
Coast & Geodetic Survey	PDP-4	80K
Tokyo University	PDP-1	?

Computer Option Orders (3-6 Months)

Customer	Option	Value	Probability
Princeton	Peripheral Equipment	75K	95%
Stanford Univ.	Peripheral Equipment	100K	80%

Orders Received

Customer	Delivery Date
Adams Assoc. System Development Corp.	Installed 9/63

INTEROFFICE MEMORANDUM

DATE June 5, 1963

SUBJECT

TO Works Committee
K. Olsen

FROM J. Smith

Date of last report: April 24, 1963

PDP-1

Additions:

	Probable delivery
Raytheon	July 1963
Beckman #3	Sept 1963
Beckman #4	Oct 1963

Deletion:

BBN	Sept 1963

During this period, machines were shipped to Stanford University and MIT. The MIT machine being on a loan basis. PDP-1 which was out on loan to Adams was returned. Princeton University will receive their machine this month. In turn, the machine they presently have will be loaned to Rutgers.

It should be noted that the added probabilities leave the available for commitment balance at 0 for August - 1 for September and 0 for October. This would suggest a trend toward a four month delivery of computors starting in the month of August. If it is desired to improve on this situation, additional production starts should be generated this month.

PDP-4

Additions:

	Probable delivery
JPL #3	July 1, 1963
JPL #4	July 1, 1963
I.E.C.	August 1963
Beckman	Sept 1963

Deletions:

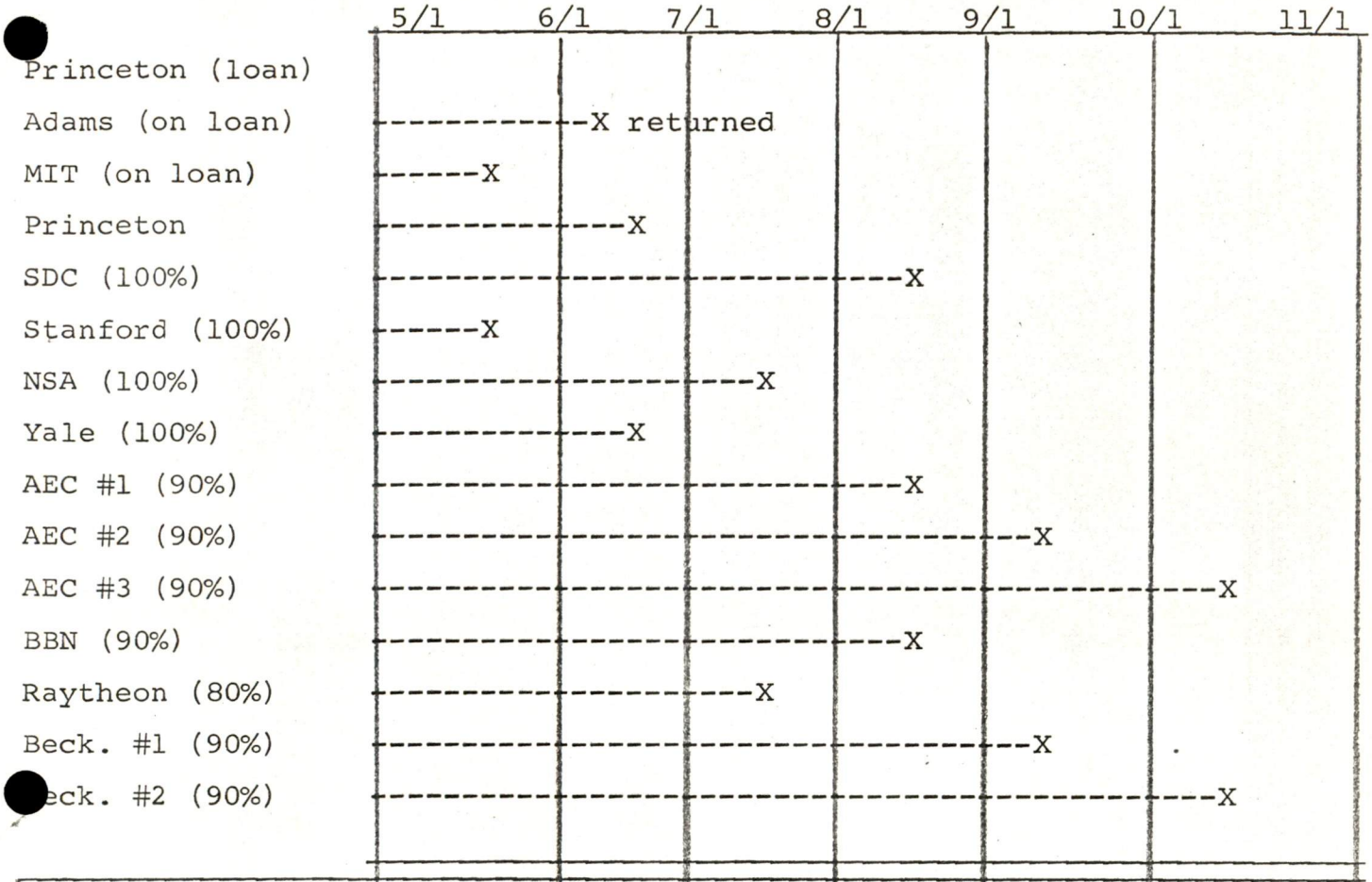
None

During this period, machines were shipped to JPL, Kie Corporation and DEC (Eng.). Even with added probabilities, the available for commitment balance remains at an adequate level.

J. Smith
June 4, 1963

Computer Delivery Probability

PDP-1



	5/1	6/1	7/1	8/1	9/1	10/1
In Checkout	7	7	6	5	3	2
Shipments	2	2	2	3	2	2
Reserved for* Customer Order	4	3	3	2	2	0
Available for Commitment	+1 #41	+2 #41 #44	+1 #45	0	-1	0
On loan	3	2	2	2	2	2
*	SDC NSA Yale Princeton	SDC NSA Ray. (38)	SDC AEC#1 (41) BBN(44)	AEC #2 (45) Beck.#1 (46)	AEC #3 (47) Beck.#2	

J. Smith
June 4, 1963

Computer Delivery Probability

PDP-4

	5/1	6/1	7/1	8/1	9/1	10/1	11/1
Mass. Gen. (on loan)							
JPL #2 (100%)	----------X						
Harvard (loan)	----------X						
Fox. (U.S.)(100%)	----------X						
Fox. (50%)	----------X						
Bell Labs (70%)	----------X						
AECL (80%)	----------X						
DEC (Eng.)	-----X						
JPL #3	----------X						
JPL #4	----------X						
IEC	----------X						
Beck.	----------X						
In Checkout	9	9	5	4	4		
Shipments	1	5	2	1	1		
Reserved for* Cust. Order	5	2	1	1	1		
Available for Commitment	+3	+2	+2	+2	+2		
On loan	1	2	2	2	2	2	
*	JPL #2 Fox.(US) Harvard JPL #3 JPL #4	Fox. Bell Labs	IEC	Beck.	AECL		

INTEROFFICE MEMORANDUM

DATE June 5, 1963

SUBJECT Fiscal '63 Annual Report

TO Ken Olsen
Harlan Anderson

FROM George O'Dea

Jack Atwood's memo of 5/28 (Attached) has all of the sounds of a full blown annual report.

If we are going to publish anything at all I would recommend that we limit it to a Balance Sheet and P&L (current and prior year only) with perhaps a cover letter by yourself stating that this is the first time DEC has revealed its financial record. A single sheet folding down into four pages would do it nicely.

The biggest reason for this recommendation is the simple fact that in DEC's case the figures speak far more eloquently than words.

Literally nothing is to be gained by adding conversation to the report.

George O'Dea

GTO'D:ncs
Attachment

dec INTEROFFICE MEMORANDUM

DATE May 28, 1963

SUBJECT 1963 ANNUAL REPORT

TO ~~K. H. Olsen~~ FROM J. L. Atwood

If we are going to do an Annual Report this year, we certainly should have it available by September 13th for General Doriot's talk in New York. As a matter of fact, I had in the back of my mind the possibility that the General would still be interested in mailing copies of our Annual Report with his Mid-Year Report in August. That was the information Bill Congleton relayed to us the afternoon we went over the annual report problem immediately prior to the ARD Annual Meeting.

In any case, it would be a very good idea for us to begin early in June outlining and drafting the text for a report. This would give us a good month before the closing of the fiscal year to decide what, if anything, we want to say. Once the text and illustrations are determined, it becomes a relatively simple matter to insert the financial figures and go to press.

K. Olsen

dec INTEROFFICE MEMORANDUM

DATE June 5, 1963

SUBJECT Programming Notes

TO PDP-4, PDP-1 List

FROM Dit Morse

There occasionally arise topics concerning programming conventions, etc., which do not require a permanent memorandum or program write-up. Such things may be very nicely covered by a "programming note".

Programming notes will be distributed to the PDP-4 and/or the PDP-1 distribution lists. People wishing to distribute programming notes are requested to do so through the Programming Group. Copies will be available through the program library or Programming Group.

Attached is the first PDP-4 programming note

cc: Sandy Moore

DHM/nbh

PDP-4 PROGRAMMING NOTE 1

SUBJECT: Conventions for library subroutines using the program interrupt

The subroutine should exit by the use of the instruction DISMIS, which will be defined in the main program as a jump to the routine which will dismiss the interrupt.

The subroutine write-up should specify the name of the place to which control should be transfered when the flag for the devices becomes a 'one'. The subroutine should turn off the flag before dismissing the interrupt.

The user of the subroutine must insure that the I/O device flags are clear before execution of the program begins. In addition the user should supply the DISMIS routine and the sequence of instructions to check the I/O device flags.

dec INTEROFFICE MEMORANDUM

DATE June 4, 1963

SUBJECT PDP-6 Console

TO Ken Olsen
Gordon Bell
Arthur Hall
Dit Morse

FROM Allan Kotok

The present PDP-6 console has aspects which I find objectionable. These are:

1) The display is mounted with its screen vertical, and much too high.

2) The punch is too high.

3) The microtape is too high.

4) The typewriter is not an integral part of the console.

5) The user faces the computer, which is akin to having a desk which faces the wall.

I, therefore, suggest a radical departure from this console. I propose a separate console, consisting of a table with wings. One wing would have the display, with the CRT sunk into the table, at a thrity degree angle from the horizontal, so it is possible to use a light pen without wearing out one's arm.

The necessary keys and switches could be mounted on a plate, not unlike the PDP-1 prototype. The typewriter should be mounted on the console, with adequate room on both sides for papers.

I believe that we are fooling only ourselves if we do not provide a usable location for the paper tape reader. This unit could also be sunk into the table at an angle.

The tape punch and microtape units are necessary, but need not be quite so convenient, since they will not be handled often.

The separate console allows much more flexible room arrangement and allows the console to be placed so that the operator may see his mag tapes and other peripheral equipment. It also shortens the computer by two bays.

Most people like to operate a computer in a seated position, so all equipment should be accessible from that position. Any chair provided should have wheels, so it is easy to get around.

I believe we will cripple the utility of the PDP-6 if we continue with its present console design.

INTEROFFICE MEMORANDUM

DATE June 4, 1963

SUBJECT Cost Analysis - PDP-6

TO R. Lane
A. Kotok
R. Mills
A. Hall
Computer Guidance Committee

FROM Gordon Bell

The Computer Guidance Committee has recommended that a study of the market be made for PDP-6 with the aim to plan PDP-6 development.

The data required is:

1. Incremental manufacturing costs of various components.
2. Development cost of various components.
3. Future development costs.
4. Programs required, and the programming development costs.
5. Field service costs/machine.
6. Sales costs/machine.
7. Continuing engineering development support.
8. Sales fixed costs, manuals, shows, advertising, etc.

These should be compared with:

1. Sales prospects.
2. DEC's ability to produce -n machines/year.

Yielding:

1. Sales forecast.
2. Crossover for costs payoff.

For the record, a list of potential customer needs to be compiled, and a sampling of the customers should be visited. It will be necessary to have a sale for the first PDP-6 prior to the prototype development.

GB/ll

dec INTEROFFICE MEMORANDUM

DATE June 4, 1963

SUBJECT PDP-6 Console

TO Ken Olsen
Gordon Bell
Arthur Hall
Dit Morse

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INTEROFFICE MEMORANDUM

DATE June 3, 1963

SUBJECT Henry McDonald, Bell Labs

TO Ken Olsen ✓ FROM Harlan Anderson

cc: Dick Best, Gordon Bell, Bob Savell and Stan Olsen

I spoke with Mr. McDonald at Bell Labs today to ask if we could come visit him in about ten days to discuss his Vector Drawing Scope and other requirements. He indicated that he had given some further thought to our discussions in Detroit and was very much interested. He is planning to visit Spectran in Maynard on June 7th and thought he would visit us in the afternoon at 2 p.m. Spectran is making a part of a speech analyzer that Bell Labs is going to exhibit at the New York World's Fair.

He is now very interested in the PDP-5 as an off-line memory display and controller. This is an alternative to adding 32,000 words of memory to their IBM 7090 computer. It will consist of three major parts. The first of these would be the Vector Drawing Scope. The second would be the PDP-5 with the 4,000 word memory. The third would be a separate 16,000 word 12 bit memory which was set up as 2,000 word modules. All of this would have some electrical connection to the 7090. They would plan to attach their typewriter stations into this sequential 16,000 word memory through a PDP-5. In addition, the PDP-5 would read the light pen and store these responses in the memory. The strings of typewriter characters would also be stored in the memory.

He is working out a specification that shows how he would like to interrelate all of these things and is almost ready with it and will discuss it with us when he visits here on Friday. His telephone number at Murray Hill is 582-4235.

H. Anderson

HEA:ncs

June 3, 1963 D A White

HIGH PRIORITY MODULES NOT YET RELEASED

MODULE NO.	PRELIM. ENGR.	DRAFT-ING	MODEL SHOP	ENGR. CHECKS	PASSED ON TO QC	ENGR.	COMMENTS
4206					0+X		Needs Tester & Data Sheet
4518				0	X	Johnson	
1534				0+X		McKalip	
1535				0+X		McKalip	
4702		0+X				Scudney	
1959			0		X	DeCastro	
1578				0+X		Chevrier	

HIGH PRIORITY MODULES AWAITING CHANGE

1572			0+X			Falco	EC 3337
1706		0+X				Falco	EC 3194
1570			0	X		Falco	EC 3332
* 1571			X			Hamilton	RUSH

OTHER MODULES NOT YET RELEASED

	MODULE NO.	PRELIM. ENGR.	DRAFTING	MODEL SHOP	ENGR. CHECKS	PASSED ON TO QC	ENGR.	COMMENTS
*	4703		X				Scudney	
*	4224		X				Falco	
*	4551		X				Wardimon	
*	4524		X				Wardimon	
*	4260		X				White/Lu	
*	4261		X				White/Lu	
*	4228		X				Tomlinson	

0 = 5/27/63
X = 6/3/63
0+X = Same as last week
* = Added this week

INTEROFFICE MEMORANDUM

DATE May 31, 1963

SUBJECT NSA SYSTEM

TO K. Olsen, S. Olsen, N. Mazzarese, W. Hindle, R. Boisvert, J. Fadiman, B. Savell, L. Butterworth, D. Murphy, J. Smith, L. Gossel, B. Stephenson

FROM Ed Harwood

It has finally become obvious to me that we will not be able to deliver the NSA System on schedule which is June 15th. In spite of all the effort we have put into this System, we will still be late on the delivery date. According to my latest estimates, the earliest we could hope to deliver this System would be July 15th. This is approximately one month late.

The fact that we are delivering this System late disturbed me greatly, because this was to be one of the Systems which was well organized and we had plenty of time to deliver. We had meetings periodically and everyone committed himself to the schedule and said they definitely could produce and checkout their hardware on time. At every meeting we noticed small slippages, but everyone was still confident that we could deliver on time. Now that we are approaching the delivery date, everyone, I hope, realizes we over estimated our abilities to produce this System in the allotted time.

The reasons for the delays are many, but the fact is that the System will be late and I would like to impress upon everyone that we should give much more thought in the future to quoting delivery dates on Systems of this type, especially where there is new equipment to be designed.

Enclosed is the new revised schedule which has my estimates of the slippage and the new delivery date, plus the addition of the acceptance test and field installation time added to the schedule.

PROJECT SCHEDULE SHEET

PROJECT NSA COMPUTER SYSTEM

TITLE	NO.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.
PDP-1C-35	Checkout							
	H.S. Data Ch. 23							
	3 Mem. Modules							
	S.B.S. Type 20							
TAPE CONTROL	Design							
	Build							
	Tie On							
	System Test							
R. Boisvert								
A/D AND D/A SYSTEM	Defined							
	Design							
	Build							
B. Stephenson	Test							
J. Fadiman	System Test							
DATA CHANNEL	Design							
	W D							
	Build							
	Test							
R. Boisvert								
HOLLY PRINTER	Delivered							
	Installed							
	Checked Out							
R. Savell								
MANUALS								
A/D								
TAPE CONTROL								
HOLLY PRINTER								
TEST PROGRAMS								
TAPE CONTROL								
HOLLY PRINTER								
A/D								
L. Gossel								
SYSTEM TESTING								
E. Harwood, D. Murphy								
IN HOUSE ACCEPTANCE TEST AND DELIVERY								
FIELD INSTALLATION								
D. Murphy, J. Williams								

NAME - ED HARWOOD

DEPT. - SALES

REVISED DATE - 3/6/63

SLIPPAGE AS OF 4/9/63

" " " 6/1/63

INTEROFFICE MEMORANDUM

DATE May 29, 1963

SUBJECT PDP-6 Marketing, etc.

TO R. Lane

FROM Gordon Bell

A. Hall
A. Kotak
Computer Guidance Committee

I believe we should look at the possibilities of doing some aggressive classical marketing for PDP-6. For the present, however, the following must be considered and co-ordinated.

1. Programming Manual

2. I/O Scheme Finalization

   (a) Interrupt definition and write up
   (b) Tape Control(s) definition and write up
   (c) I/O structure

3. Micro Tape Control and Unit Specifications

   (a) Number of controls required
   (b) Improved performance of Micro Tapes (eg. automatic rewind)
   (c) Programming investigations
   (d) Time shared program preparation
   (e) Assemble - Compile
   (f) Sorting
   (g) General data storage

4. Sample Programs Investigating:

   (a) I/O
   (b) Matrix Operations
   (c) Sample data processing
   (d) Half word facilities
   (e) Index modification, etc.

5. Decisions regarding importance of future planning of instruction codes

   (a) Double precision fixed point
   (b) Double precision floating point
   (c) Extended character manipulation

6. Consolidate facts on Micro Tape system and schedule meeting regarding the Micro Tape with the Computer Guidance Committee June 13, 1963.

GB/ll

INTEROFFICE MEMORANDUM

DATE May 29, 1963

SUBJECT DECAL Draft

TO J. Atwood

FROM Gordon Bell

R. Beckman
Computer Guidance Committee

Enclosed is one copy of a DECAL Draft write up from BBN. Their final copy is due August 1, 1963. We should go ahead and photograph this draft, and print 250 copies of the draft manual.

BBN would like the following forward, in addition to McQuillan's name, in the title page:

CAUTION: This manual is a working draft. There is no guarantee of accuracy. The draft does not represent the final DECAL (BBN) system. A manual will be available in September, 1963.

DEC INTEROFFICE MEMORANDUM

DATE May 29, 1963

SUBJECT PDP-6 Signal Conventions

TO L. Hantman
S. Lambert
A. Hall
A. Kotok
Engineering Projects Committee

FROM Gordon Bell

Signal Name Format

A signal name should be brief, but descriptive. The format for various signal types is:

1. Flip-flops

NAME f/f side (0, 1) (bit position)
eg. RUN 1 —◇ , or RUN 0 —◆ or
AR1 (17) —◆ MQ0 (0) —◇

2. Logic Levels

NAME —◆ ≡ ~ NAME —◇ (for complement)
NAME —◇ ≡ ~ NAME —◆ (for complement)

2A. The complement symbol

NAME —◆ ≡ ~ NAME —◇ ≡ $\overline{\text{NAME}}$ —◇

3. Pulses

NAME —▶

NAME —▷

Name may include a T or P to denote a time sampled event or a pulse.

4. TRANSFER PULSE names and symbology

<— or —> The register bits on right (or left) go to left (or right) at the command.

EXAMPLES:

AR ←	MBJ	Jam transer MB to AR
AR ←	MB0	0's side transfer
AR ←	MB1	1's side (inclusion or transfer
AR ←	MBJ RT	Jam transfer right side
AR ←	MBJ LT	Jam transfer left side
AR	SH LT	(shift left)
AR ←	0 ≡ AR CL ≡ 0 → AR,	Clear the AR
AR +1 RT		Add one to right side
MBJRT ← → MBJLT		Exchange left and right parts
IR (XD) ← MB1 (XD)		Transfer MB ones to IR, (the X and D parts only).
AR ← AR ∨ MB		(partial add)
SC ← MB1 (29-35)		MB bits (one's side) 29-35 go to SC.

5. Signal names are taken exactly and the two names:

NAME 1 ≠ NAME 1

Abbreviations:

The following abbreviations are suggested, and if any of these words are used, these abbreviations must be used if the words are abbreviated.

Words do not have to be abbreviated, but words and their abbreviations may not be intermixed.

If the word "CLEAR" and its abbreviation "CL" are used on the same print, they refer to two separate signals.

Characters Used For Naming

1. All signal names consist of DEC Line Printer code characters. This included space.

2. There are no lower case letters.

3. There are no superscripts, subscripts or overbars (complement).

4. Signal names are delimited by at least two spaces.

Print Names

The print name should yield a 1-6 character mnemonic, which will be used as a

prefix on all signals originating on the print.

CP (Central Processor Abbreviations)

AR	Arithmetic Register (the main register of PDP-6)
MQ	Multiplier - Quotient Register
MB	Memory Buffered
MA	Memory Address
SC	Step Counter
IR	Instruction Register
PC	Program Counter

ACcumulator
X index
I indirect or defer

CM (Core Memory Abbreviations)

CMB	Core Memory Buffer
CMA	Core Memory Address
CMC	Core Memory Control

FM (Fast Memory Abbreviations)

FMB	Fast Memory Buffer
FMA	Fast Memory Address
FMC	Fast Memory Control

Logic Symbols

∧	AND
∨	INClusion or
⊻	Exclusive or
∽	NOT (the complement)
+	ADD
-	SUBTRACT
<-	Goes to Left
->	Goes to Right
Jam	
0	zero's side
1	one's side

Module Abbreviations

FF	flip flop
SA	Sense amplifier for core memory
PA	
BD	
DEC	
NOR ≡ ∼ ∨	$\overline{\text{or}}$
NAND ≡ ∼ ∧	$\overline{\text{and}}$
INVerter	

Register Abbreviations

REGister	Register
CL	
SET	
COM	
SH	
ROT	
LT	
RT	
BH	
CRY	
PAD	
IOR	
XOR	
INCR	
DECR	
RESet	

Miscellaneous Signal Abbreviations

ACT	Active
ADRS	Address
BUF	Buffer
CHAR	Character
CHG	Change
CM	Core Memory
COMP	Completion
CTR	Counter
DONE	
FET	Fetch
INH	Inhibit
INTCHG	Interchange
IMM	Immediate
IN	Incoming
LC	Location Counter
MEM	Memory
MISC	Miscellaneous
MODE	
OTG	Outgoing
PROC	Processor
PSE	Pause
PTR	Pointer
PWR	Power
RD	Read
REP	Repeat
RPL	Replace
RS	Restart
RSP	Response
SEL	Select
SK	Skip
STRB	Strobe
SW	Switch
SYNC	Synchronize
T TP P	(Time, time pulse or pulse)
TS	Test
WAIT	
WC	Word Counter
WR	Write

dec INTEROFFICE MEMORANDUM

DATE May 23, 1963

SUBJECT TRADE SHOW BOOTHS

TO Kenneth H. Olsen FROM John L. Atwood

I have three specific recommendations on trade show booths on the basis of our participation in the Spring Joint Computer Conference.

First, Technical Publications should be responsible for the design, construction and crating of all booths and display materials. The design should be done in cooperation with Howie Painter, as trade show manager, and should have the approval of designated members of the management. Once the design has been accepted, it should be up to our department to carry the project through to completion.

Ted Bertz has the interest and ability to do an excellent job on design, and Bob Graham has experience and the know-how to help Ted coordinate the production of the finished exhibits.

This would free more of Howie's time for engineering-type sales work, which should be more satisfying to him and more profitable for the company.

Second, each such project should be carried out on a definite schedule. The minimum time allowance should be eight weeks from design start to show opening. It should be understood and agreed that there are to be no deviations from the schedules except in the event of civil insurrection or atomic attack.

The minimum schedule should allow two weeks for design, one weeks for review, three weeks for construction, one week for final assembly and crating, and one week for delivery.

If move-in day is designated "M," the design should be started at M-56 days, the review should begin at M-42 days, construction should commence at M-35 days, final assembly and crating should be underway by M-14 days, and everything should be ready to ship by M-7 days.

Third, the present 40-foot booth should be retired. It should be replaced by a lighter, more easily assembled, more representative booth. The new booth should be modular in design, so that any combination of modules can be combined to fit smaller booth spaces.

The present booth, though replaced, need not be junked. It could serve as a badly needed stage set in the storage area in Building 5 - a place where computers and systems can be moved in and out easily for photographing under controlled conditions. I believe the booth already contains enough material to provide such a set with a minimum of modification.

INTEROFFICE MEMORANDUM

DATE May 23, 1963

SUBJECT Inspection of Facilities At Mid Western Instruments, Tulsa, Oklahoma

TO ✓Ken Olsen
Harlan Anderson
Richard Best
Gordon Bell

FROM Roland Boisvert

Persons Contacted:

R. Morrow	President of Mid Western
S. Keller	Vice President Telex
W. Harrison	Chief Engineer
B. Hall	Production Manager
B. Brown	Marketing Manager

Itenerary of Visit:

A. Plant Tour
B. General Engineering Meeting
C. Marketing Practices Meeting
D. Revisit To Areas Of Interest
E. Seminar On PDP-4
F. Discussion of general nature concerning transports at CDC, and short seminar on all products with emphasis on the PDP-6.

Additions To The Plant Tour:

A. Machine facilities: These are divided into two groups; a model shop approximately the size of our machine shop with approximately the same facilities, and a production facility of 15 to 20 lathes from 10" to possibly 16" capacity, although probably only 14", and about 25 milling machines. Approximately two-thirds of these are Bridgeports of various ages and sizes and the remainder are #2 Brown and Sharpe milling machines. They also have at least one Harding horizontal miller for extremely precise work on the magnetic heads. They have surface grinders, but I did not see any other grinding facilities. Their machine facilities are much too crowded to be efficient, and all of their production is stagered through ESF units that is sequentially put through the machine facility. Separate machines or separate groups are not assigned to any particular project. They do a considerable amount of lapping and they have excellent equipment for this work. Production is in charge of Mr. Burl Hall. He not only seems to know their operations but also the short comings of their operations. I am sure that he is aware of what the increase in production of tapes we contemplate would mean to his operation. They can do considerable in-plant manufacturing of details which would have to be sent to outside vendors. The facility for making printed boards is just barely that, and is the minimum that can be gotten along with. The camera facilities are a real jury rig and they are using ammonium sulfate for etching with the barest facilities imaginable.

B. We spent considerable time discussing the tape hub with the personnel directly involved in the assembly of the tape transport and Bruce Brown of the Sales Department. Several sketches were made of the improvements that we felt were necessary. The most difficult thing, I believe, for them to do would be to bring the air through bleeding holes directly over the tape gaps as suggested by Roland. This is not impossible as they use a shear type valve to bring air into the arms at the present time. There is no reason why this same type of nozzle valve could not be used to bring air into the clamp unit that is directly over these heads. This would mean some modification and experimentation to prove its worth, but the feasibility is quite reasonable.

C. I believe our strongest contacts, that is the people most sympathetic to our position and most cognizant of it, are Mr. Steve Keller and Mr. William Brown from Technical Instruments, their representatives in this area. Mr. Keller again raised the question of whether or not they could use our control circuits and our logic and have us manufacture these for them if they felt it was an advantage. They do have an outside source in or about Tulsa that can make printed circuit boards for them but, as mentioned above, they do not have sufficient facilities for in-plant manufacture of these items. Both Mr. Keller and Mr. Brown are well aware of the advantage of putting a working transport in each of our sales offices in this country, and I believe they will bring what prestige they have to bear to bring this about.

D. The welding area is very small and is geared to their five transports per month. Evidently they do not use this area for much other than producing frames for these transports. At present it consists of one National Cylinder Gas Company's 200 amphere heliarc welding machine and associated equipment, very good welding jigs, an experienced welder, and possibly two helpers. I do not believe they would experience any difficulty in expanding the facility or to change it over to steel welding if they decide to go along with our cabinetry and to produce it in that area. They have room for expansion for a reasonably large welding shop. The man in charge seems to be extremely competent. I have seen no report in the bi-weekly that people from Mid Western called at our booth, but I believe their engineer in charge of marketing and Mr. M. E. Morrow were in Detroit for a directors meeting at the Telex Corporation. Probably both of these people called at our booth. Mr. Keller was in

Detroit later in the week and may have called to look over our set-up at the Eastern Joint Computer show.

Mr. R. G. Morrow is president of Mid Western Instruments Company, Mr. M. E. Morrow is chairman of the board of both the Telex Corporation and Mid Western Instrument, and General Gregory is Mr. M. E. Morrow's first administrative assistant. I believe General Gregory was in the Air Force and was instrumental in the development of the Sikorsky helicopter for use with the Air Force.

Loren Prentice

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The plant tour consisted of a visit to the production area, the administrative area, and the engineering area of Mid Western Instruments. In general, we were very impresssed with both the plant and the personnel that we met in all the areas.

The manufacturing of tape units is presently set at five per month, and Mid Western does have the facilities and the man power to expand this production effort to approximately 32 transports per month before taxing either personnel or facilities. In addition, there is, if necessary, approximately 10,000 square feet of expansion space available in the present building.

The traffic flow through Mid Western is somewhat broken. However, sometime in the next year they plan to correct this factor and give a straight flow to their production lines. The special area of interest to us was the construction of the heads and transports. In both of these areas we saw much improvement over the previous production practices employed by Mid Western. To be specific, one of these areas was the change in the manner of referencing the vacuum column to the main casting.

Roland Boisvert

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My impression of the plant was that they had no production line of tape transports. There were two completed transports and several empty frames. I felt that the work force looked padded in all areas except head assembly.

Bob Hughes

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While walking through the Mid Western plant, I was not impressed by their production line. There seemed to be disorganization of parts flow through the line. Production is accomplished through many departments where each department is scattered randomly throughout the building. I was told that steps are being taken towards smoother production operations.

The standards lab was well equipped with secondary standards and I noticed they have resistor and voltage standards that are better than ours. The scopes are checked every three months against the Tektronix, oven controlled frequency meter.

Static skew tests for the M3000 read/write head are accomplished with an off line testing rig. The read head is used as a write head during these tests. Likewise the write head is used as a read head.

Reliability or life tests are recorded with a pen-graph recorder. Mid Western has accumulated a large amount of reliability data on a few transports and we will receive the data sheets in the near future.

Steve Lambert

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B. General Engineering Meeting

The general engineering meeting consisted of discussing with the chief engineer and the production engineers those modifications which we considered necessary to effectively operate the Mid Western transport from the computer. The problems that were involved on Mid Western's part were presented in a general plan of attack which will wait upon our decision to either accept or reject the transport. In addition, we discussed reel hubs. The quick release hub they have designed we found to be unsatisfactory, and we gave them a short dissertation on what we thought a quick release hub should be. We found that on their 728 Audio Tape Recorder this hub in basic principle existed, and that a slight modification to this hub would readily fit our requirements. We also talked about the possibility of blowing air on the tape such that it would act over the pole tips of the head onto the tape thereby creating what we felt would be very intimate tape contact with the head.

Roland Boisvert

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C. Marketing Practices

At the marketing practices meeting we discussed the standard contracts and arrangements that Mid Western has with O.E.M. customers and their favorite customer, the government. Basically, these amount to ordering a certain amount of transports at a particular price and then a re-order would move us into a new discount category. Our account would then be credited on the basis of the total order for the transports in a year's time. We also at this time talked to Steve Keller about buying the transports at CDC and having them retro-fitted for the state purposes both here and the factory and possibly in field offices and for show purposes. Mr. Keller said that he could not speak with authority to actually do this at this time but he would go into it with the president of Telex. He advised us that he felt that Mid Western would be much happier to present to us five transports at cost rather than to see us do anything at all with CDC. He very strongly stated that, "they bought those things, now let them rot with them". He did indicated that he felt that some reasonable agreement as far as transports for display purposes could be reached.

Roland Boisvert

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The problem here is not changing O.E.M. accounts less than the government. The government does not want a "favored customer" (unless it is the government).

Bob Hughes

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Mr. Keller stated catagorically that Mid Western would, "rather give Digital Equipment Corporation units at cost rather than rework those C.D.C. units" and even "give to Digital Equipment Corporation five units on consignment rather than have Digital Equipment Corporation pick up the five C.D.C. machines."

We discussed with Bruce Brown the sequence of negotiations between Mid Western and Digital Equipment Corporation. There seems to be three distinct phases through which we will pass:

A. Prototype - return to Digital Equipment Corporation of prototype after Pierrre Foret completes the rework as defined by Digital Equipment Corporation. Tie to our computer and decide if the tape deck is acceptable. An estimated price of this tape deck is $11,900. including Mid Western's hardware and read/write electronics. To be concluded prior to June 15th.

B. Semi Modified Transports: As defined by actual commitments a minimum number of tape transports be ordered as semi modified

units. Bruce Brown feels that a firm pricing structure will not be available at this point in time - estimated to be July 1 - and that the best approach would be to price the transports after this first order is nearly completed. However, on this point I feel we should, as a point of considering Mid Western as a source, have an estimate of pricing in all quantities based on the prototype.

C. Final configuration specifications and pricing: Based upon the prototype as a standard the final specifications are to be written and final pricing structure to be established in quantities to one hundred units and an O. E. M. contract be written.

Mr. J. A. Arrington is sending along a statement of Mid Western's O.E.M. Account Policy for reference in establishing an O.E.M. discount based on accumulated orders over an approximate twelve month period.

Henry Crouse

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Interface Meeting

While the marketing practices meeting was being held, Mr. Griffen, Mr. Foret, Loren Prentice and I held a meeting to discuss the mechanical and electrical interface requirements. Mr. Griffen submitted a list of modifications (enclosed) that Mid Western would like to supply. It was decided that if all the specs listed were included in the transport that much of our control logic would be redundant. Therefore, some of the items will be deleted.

PDP-4 Seminar

During Monday afternoon, I gave a one and one half hour seminar to approximately twenty Mid Western employees. A classroom approach was used in describing computer systems in general. Half of the individuals present were not familiar with comput ers. Thus, I purposely took time to familiarize them with computer jargon. I discussed the majority of options available and how they are attached to the computer. Particular emphasis was placed on tape systems describing the use of a computer and options to test tape transports. I emphasized the fact that the same computer may be used by different departments. Also, an explanation of customer service, PDP-4 reliability, quality and sales advantages was pointed out. A note was added on the programming material available.

Everyone seemed to be very attentive throughout the seminar. There were pointed questions on practically all the items I spoke about. It was evident that at this time Mid Western does not feel like buying a PDP-4. However, there was a great deal of interest. Bruce Brown asked if we would rent the PDP-4 to them. I referred him to Harlan Anderson.

Steve Lambert

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MIDWESTERN INSTRUMENTS

MI-428-1 A

From: Mr. T. H. Griffin

Date: May 15, 1963

To: Mr. P. G. Foret

Subject: M3000 (DEC) Signal Definitions

The following signals have been incorporated in the DEC modification in compliance with their requests and our effort to achieve closer IBM compatibility. There are some departures from IBM in that some additional status lines are made available, such as status EOT, LOCAL AND WRITE LOCKOUT, and the prime of SELECT & LOAD POINT is not made available.

The balance of the standard IBM input/output lines will be included in the 800 BPI program.

All inputs require minus 6 volts ±1 volt to initiate their respective functions, and zero volts to disconnect. Input impedances are on the order of 15K thus allowing parallel operation of several transports without appreciable loading on the source.

All outputs supply a low impedance minus 6 volt ±1 volt level, capable of driving up to a 10 ma load, in the active state and a low impedance 0 volt level corresponding to the function's logical prime.

All functions require d-c level control with the exception of the RWD operation which may be initiated by means of a pulse whose "up-time" is sufficiently long to insure relay closure.

The following is a brief description of the proposed modifications including signal definitions.

out

SELECT: There are ten (10) machine select lines made available for the purpose of remotely selecting a particular transport for on-line operation. Each of the 10 lines corresponds to a particular manual address switch setting such that upon energizing that line corresponding to the preselected setting, the transport will be logically enabled.

If the proper line is not selected, no REMOTE operation may be performed; however, all LOCAL functions will remain intact. There are no rise time specifications on this line.

out

SELECT & READY: This output says that the machine has been selected, the tape is loaded into the vacuum columns, all interlocks are closed, and the transport is under REMOTE control. This line will remain at minus 6 volts (except during RWD) until the select line is dropped, the address selector switch is changed, the machine is placed in LOCAL control, or any one of the interlocks are broken.

REWIND: Upon energizing this line, any existing tape motion command is interrupted and inhibited until completion of the REWIND operation. This line may be pulsed provided that the pulse time duration is sufficient to allow relay closure (approx. 10 ms). The only requirement to initiate the REWIND operation is that there be tape on both reels as sensed by means of the "Broken-tape" optical sensing station.

The operation overrides a normal fail condition and may be started with tape in or out of the vacuum columns. Once started, the operation depends upon the tape distribution on the take-up (machine) reel. If sufficient tape is on the reel (high speed zone), tape will be drawn out of the vacuum columns, if it is not already out, and a normal high speed rewind will commence. Upon optically sensing a low tape condition, the high speed operation will terminate and the tape is automatically loaded in the columns. Upon closing the column interlocks, a low speed (normal velocity) rewind begins until LOAD POINT is sensed at which time the transport stops and the REWIND operation terminates.

Had REWIND been selected in a low tape zone, the operation would simply drive the tape REVERSE to LOAD POINT.

Once a REWIND has been initiated, it may not be interrupted in REMOTE until LOAD POINT has been reached or a broken tape condition occurs.

Switching from REMOTE to LOCAL does not affect REWIND; however, the operation may be manually terminated by depressing the STOP pushbutton. In LOCAL control, the transport will sense and stop on both end-of-tape and load-point reflective markers. Either of these markers may be cleared by depressing the FWD or RVS pushbuttons.

In REMOTE control, the end-of-tape marker is sensed but does not alter machine operation.

If the transport happens to be at LOAD POINT, the REWIND function is inhibited. The next GO command will clear the internal interlock in REMOTE whereas depressing either the FWD or REVERSE pushbuttons will clear LOAD POINT in LOCAL operation.

REWIND & UNLOAD: Functionally, this operation is equivalent to the REWIND operation with the exception that LOAD POINT is logically disabled and tape is allowed to completely unload off the machine reel.

The operation may be selected by means of a pulse whose duration is sufficiently long to insure relay closure. This signal may initiate a RWD & UNLOAD operation or, if energized during a normal RWD, it will cause tape to be unloaded.

Both the REWIND and REWIND & UNLOAD lines require that the transport be selected, however the SELECT line may be dropped, after a time sufficiently long to insure the rewind relay to pull in to conserve computer time.

SELECT & REWIND: This is an output indicating that the transport has started to rewind. This line switches from 0 volts to -6 volts as soon as the rewind relay has been energized. It is held at this level until either the select line is dropped or the rewind operation is completed.

SELECT & LP: This output indicates that the transport has been selected, the load point reflective marker is photo sensed, and the unit is ready for the next instruction.

This line will remain at 0 volts if a RWD & UNLOAD is in progress even though the load point reflective marker is momentarily photo sensed.

SELECT & EOT: This output indicates that the transport has been selected and the End-of-Tape reflective marker is photo sensed. The output is in the form of a minus 6 volt pulse, the duration of which is a function of tape velocity.

FORWARD: This input requires a minus 6 volt level and if the unit has been selected and ready (not in rewind), it will initiate forward tape motion at the specified velocity. If in LOCAL operation, forward tape motion will be interrupted upon photo sensing the end-of-tape reflective marker.

REVERSE: This input requires a minus 6 volt level and if the unit has been selected and ready (not in rewind), it will initiate reverse tape motion at the specified velocity. Photo sensing the load-point reflective marker will terminate the REVERSE tape drive operation in both LOCAL and REMOTE operation.

The absence of both FORWARD and REVERSE tape motion commands with the unit selected and ready will result in the STOP tape motion condition.

The unit may be programmed without regard to tape motion command sequence under automatic control; however, each command must be a minimum of 1 ms in duration in order to allow the tape motion control circuitry to stabilize.

In LOCAL control the STOP pushbutton must be depressed prior to changing direction of tape motion in order to clear the previous motion command.

STATUS LOCAL: All transport output lines are logically disabled (0 volts) upon selecting LOCAL operation except for this line which switches to minus 6 volts thus indicating the unit is not under automatic control.

STATUS WRITE LOCKOUT: This line indicates that the write lockout ring has been mounted on the supply reel thus enabling the transport recording circuitry.

T. H. Griffin

THG:mc

INTEROFFICE MEMORANDUM

DATE 21 May 1963

SUBJECT In House Acceptance Test Procedures; Computer Systems

TO E. Harwood
R. Hughes
K. Fitzgerald

FROM R. Beckman
N. Mazzarese

cc: K. Olsen
H. Anderson
S. Olsen
S. Mikulski
R. Wilson
J. Rutschman

The following procedures have been established for final acceptance testing and shipping of computer systems:

1. Final electrical and mechanical inspections must be signed off before starting acceptance tests.

2. Final shipping arrangements will not be made before completion of acceptance tests.

3. All modifications and wiring on machines must be completed before starting acceptance tests.

4. Any discrepancies during acceptance tests will be corrected as they are discovered before proceding with the testing.

5. After completion of acceptance tests, the system will be moved to the crating area and prepared for shipping with no further inspections or machine operation.

6. Copies of the completed acceptance tests will be furnished to customer with the delivery of the system.

Enclosure - Acceptance Test Form

INTRODUCTION

The following forms are to be used with all computer installations. The program operation portion of the tests will vary depending upon the system under test, however, the general forms will be used for all systems.

DESCRIPTION OF TEST

The MECHANICAL inspection during the test consists of visually inspecting all solder connections for excess flux, burnt wires, excess flux, bad joints and general dress of wires. The power cords should be examined for the proper connectors. A close check should be made on the internal and external appearance such as long loose wires, tape on cables between racks, console appearance, etc. The final mechanical inspection report should be reviewed.

The object of the test is to view the system through the "eyes" of the customer to assure that it looks like a new piece of equipment.

The IO equipment should be examined very closely as this equipment is most often used by the customer and under constant observation. The reader should be examined for cleanliness, loose parts, mailed screws, etc. The typewriter or teleprinter should be examined for proper connectors, new ribbon and platen, proper impression setting, etc.

The ELECTRICAL inspection should examine all indicators for proper operation. The final electrical inspection reports should be reviewed. The software library tapes should be tested for proper operation.

Any discrepancies should be both noted and corrected as they are discovered.

The following pages should be completed by the customer relations representative and signed by the checkout technician. A copy of the forms will be forwarded with the system under test to the customer.

IN HOUSE ACCEPTANCE TEST

SERIAL NO. _____ DATE _____

MECHANICAL INSPECTION

FINAL MECHANICAL INSPECTION REPORT ____

WIRING AND SOLDER ____

INTERNAL CLEANLINESS ____

EXTERNAL CLEANLINESS ____

PROPER POWER CONNECTION ____

RUNNING HOUR METER CONNECTED ____

IO EQUIPMENT

READER ____

PUNCH ____

TYPEWRITER OR TELEPRINTER ____

OPTIONAL EQUIPMENT (as noted)

____

____

____

____

____

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____

____

____

____

____

____

ACCEPTANCE TESTS (page 2)

ELECTRICAL INSPECTION

CONSOLE INDICATORS ___

OPTION INDICATORS ___

STANDARD ACCEPTANCE TEST COMPLETED ___

SOFTWARE INSPECTION

MAINTENANCE TAPES ___

WRITE-UPS ___

LIBRARY TAPES ___

WRITE -UPS ___

other test (as noted)

COMPUTER CHECKOUT REP. _____ DATE _____

ACCEPTANCE TEST OPER. _____ DATE _____

ACCEPTED BY CUST. REL. _____ DATE _____

PDP-1 COMPUTER SYSTEM

PRE-DELIVERY AND POST-INSTALLATION TEST PROCEDURE

This test procedure shall be followed for basic PDP-1 computers and installations with central processor options as noted below. Part I describes the testing routines that demonstrate hardware operation. Part II is an operational test of the computer utilizing library program tapes furnished in the software package.

Part I

General: Test procedure consists of operating the following maintenance routines for the length of time specified in the given sequence. Approximate time required for a standard PDP-1 is four hours.

1. MAINDEC-3 Address Test Program (F-39-3)
   Time: 30 minutes (total time)
   Function: Program detects multiple addressing and failure to address all 4096 locations of each memory tested.

2. MAINDEC-2 Memory Checkerboard (F-39-2)
   Time: 30 minutes (one memory module)
   15 minutes/module (machines with multiple modules)
   Function: Program tests proper memory operation by placing various patterns in adjacent storage locations to induce worst possible "noise" with cross-coupling.

3. MAINDEC-1 Instruction Test (F-39-1)
   Time: 30 minutes
   Function: A sequence of routines which test all PDP-1 instructions except multiply/divide and the IOT group. For deferable instructions indirect addressing is tested. The augmented instructions are tested with the defer bit both 1 and 0.

4. Multiply/Divide Test (DEC-105)
   Time: 30 minutes
   Function: The program generates random numbers, and uses them in multiply and divide operations. Sense switch settings allow the program to test both step instructions and automatic instructions.

5. MAINDEC-10 Read Binary Test (F-39-10)
   Time: 15 minutes
   Function: Test the performance of the photoelectric reader during binary operation. It detects the picking up or dropping of bits, clutch and brake operation.

6. MAINDEC-11 Read Alpha Test (F-39-11)
   Time: 15 minutes
   Function: Test the performance of the photoelectric reader during alphanumeric operation. It detects picking up or dropping bits, clutch and brake operation.

7. MAINDEC-13 Punch Test (F-39-13)
   Time: Punch one box of tape (approximately 25 minutes)
   Function: Test paper tape punch by punching random numbers in all possible variations of punch instruction in both binary and alpha modes. Detects picking up or dropping bits in both binary and alpha modes.

8. Type-in, Type-out Test (DEC-106)
   Time: 30 minutes
   Function: Exercise all typewriter characters available on the computeriter. Tests for proper coding both typing out and typing in.

9. Sequence Break Test (omitted if Type 120 installed)
   Time: 15 minutes
   Function: Exercise typewriter, reader, and punch through the use of the one channel sequence break system.

10. Optional Equipment (See Appendix A)

Part II

General: Test procedure demonstrates the operation of the computer and the basic programming system. The basic programming system consists of four programs: The MACRO Assembler, Expensive Typewriter, DDT and Compatible Reproduce. The total time of program operation is approximately four hours.

1. Expensive Typewriter
   Function: A typewriter control program which allows generation and modification of a MACRO symbolic program.

2. DDT
   Function: A debugging program for machine language tapes with added features for tapes assembled by MACRO. It is also useful in preparing new programs.

3. MACRO Assembler
   Function: Assemble coded program tapes into machine language tapes.

The tests will include operation of above mentioned tapes. Assembled programs will be demonstrated. Programs assembled by MACRO shall produce recognizable operations in accordance to the system under test. If desired, the customer may substitute special programs for assembly, however, it is the responsibility of the customer to prepare and test such special programs in advance.

A satisfactory test shall consist of a total of 8 hours of operational time, and a maximum of 45 minutes of down time during the entire period of testing time.

Operational time is defined as unattended computer operation without manual intervention unless the operating directions of the program require it. Necessary manual setup operations (i.e. insertion of paper tape in the reader) are considered part of the operational time

Down time is defined as the time during which operation of the test is halted for the performance of corrective maintenance.

SYSTEM ACCEPTANCE TEST FOR PDP-1 COMPUTER

☐ Type 20 Sequence Break (0.25 hr.)
☐ Extra Memory

PART I TEST	Time Estimate	OPERATE TIME		DOWN TIME		REMARKS	APPROVAL
		Start	Stop	Start	Stop		
1. Memory Address MAINDEC 3	0.5						
2. Memory Checkerboard MAINDEC 7	0.5						
3. Instruction Test MAINDEC 1	0.5						
4. Mul./Div. Test (STEP & AUTO)	0.5						
5. Reader Test MAINDEC 10 MAINDEC 11	0.5						
6. Punch Test MAINDEC 12	Approx. 0.5						
7. Typewriter Test	0.5						
8. Sequence Break							

PDP-4 COMPUTER SYSTEM

PRE-DELIVERY AND POST-INSTALLATION TEST PROCEDURE

This test proceedure shall be followed for the basic PDP-4 computers and installations with the central processor options as noted below.
Part I describes the testing routines that demonstrate hardware operation. Part II is an operational test of the computer utilizing library tapes furnished in the software package.

Part I

General: Test procedure constists of operating the following maintenance routines for the length of time specified in the given sequence. Approximate time required for a standard PDP-4 is four hours.

1. MAINDEC 43 Address test program
   Time: 30 minutes (total time)
   Function: Program detects multiple addressing and failure to address all 4096 locations of each memory tested.

2. Checkerboard test (digital 4-4-M)
   Time: 30 minutes (one memory module)
   15 minutes/module (machines with multiple memories)
   Function: Program tests proper memory operation by placing various patterns in adjacent storage locations to induce worst posible "noise" with cross-coupling.

3. Instruction test (modified digital 4-15-M)
   Time: 30 minutes
   Function: A sequence of routines with test all of the PDP-4 instructions except the IOT group.

4. ACU test (see optional equipment)

5. Reader and Punch test (digital 4-5-M)
   Time: 60 minutes
   Function: Punch test consists of punching various patterns on paper tape and reader test consists of reading these patterns. Approximately one box of paper tape should be punched.

6. Teleprinter test (digital 4-6-M)
   Time: 30 minutes
   Function: Test print out and type in of the teleprinter. It can exercize all characters available on the keyboard.

7. Clock interrupt test (digital 4-14-M)
   Time: 30 minutes
   Function: Tests operation of the clock, reader, punch and teleprinter in the interrupt mode.

PART II

General: Test procedure demonstrates the operation of the computer and the basic programming system. The basic programming system consists of four programs: The Assembler, Edmund the editor (an on-line symbolic editor), DDT and Tape reproducer. The total time of program operation is approximately four hours.

1. Edmund the editor
   Function: A teleprinter control program which allows generation and modification os symbolic tapes for the assembler.

2. DDT
   Function: A debugging program for machine language tapes with added features for tapes produced by the assembler. It is also useful in preparing new programs.

3. PDP - 4 Assembler
   Function: Assemble code program tapes into machine language tapes.

The tests willi include operation of the above mentioned tapes. Assembled programs will be demonstrated. Programs assembled by the PDP-4 assembler shall produce recognizable operations in accordance to the system under test. If desired, the customer may substitute special programs for assembly, however, it is the responsibility of the customer to prepare and test such programs in advance.

A satisfactory test shall consist of a total of 8 hours of operational time, and a maximum of 45 minutes of down time during the entire period of testing time.

Operational time is defined as unattended computer operation without manual intervention unless the operating directions of the program require it. Necessary manual setup operations (i.e. insertion of paper tape in the reader) are considered part of the operational time

Down time is defined as the time during which operation of the test is halted for the performance of corrective maintenance.

ACCEPTANCE TESTS

worksheet

extra memory module ( )

test	time(hr)	start	finish	remarks	approval
Memory Address Test MAINDEC 43	0.5				
Checkerboard Test digital 4-4-M	0.5				
Instruction Test digital 4-15-M	0.5			Place nop's in 7725, 7726 of Contest to surpress I/O equip. Start in loc 7700.	
ACU Test (if applicable)	0.5				
Reader and Punch Test digital 4-5-M	1.0				
Teleprinter test digital 4-6-M	0.5				
Clock interrupt test digital 4-14-M	0.5				

dec INTEROFFICE MEMORANDUM

DATE May 16, 1963

SUBJECT TECHNICAL MANUAL PRODUCTION

TO K. H. Olsen
H. E. Anderson
S. C. Olsen
R. L. Best

FROM Jack Atwood

Our people working on technical manuals met recently with our four principal customers - Bob Savell, Bob Beckman, Roland Boisvert, and Arthur Hall. We discussed in detail ways and means of speeding the production of equipment manuals.

The discussion produced several points of agreement which I think will be most helpful in the future:

1. The level of detail of the text and its accompanying diagrams should stop outside the individual packages. To go inside the modules in this type of text not only wastes writing and illustrating time; it also tends to confuse the reader by branching too far from the main stream of the explanation.

2. However, there is a place for circuit descriptions in many manuals. This is particularly helpful from a sales standpoint. These descriptions should be somewhat more detailed than the catalog pages, but they do not need to be too extensive. They should be available in prepackaged form for ready inclusion where needed.

3. The biggest saving in technical illustration time can be achieved if engineering drawings are produced originally in satisfactory form. Virtually all drawings produced by Jon Fadiman's group, for example, are readily reproducible in his manuals. Many drawings available from the computer group, on the other hand, must be both reorganized and redrawn.

4. The project engineer on most peripheral equipment projects should be able to produce a workable outline of his piece of gear in four to eight hours of dictation. This, together with adequate drawings, should enable the technical writer to produce a manual in a matter of days or weeks, rather than months or years!

Obviously, some pressure for better drawings is forthcoming from the Drawing Standards Committee. In addition, people like Bob Savell and Bob Beckman are going to apply pressure where it is most useful to upgrade the effort in this direction. This all contributes to a general improvement.

Still, I do feel that some pressure from a higher level would have even more immediate results. Dick, as chief engineer, or Ken, as president, could certainly apply pressure on the engineering group as a whole to produce better drawn and better thought-out diagrams without waiting for a final report on each detail of technique from the Drawing Standards Committee. Any help along this line would be most appreciated.

TO: KEN OLSEN

DEC MEMO

SUBJECT: VISIT WITH DR. JACK V. KANE
BTL, MURRAY HILL

DATE 5/16/63

TO
Stan Olsen
Nick Mazzarese
Dick Best
Gordon Bell
Bob Savelle
Jerry Moore
Barbera Stephenson

FROM Dave Denniston

I spent the better portion of Tuesday, May 14th with Jack Kane and his group at Bell Labs. This was a very informal visit since I have known Jack Kane for a couple of years. Jack has been interested in displays for some time, and his group has now interfaced two to the SDS 910. These displays are actually two techtronic scopes controlled by electronics they have constructed (he claims about $2K each), including a light pen made out of an eye brow pencil. Although I get the impression that he would like to have a display with a larger screen, Jack did mention that he was quite satisfied with the performance of these displays which he has built, and they are providing him with the quick look at his data that he desires. His objection to one of our displays is price. I might also mention that he has, in the past, inquired about such things as just a light pen with amplifier, and the cost of one of our display cabinets with the CRT and deflection amplifiers only. At this point, I rather doubt that we can do anything to interest him in a display other than by making him an outright gift of one.

Over a year ago when Jack was first thinking about getting a computer for pulse height analysis, I gave him quite a bit of literature on the PDP-4 and talked to him a number of times. His decision to buy the SDS 910 was made solely on the basis of price. He readily admits that as far as he is concerned, the PDP-4 has all of the capabilities that he could desire. I really think that Jack is the sort of person who is willing to spend a year or so trying to make a less expensive piece of equipment perform like the high-priced model.

Jack is now quite interested in the PDP-5, and I left the preliminary specifications with him, and as a matter of fact, he spent all of lunch time going through them. He feels that this is just the sort of machine that people in the pulse height analysis business need, and, naturally, the price range is quite impressive to him. This machine has made him re-evaluate his "it has to be much cheaper to do things serially" idea.

The one feature of the PDP-5 which Jack is unhappy with is the built-in A-to-D converter. I believe that he has already mentioned this to Gordon. He claims that in the pulse height analysis business or that in any field where a distribution of pulse heights is desired, a feedback type of A-to-D converter using a ladder network may not be desirable since the uniformity of channel width is of

Dit Morse

the utmost importance, and where a large number of channels are desired, say 512, people will not consider this type of converter. He is presently using a fairly straightforward voltage to pulse width A-to-D technique. An input pulse, variable in amplitude, provides a ramp with a negative slope. The initial value of the ramp is proportional to the input pulse, and the period of the decaying ramp provides a gating level to a clock which then increments a scaler. In the converters he has, a 20 megacycle clock and scaler are used. Jack mentioned that this technique was very common in the pulse height analysis field. He also claims that the same type of conversion is most applicable to the medical field for histograms.

In Gordon's memo of May 7th to Nick, he mentioned that the "advent of an SDS machine probably means a start of a decline in modules sales there" (at BTL). I don't believe that this will turn out to be so, for in the first place, Jack is using our modules as part of his interface and I spent a short time talking with one of his people, Ed Gere, on Tuesday outlining some logic that he is interested in adding. Ed Gere also mentioned that he really was beginning to wonder about the claim of increased reliability with silicon semi-conductors, due to the experiences they have had. As far as anyone else at the Labs is concerned, I have heard no mention of the SDS machine or SDS modules except from one computer prospect who only mentioned the difficulty initially encountered with Jack's machine. Jack and Ed were, in fact, experiencing difficulties during my visit. A program which had run previously was indicating errors on read-in. (Paper tape does not stop on error.) They ran several SDS diagnostic routines but could find no machine trouble. At that point, Ed mentioned that for all but about one of there past problems, the diagnostic routines had not brought to light any of the troubles.

There is one area in which SDS really puts us to shame and this is their software write-ups. Although Jack Mentioned that they do not always include everything that is desirable to know about the routine, the write-ups themselves are extremely well done compared to what we have to offer, in my opinion. Jack specifically asked me to bring along some of our program write-ups, and I must say I was somewhat embarassed to show him what ours look like as compared to SDS (even though we may have far better and more exact information in our write-ups).

May 15, 1963

57 Magnetic Tape Control

Computer Guidance Committee

S Lambert

Obviously the 57 Control has been tossed through much controversy. The fact of the matter is that I am trying to produce a control that satisfies everybody's needs. This is impossible. When the 57 control was conceived, there were no thoughts about connecting the IBM transports to it. However, after the first model was in production, a meeting was held and the outcome suggested we integrate the IBM transports onto the control at a latter date. The latter date has arrived.

This month I redesigned the 57 adding features but not changing the basic control. The reason behind the change was to incorporate the interface requirements of the IBM and Midwestern transports. As a result, a new set of drawings, a new (or modified) Programming Manual, a new Maintenance Manual and Control Tester must be worked on. This seems like a lot of work for me but I feel that I can have the majority of the work accomplished by June 15th.

The transition thrown into the existing Programming Manual is small. The manual implies that the Type 50 transport is capable of 556 density IBM format. Presently we are comparing the transports against IBM to see if this statement is true. If we find that some transports work and others are marginal then an addendum should be attached to the manual stating "We don't guarantee 556 when using Type 50 transports. My analysis of the Potter and IBM skew tolerance (the problem) suggests to me that we should never have trouble as long as both transports are kept to within 50% maximum skew.

To eliminate confusion, the redesigned 57 has been assigned the numbers (520) to operate Potter transports, (521) to operate Midwestern transports (522) to operate IBM transports. The Programming and Maintenance manuals will contain (57) as the titles and each manual will be broken into sections 520, 521 and 522. Any additions or deletions to the existing sales material will take the form of an addendum.

In the last month or two, I have had a large number of personal factors to take care of or get adjusted to. As a result the maintenance manual has not been completed on the assigned date. Paul Scriven has helped tremendously in gathering data and writing a portion of the manual. Of course, the manual will have to be modified for Midwestern and IBM.

What does the new 57 look like as compared to the old?

The new control will be controlled by two crystal clocks and is capable of 200, 556 and 800 densities. The old control was clocked by the PDP-4 timing chain. The new control will contain its own Current Address (CA) and Word Count (WC) registers, where the old control used Memory Locations 4 and 5 as (CA) and (WC). The reason behind these modifications is to allow more flexible timing restrictions at 112.5 ips tape speeds, for the programmer. These modifications also allow the 57 to be connected to either the PDP-1, PDP-4, PDP-5, and possibly the PDP-6.

In addition to the old control, the 57 now has a new IOT command for transferring data to the (CA) and (WC) and reading the (CA) to the AC. The control has two additional tape commands and status flags. The commands are Rewind/Unload and Dual Level Read (two commands for Midwestern and IBM only). The status flags are Data Request Late (DRL) and Tape Miss Character (TMC). Everything else remains the same as stated in the Programming Manual with the exception that the programmer has more machine time available.

The physical appearance of the control changes radically in reference to module locations. To facilitate the three interface requirements, the four mounting panels of logic have been broken into a 3 - 1 combination. Three mounting panels are considered as basic logic where the fourth is the interface logic. Between the third and fourth panel there are standoff tie points. This allows us to stock the basic logic and when a customer orders we solder on the fourth. For the interface between computer and control 3-50 pin Amphenol Plugs will be used. Two of these plugs will be identical to the Type 24 Drum interface. The third will carry IOT's and extra AC inputs not used by the drum.

Two panels of logic are required in addition to the three basic logic panels to operate IBM transports. All the specifications outlined for the 57 are true for IBM except IBM does not produce a status for Near Load Point or Near End Point. More panel space is required for the IBM transport plug (equivalent to additional mounting panel).

The basic logic contains 2 eighteen bit buffers, buffer control logic, and time delays. The basic unit has a data band width of 200,000 kc. In reality, any device may be connected to this logic where a time function is required before and after data transfer. Skew tolerances are adjustable on data transfer-in and up to three data transfer rates and skew factors may be selected by program. In addition other devices may utilize one of the eighteen bit buffers without using the available time delays. To incorporate this last feature an additional set of gates must be supplied at the Data Buffer plus priority logic must be added to the (CA) and (WC). This in truth then makes part of the basic logic a Data Channel. It is suggested that only one such device be added if any. All data lines between the basic logic and interface panels are 6 data levels + parity (negative for a one) out and six data pulses + parity (positive for a one) in.

What's new?

Near the end of April I designed two new modules (4304 and 4305). These modules are used with the 4303 integrating delay and cut the cost of tape controls considerably. The purpose of the modules is to make one 4303 look like n 4303's. For every six 4303's used previously, one 4303 and one 4304 take their place at .3 times the original cost. Before, it cost me $1910.00 and now it costs approximately $630.00 for delays and logic control.

The module is well on its way to production through the proper channels. Test data sheets, tester and models are almost complete. The production release is presently in drafting. Test procedure and module specifications will be available shortly.

Midwestern Type 570 Transport Control?

I devoted the majority of my time to the Midwestern transport during the first week in May. After completing the design, I received a memo from Gordon Bell proposing a common buss system. The idea sounds great between computer and control but NOT BETWEEN CONTROL AND TRANSPORT. Ridiculous. The cost of transport controls would skyrocket. Can one imagine commutating 30 to 40 wires?

The basic 570 Control is designed for multiplex operation. That is, two tape controls may address the same transport separately. The logic is set up so that when the customer desires multiplex operation, he buys an additional mounting panel called B Control and plugs it into the existing A Control. Each mounting panel carries a maximum of 12 modules. For multiplex operation 4 - 50 pin cannon plugs are required in each transport. The logic is designed that more transport controls could be added in a priority arrangement. The basic A Control with read/write logic uses 22 modules where the B Control uses 7 modules.

The first control unit will be out of production by the last week in May. It is planned to have the 521 tape control out approximately the same time. However, drafting has held me back a week and who knows when they will be finished.

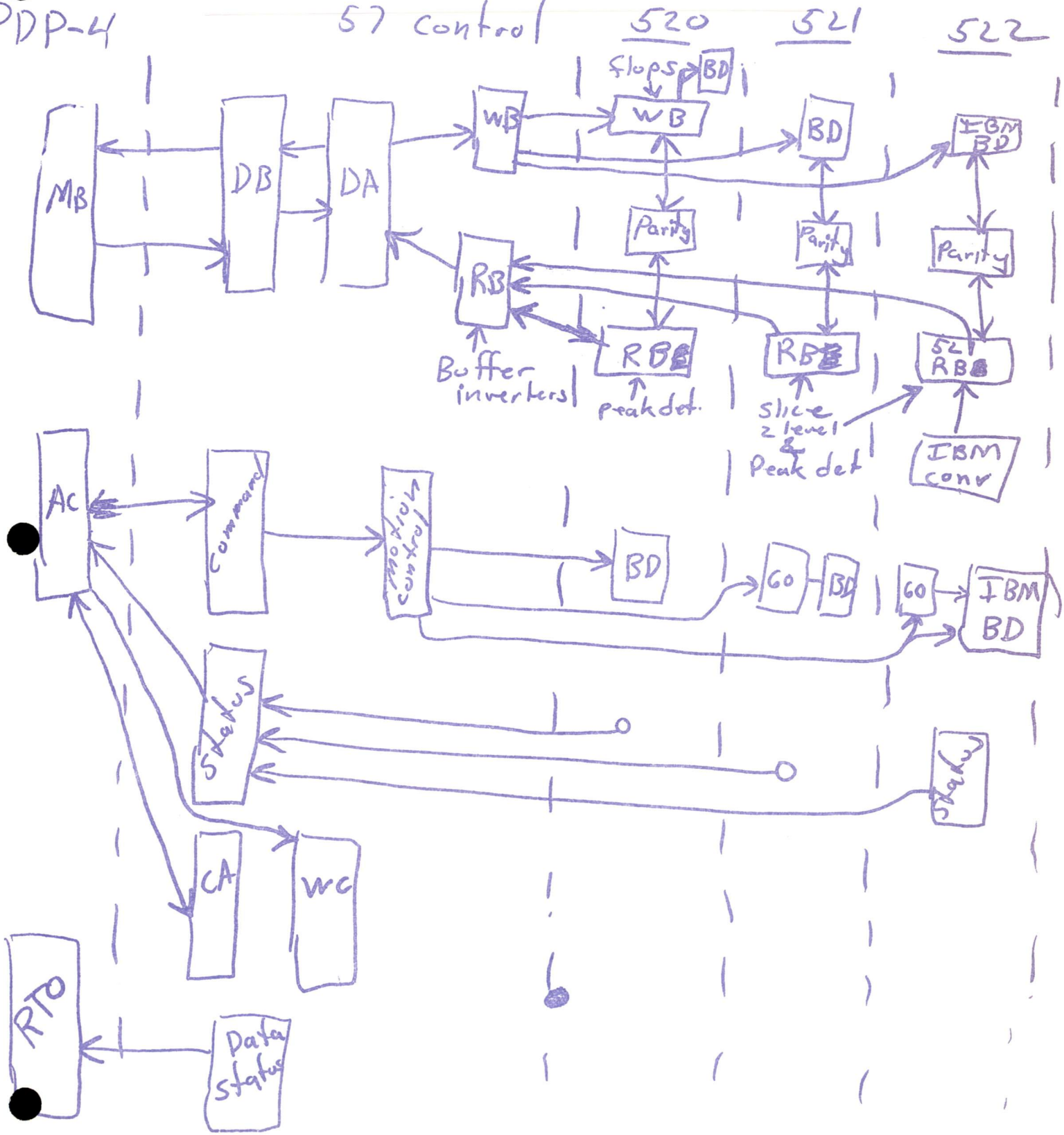
I've suggested to Scott Miller that two transport select switches might have great sales potential for multiplex or time sharing of transports. There is valid logic reasoning behind this suggestion. If computer A has programs written using transports 1 and 2 and computer B has a program using the same unit numbers but B wants transports of his own not being used by A, what does B do?

Anything else?

Yes, I'm still hep on wirelisting. How? Refer back to a memo that I wrote a month ago. Presently the 570 is on cards with a wiring diagram for backup. I have found a great amount of the problems in the initial stage are emotions, documentation and ease of handling. Errors crop up every time the list changes hands. The key punch operator has trouble reading the scribbles and she finds it difficult to switch to and from alpha and numerical modes.

I've been doing this work in my spare time (What spare time?) and hope to see results soon.

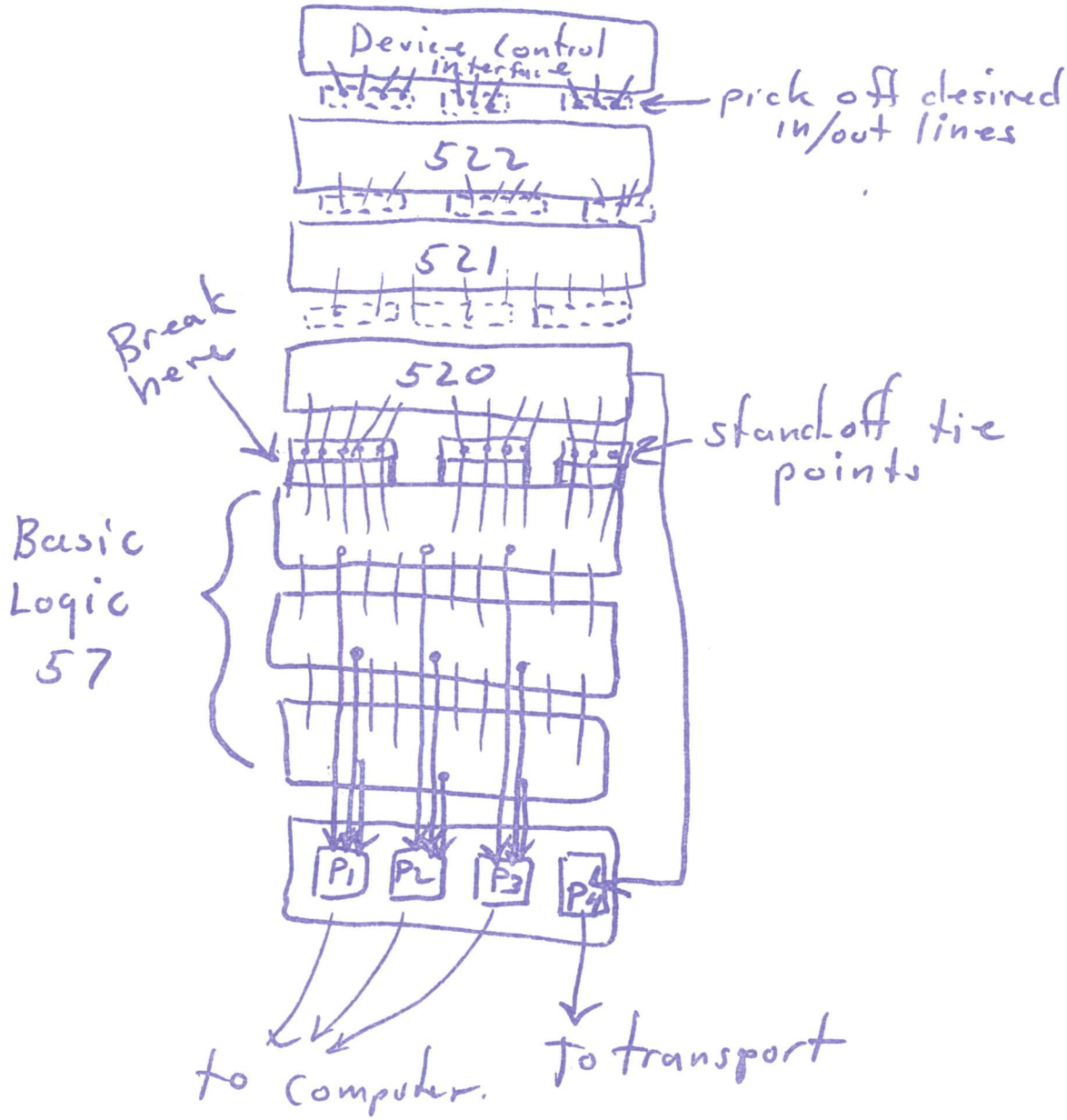
Type 57 Mag tape Control



S. Lambert
5/14/63

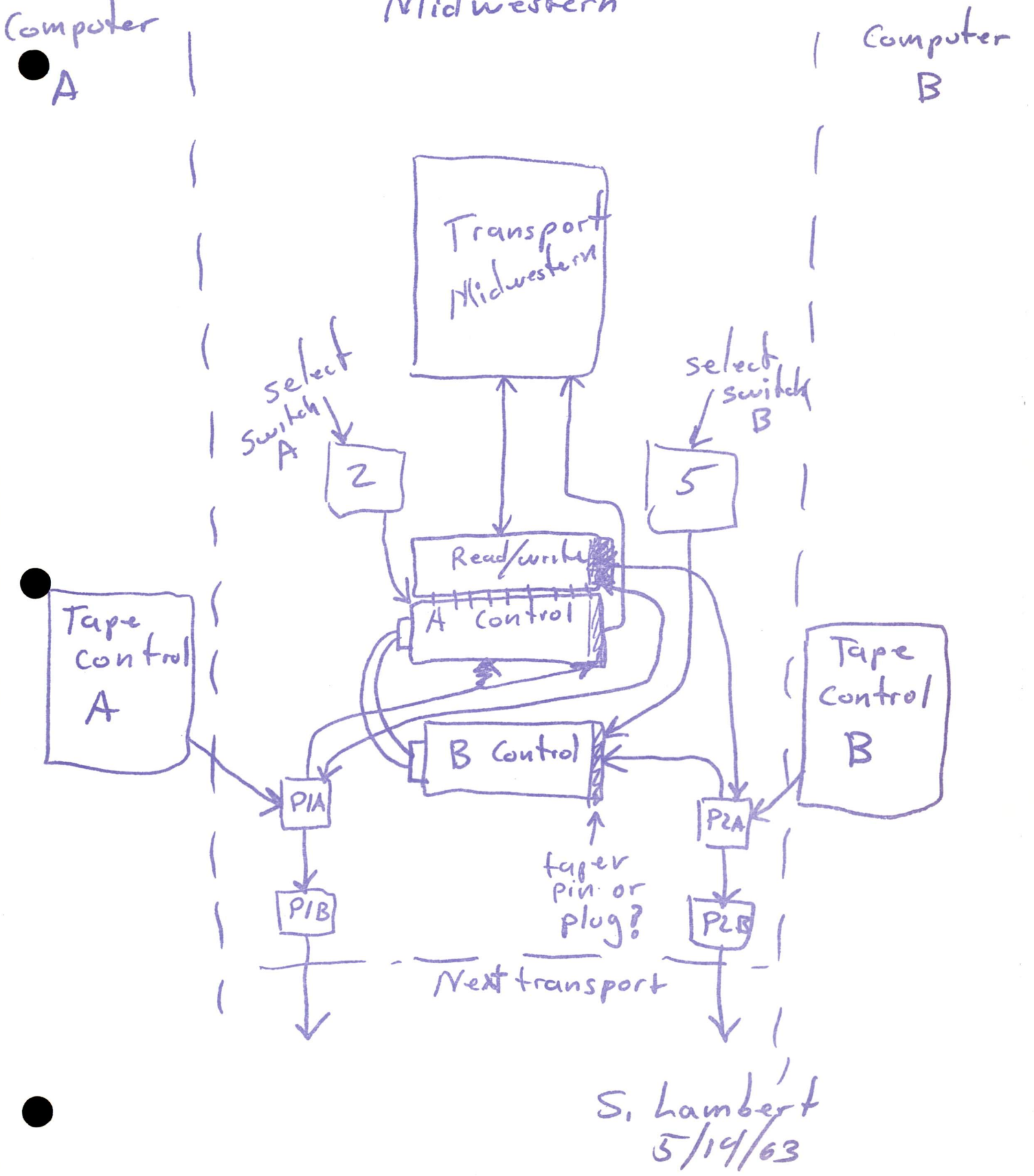
Type 57 control

520, 521, 522 interface or other



S. Lambert
5/14/63

Type 570 Transport Control
Midwestern



S. Lambert
5/14/63

K. olsen

COMPANY CONFIDENTIAL

5/16/63

MEMO:

TO: Mr. Louis Calatrello, Internal Revenue Service

SUBJECT: Computation of Digital Equipment Corporation Stock Valuation for Options and Sales

During your examination of our Fiscal Years Ended, June 30, 1961 and June 30, 1962, you requested a computation of the Option and Sale price used in valuing $3.00, $14.00 and $30.00 agreements for Digital Equipment Corporation Stock. Following is a description by factor, of the items considered in establishing a value for DEC Stock for Option and Sale purposes:

Three Dollar Option Price per Share - Granted, November 24, 1958, by Vote of the Board of Directors

1. When these options were granted, the company had a book value of $1.78 per share as of October 31, 1958, and had been organized slightly more than a year. As is apparent from this short term of operation, the future possibilities of the company were most uncertain.

2. This optioned stock was subject to a restriction that it could not be sold by the optionees without first offering it back to the company at $3.00 per share.

3. Within the month of November 1958, ITEK had offered to acquire the business of the corporation on the basis of 80 % of the cost of AR&D's investment in Digital Equipment Corporation. The cost of the investment of American Research & Development Corporation in DEC was $2.00 per share at that time. This would make ITEK's offer $1.60 per share.

4. These value restrictions, plus the absence of a public market, the newness of the company and attendant future uncertainty, were severe depressants on the value of the stock.

TO: Mr. Louis Calatrello, I.R.S

Fourteen Dollars per Share - Granted, September 12, 1961 - Sales

1. The first factor considered at this time was the Book Value per share of the company as of the end of the previous fiscal year - June 30, 1961, which was $13.79. The company had been in existence only slightly over four years, but still was not in a position to determine, with any degree of certainty, what the future prospects were for its new product lines, due to the rapid evolution of processess in the industry. The company found itself absolutely dependent on one man in engineering for the superior design of its module line, which was the basis of the company's sales. This fact introduced an even higher element of risk, in addition to rapid evolution in the industry.
2. Here again this optioned stock was subject to a serious value restriction. It cannot be sold without first being offered back to the company at the Book Value at the end of the month previous to the sale.

The above restrictions, plus the continued absence of a public market, the relative newness of the company and unproven future market for its products, and its attendant future uncertainty, were felt to be a solid base for the $14.00 value.

Thirty Dollars per Share - Granted, September 12, 1961- Sales to Non-Employees

1. As will be noted, the Vote by the Digital Equipment Corporation Board of Directors to sell to its non-employees, composed primarily of Directors, stock at $30.00 per share, was prepared under the same circumstances as in

5/16/63

TO: Mr. Louis Calatrello, I.R.S.

the prior option above. However, the stock was subject to no restrictions. Hence a higher value was justified.

2. One of the offerees - John Barnard, Jr., did not choose to buy the stock at the price quoted and after 30 days, his offer lapsed.

Due to the absence of restrictions on disposal of the stock, the increase in value to $30.00 was believed to be justified.

*See Comparison Chart Attached

DIGITAL EQUIPMENT CORPORATION STOCK VALUATION COMPARISON

Date Granted -	11/24/58	9/12/61	9/12/61
Issue Price per share -	$3.00	$14.00	$30.00
Value Restrictions -	yes	yes	no
Book Value per share:			
Date	6/30/58	6/30/61	6/30/61
Value	$1.29	$13.79	$13.79
Net Profit per share:			
End of fiscal year	6/30/58	6/30/61	6/30/61
Amount	(Loss .27)	$ 7.35	$ 7.35
Stock Rejections -	Outsider	none	Director

5/16/63

Report on the High School Market

Robert F. Maxcy

May 13, 1963

The High School Market

In the recent past, educators have shown increased interest in the use of computers at the secondary school level. Mainly, interest is centered around the use of EDP equipment as a teaching aid in furthering student knowledge of computer fundamentals and operation. This has led us to explore DEC's position in the secondary school field.

Investigation began through several contacts with Mr. Jesse Richardson. Jesse is the head of the math and science department in the Massachusetts Department of Education. He is highly enthused about the possibility of using EDP equipment for student training. Jesse is also in charge of allocating Title III Funds to high school science departments.

These funds are made available by the National Defense Education Act of 1958, and provide for a 50% reimbursement to high school science departments for the purchase of certain scientific equipment for student use (computers fall into this category).

It is to our advantage to have Jesse enthused about our equipment and our intentions as he makes the final decision on what equipment is subject to government refund.

To get him acquainted with our products, we have loaned him a double-size logic kit which he will demonstrate to schools this fall.

I have obtained a list of Jesse's counterpersons, that is, the directors of math and science in other states, and a list of the most progressive high schools (those currently using or interested in EDP equipment) in this state. These served as the basis of my contacts.

I spoke primarily with high school principals and science and math teachers.

DEC had a booth at the National Science Teachers Convention in Philadelphia, and I spoke with several interested educators. The results of my interviews at the show, and numerous state and out of state contacts have produced the following opinions.

Educators are interested in EDP equipment for three broad reasons.

1. They prefer that the student deal with the machine directly, that is, he becomes familiar with machine language and the logical operations of the computer.

2. School authorities are interested in having a computer solve their administrative and scheduling problems. (IBM offers a service like this for $2.00 per student per year.) They feel that teachers could use the machine for instructional purposes when it was not solving administrative problems.

3. Some teachers feel that courses in FORTRAN or COBOL are all that is needed to teach about EDP.

This last group seemed unsure of their plan of action, and it was relatively easy to steer them in another direction.

Title III Funds are only available for the first type of application. That is, the government will foot 50% of the bill only if the equipment is used for educational purposes only, i.e., equipment that, in any way, alleviates any school administrative problem is not subject to Title III.

I feel that, at the present time, it is unwise for Digital to make any concentrated sales effort in the high school market. My reasons follow.

1. School boards are generally not receptive to allocating money to buy EDP equipment. Text books, school improvements, teachers salaries, and "run of the mill lab equipment" comprise most of the school's yearly budget, and there is not enough left over for "long shot" investments.

2. This market is characterized by its need for consumer education. Most of the people I talked to recognized that at some time they would need to teach some thing about EDP. Very few knew exactly what. To educate the high school market would require vast amounts of time and money and would yield a small return on the investment dollar.

3. We have characterized ourselves by selling to a select group of people; people who have product knowledge and the money to buy good equipment at prices that allow us to make a fair return on our investment dollar. Companies engaged in selling to the high school market generally sell on a high volume low margin basis.

We are not ready to make vast outlays of time and money to educate and sell the high school market. We should continue with a moderate good will program to local schools.

In relation to the entire picture, our contribution may seem small, but we should contribute in relation to our interest and ability.

Ken Olsen

dec INTEROFFICE MEMORANDUM

COMPANY CONFIDENTIAL

DATE May 14, 1963

SUBJECT Type 54 Tape Control

TO Computer Guidance Committee FROM Dit Morse

I intend to bring this subject up at the Computer Guidance Committee meeting of 5-15-63 for the purpose of discussing the possibility of (1) obsoleting the tape control or (2) downgrading the responsibility we assume in regard to programming.

The points in favor of some action are:

1. The control is extremely hard to use.
2. We have sold only one.
3. Operation of the in-house control has not been satisfactory.
4. Foxboro is unsatisfied with the programs we have furnished.
5. Type 51 hindsight
6. The type 57 is only (2xtype 54) dollars!

On the other hand, in favor of keeping the present control are

1. It is inexpensive.
2. It is somewhat less restrictive in the formatting of data.

The overall summary is that we presently offer a tape system which consists of the type 54 control and programs. However, I believe we will spend an amount of time and effort maintaining systems containing the type 54 which will be out of proportion to the returns in monetary profits, computers sold or satisfied customers.

There may be a strong case for the control as part of small data collection systems where the number of dollars is especially significant to the user. Perhaps if such a case arises, the type 54 should be sold as a "special option."

dec INTEROFFICE MEMORANDUM

DATE May 14, 1963

SUBJECT Modules for the 10mc Line and PDP-6

TO R. L. Best

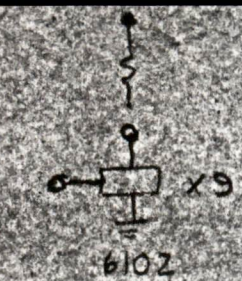
B. Scudney
D. White
E. Chevrier
R. Doane
A. Hall
K. Olsen
A. Kotok
E. Harwood
L. Prentice
R. Reed

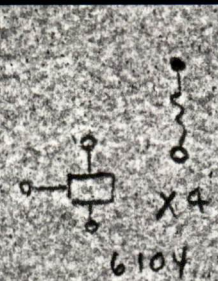
FROM Gordon Bell

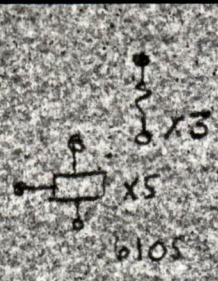
I am planning to use the enclosed modules for PDP-6. The delays and PAs may present packing problems, but our logic dictates a great number of these, so it would be nice to have them. Since it seems possible to improve the speed and fan out of the 6102, 4, 5, and 6, I think we should go ahead despite some ill effects to schedules.

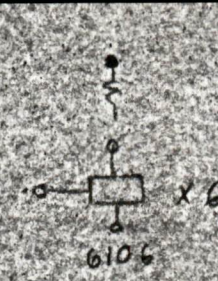
The first unit, the memory will need modules pins by June 7, 1963, and modules by June 21, 1963. The memory uses all those shown (the 6 delays and PAs per card are still open for debate).

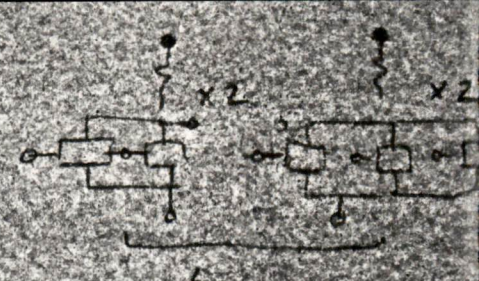
There are additional mechanical layout-connector problems in the two modules for memory.

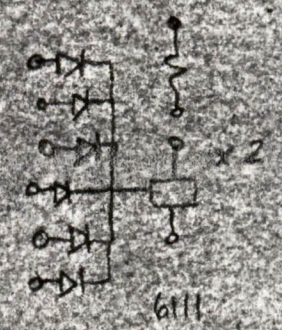


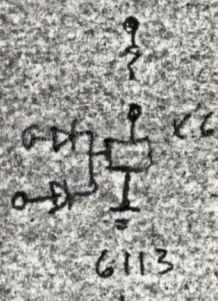


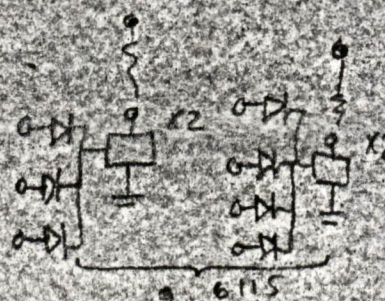


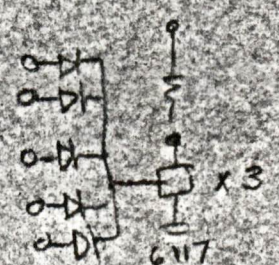


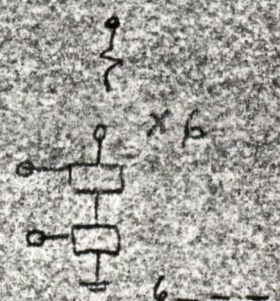


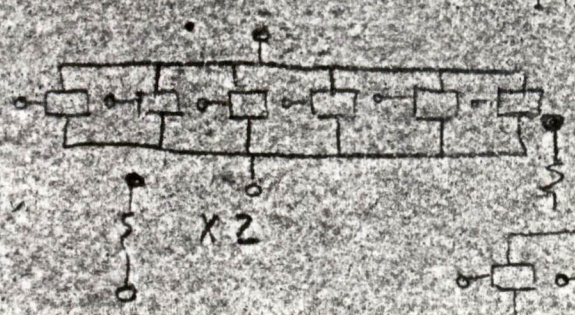


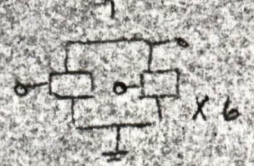


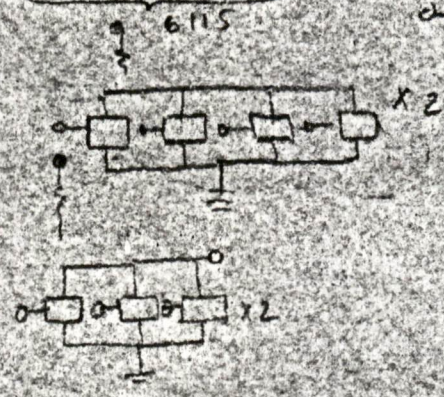


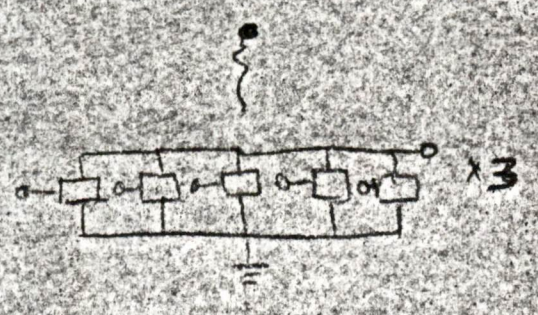


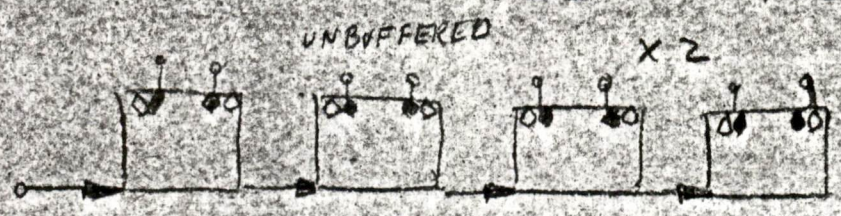


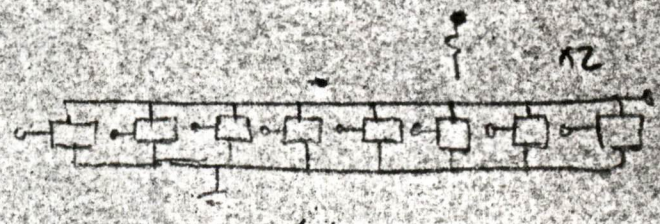


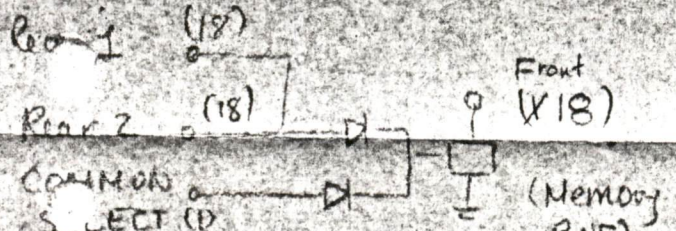


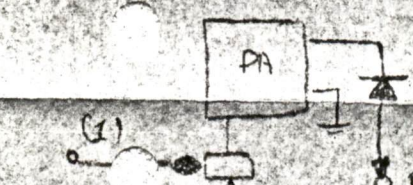


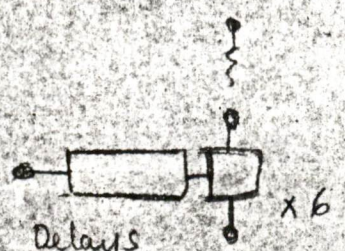


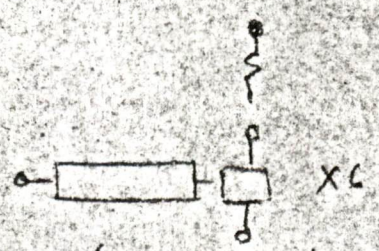


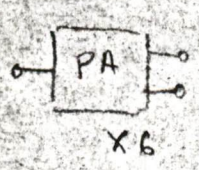


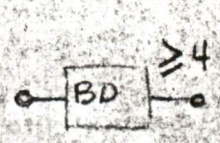












6___ or 1___ 6___ or 1___ 6___ and 1___

K. Olsen

dec INTEROFFICE MEMORANDUM

DATE May 10, 1963

SUBJECT Attached Arithmetic Execution Times Table

TO "PDP Distribution List" FROM Pete Bonner

Due to the encountered increased demand for arithmetic operating times for both of our computers, the attached table has been compiled. The figures comprising this table were gathered from presently existing tables and "educated guesses" as to function execution times.

The table is being circulated only within DEC with the intent of having missing times filled in, correct times certified and incorrect times corrected. Where it is applicable, it would seem highly desirable to have minimum, maximum and average times.

It is hoped that serious consideration will be given to correcting and updating this table. Toward this end, I would appreciate having all responses directed to me.

Function	Arithmetic Execution Times for PDP-1 (In Microseconds, Including All Access)				Arithmetic Execution Times for PDP-4 (In Microseconds, Including All Access)		
	Fixed 18	Float 18-18	Fixed 36	Float 36-18	Fixed 18	Fixed 36	Float 36-18
Addition	10	720	180	790	16	96	min. 360 max. 336 ave.
Addition*							1,000
Subtraction	10	750	180	710	24	128	min. 360 max. 336 ave.
Subtraction*							
Multiplication	14 min. 25 max. 20 ave.	470	795	1,500	40 min. 256 max. 148 ave.	700	min. 700 max. 500 ave.
Multiplication*					2,500	8,500	10,000
Division	30 min. 40 max. 35 ave.	470	950	1,625	200	min. 720 max. 650 ave.	min. 820 max. 750 ave.
Division*					3,100	10,000	10,000
Sine-Cosine	390			12,000	2,550		6,840
Sine-Cosine*							
Tangent							
Tangent*							
Arcsine	1,035						
Arcsine*							
Arccosine	965						
Arccosine*							
Arctangent	2,035						
Arctangent*							
Square Root	715			3,025	1,420		1,630
Square Root*							
Exponential		660					825
Exponential*							
Logarithm							
Logarithm*							

*Without Extended Arithmetic Unit in PDP-4

Pete Bonner 5/1/65

INTEROFFICE MEMORANDUM

62-003

DATE May 29, 1963

SUBJECT Schedule of Activities

TO K. Olsen
S. Olsen
H. Anderson
R. Best

FROM K. Wakeen

EN 1157 AUTOMATIC MODULE TESTER

1. Instruction manual - written by 5/30/63.
   Printed and distributed by 7/15/63.

2. Install tester in new room by 6/1/63.

3. Complete programming for 4201 F.F. by 6/30/63.

4. Add programs for P.A. and C.D. gates 7/30/63.

5. Add micro-tape 7/30/63.

6. Add high speed printer 8/15/63.

7. All programs for testing production modules in by 9/1/63.

EN 1206 AUTOMATIC MODULE TESTER SALES

1. Add Burrough's modules 6/7/63.

2. Add Fairchild modules 6/30/63.

3. Other contacts which were established during and before EJCC Show will require concentrated follow-up during the next three months. The most active prospects to date are Burrough, Texas Instruments, and Fairchild.

4. Follow-up Weston Instruments 5/29/63 for resistor tester and computor.

dec INTEROFFICE MEMORANDUM

DATE May 8, 1963

SUBJECT TMC

TO File

FROM Harlan E. Anderson

cc: K. Olsen
G. Bell

Today we were visited by Mr. Robert M. Ghen, President of Technical Measurement Corporation in North Haven, Connecticut. With him was Mr. Stanley Goslovich. The purpose of their visit was to explore ways in which we might work together and to get better acquainted with DEC. This is the company which has made the Computer of Average Transients (CAT), which is an inexpensive commercial version of the ARC. This is made by the Mnemotron Division which formerly was a separate corporation.

They have two other major types of products. The first of these is pulse height analyzers which were the subject of the recent Physics Conference in Monterey. The other is Telemeter Demultiplexing which is carried out by their Telemetric Division. Of their 6 million dollars of sales about 1 and 1/2 million will be in export business. They also indicated that they have a patent on the basic averaging technique which I find a little hard to believe. They presently have approximately 500 employees in the total complex and have opened a sales subsidiary in Frankfurt, Germany.

They showed considerable interest in the possibility of buying a computer from us to use as a component in a new type of pulse height analyzer. They were particularly interested in the PDP-5 and were given a copy of our internal preliminary specification on it. After reading this, I would expect someone from there will contact us to have detailed technical discussions which could lead to our submitting a proposal to them. In the reverse direction they are going to send us some detailed technical information about their digitizing front ends to pulse height analyzers. If these appear to be devices that we might be interested in, we might pursue them for purchase. I pointed out to them that in our other joint undertakings with people like Foxboro, and ITT, we kept the relationship strictly on a vendor supplier affair and recognized that at times we might be competing with each other. We attempted to make no constraining type implications or agreements on each other and the TMC people appeared to understand this and felt that it was a good plan. If we do not hear from them within a couple of weeks I think we should take the initiative and contact them to try to sell them a PDP-5 or maybe even a PDP-4. They were very impressed by our automatic module testing and were also interested in the possibility of using a computer like the PDP-4 in their business operation. These two applications would be secondary, of course, to their primary

interest of gaining experience in general purpose stored program computers. My own personal opinion is that if they do not somehow get involved with general purpose computers either with us or some other way, their business will start showing a decline in the next year. This is certainly a critical thing to the future of their company in my opinion.

A few more interesting technical notes to the pulse analyzer business are the following:

Some of the front ends to the pulse analyzers actually are coincidence detectors that have built-in delays for one of the inputs. The two inputs would come from things like scintillation counters placed at very precise angles relative to a nuclear source or an accelerator. The time intervals that are used for these coincidence detections are like 20 nanoseconds between the two pulses. Another interesting technique is the pre-loading of the core memory of the pulse height analyzer with the negative image of the background noise. Then when the actual experiment is run, the background tends to be eliminated and the result is the crew signal. This might be described as a one-shot average. Most of the output of their pulse height analyzers now is done with punch paper tape although some of the systems are equipped with magnetic tape units for which they have used the Potter. Also some of the pulse height analyzers have a modest amount of computation ability built into them.

H.E.Anderson

HEA:ncs

INTEROFFICE MEMORANDUM

DATE April 30, 1963

SUBJECT Micro Tape Controls; Past, Present, Future

TO Tom Stockebrand ✓Ken Olsen
Richard Best
Roland Boisvert
Alan Kotok
Steve Lambert
Dit Morse

FROM Gordon Bell

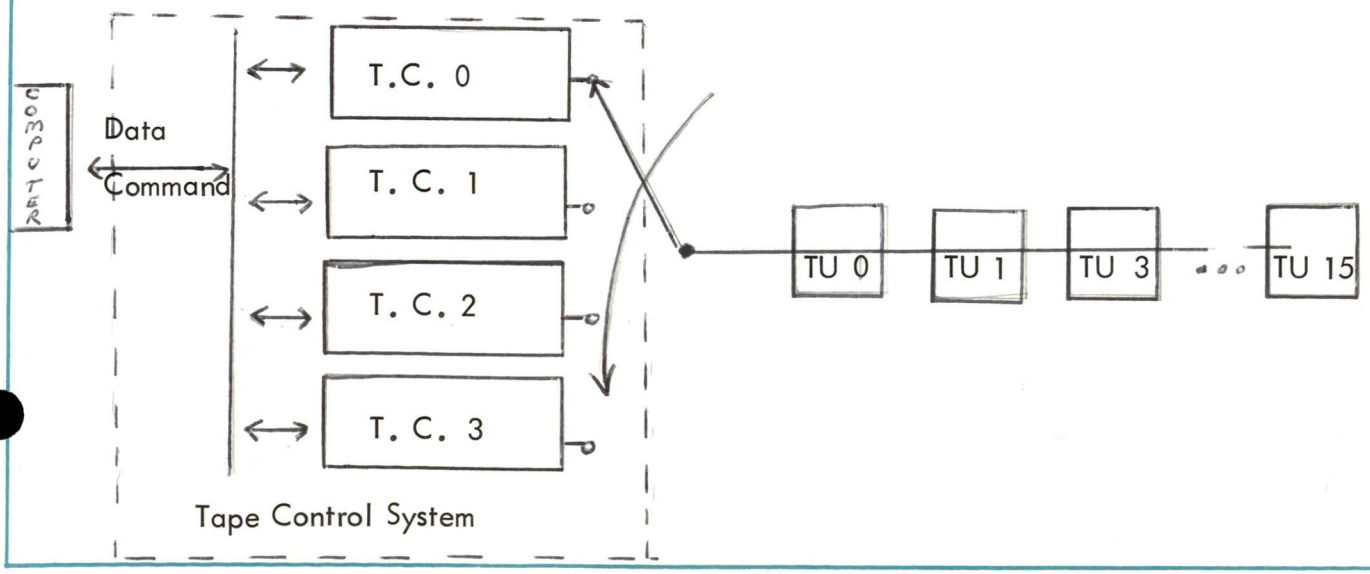
Tape systems need the capability of running a maximum number of random tape units simultaneously, regardless of the control to which they are connected.

IBM systems, and DEC too, generally have only the ability to have one unit running per control. Several units can be connected to a control, and in general, units cannot be mixed or moved among controls. Larger CDC and Remmington Rand systems have controls which read one unit, write another unit simultaneously. In the ADX system, eg. two controls share all transports, using relay switches.

In general, however, we need multi-unit controls that operate on a cross-point switch. A better way around the problem perhaps is to use only one bus for all transports, but to time share the bus from a central control. This is the system we are using in PDP-6 memory.

This would be accomplished by read, write, and motion buffers within a unit. A control, then which consists of several (4) read, write, motion, etc. controls for all or any of the 16 units then shares the data, and unit control bus, perhaps on a linear priority basis or 1 microsecond/control.

The sketch shows the system:



TCO, 1, 2, and 3 have data buffers (perhaps 1 character or 1 word, depending on PDP-6 organization), the tape motion control.

The tape units now must then have slightly more electronics. Assuming the present system, a computer really needs one control per unit.

A system for PDP-6 (perhaps PDP-1, or PDP-4) would be like:

1. Some method of tape movement (quanta of tape feet) without control intervention.

2. Some method of switching units between controls, because the control is busy with searching, tape movement, and waiting for tape to get up to speed, etc. In general, the ability to have any 1 or 4 of 16 units running simultaneously.

INTEROFFICE MEMORANDUM

DATE April 25, 1963

SUBJECT

TO Ken Olsen

FROM Ed Harwood

I have applied for transfer from Associate to Member grade in the I.E.E.E. and have used your name as a reference for the following resumé.

Present Occupation

Title or Position - Manager, computer test

Firm - Digital Equipment Corporation, Maynard, Mass.

Nature of Work Done by Firm - Manufacture Modules, Computers and Special Systems

Nature of Your Work - Responsible for all computer assembly and testing

Professional Experience

July 1959 to Present — Digital Equipment Corporation, Worked on the design of the PDP-1 and PDP-4 computers and am now supervising the complete system testing of these computers.

June 1952 to July 1959 — Lincoln Laboratory, Worked on the design of Cape Cod System, the Sage System, also was involved in the design, construction and assembly of the TX-0 and TX-2 computers. I also did much of the testing of these computers.

Ken Olsen

INTEROFFICE MEMORANDUM

DATE April 24, 1963

SUBJECT Midwestern 3000 series transport

TO Computer Guidance Committee FROM Steve Lambert

The following modifications should be made to the Midwestern 3000 series transport.

1. The Hub Spool (½ I.B.M. Reel Assembly) should be redesigned without using rubber friction rings.
   Reason: The tolerance and durability of rubber rings results in difficulty of loading reels and short term life. It took me five (5) minutes to load the tape reel onto the hub assembly.

2. Status and command levels should all be compatible.
   Reason: Undesirable special circuits must be constructed. The interface becomes expensive.

3. The first 5 sec. thermal delay in series for rewind should be removed.
   Reason: As the circuit stands now, a rewind command given 3 or 4 feet from load-point results in a no-load and a fail condition exists.

4. The load-point sensing station should be on the outside of tape not the inside .
   Reason: IBM compatibility.

5. The load-point marker should be sensed in the rewind state no matter how close the marker is to the sensing station.
   Reason: Programmer have the tendency to rewind after writing 1 or 2 records on tape. This puts the marker about a foot away from the sensing station.

6. After a rewind command the transport should stay in the remote state.
   Reason: When rewinding, it does not necessarily mean that the programmer is through using tape. Presently it requires the programmer to go over to the transport and select remote after rewinding.

7. A status level should be made available to indicate that the transport has tape in the chambers, no fail condition exists, and the transport is ready to accept a tape function.

8. The write lock (inhibit) switch should be pulled in while the plastic ring is in the reel. A status level should be made available externally.
   Reason: If the switch lever is not pulled away from the plastic ring, the ring will be shreded when the tape reel is in motion.

9. The cabinet has to be redesigned to DEC standards.
   Reason: The present cabinet is flimsy and internal areas are not easily accessible. A transport select switch must be incorporated in the cabinet design.

10. New mounting panels must be made for installation within the area assigned.

11. Fixed tape guides must be compatible with IBM in reference to channel 1.
    Reason: Tape widths vary to some degree.

SL/nbh

ted
ERANCES
CENT.

10 —

3 —

1 —

0.3 —

0.1 —

.03 —

.01 —

.003 —

.001 —

Boonton 95A

DC AMPS

DC VOLTS

Boonton 95A

HP 412A

DC AMPS

with shunt

with probe

630-NA

Triplett 630-NA

Weston Mirror-Scale

DC VOLTS

John Fluke 821A

Kin-Tel 303
with 95A as nullmeter

10^{-13} 10^{-12} 10^{-11} 10^{-10} 10^{-9} 10^{-8} 10^{-7} 10^{-6} 10^{-5} 10^{-4} 10^{-3} 10^{-2} 10^{-1} 10^{0} 10^{1} 10^{2} 10^{3} 10^{4} 10^{5} 10^{6} 10^{7} 10^{8} 10^{9} Value

Rated Tolerance of
DUT

4/9/[illegible]

100

30

10

3

1.0

0.3

Amplifier
RS-1

AC AMPS RMS @60~

AC VOLTS RMS @60~

Ballantine 300H | Beckman 5350 | Western Electric 433 | Beckman 5350 | Triplett 630 NA

10^{-8} 10^{-7} 10^{-6} 10^{-5} 10^{-4} 10^{-3} 10^{-2} 10^{-1} 10^{0} 10^{1} 10^{2} 10^{3} 10^{4} 10^{5} VALUE

Refer Tolerance of
IEC Test Equipment 4/9

Rated Tolerances in Per Cent.

10
3
1
0.3
0.1
.03
.01
.003
.001

Tek. L-C Meter ↔ C ↔ ESI 270

FARADS

Tek. L-C Meter ↔ L ↔ G.R. 650-A

HENRYS

ESI 230-R ↔ Ω ↔ FLU MET

Tek. 180-A ↔ ω ↔ Tek. 567

Ω
ESI
230-R

OHMS

CYCLES PER SECOND

10^{-13} 10^{-12} 10^{-11} 10^{-10} 10^{-9} 10^{-8} 10^{-7} 10^{-6} 10^{-5} 10^{-4} 10^{-3} 10^{-2} 10^{-1} 10^{0} 10^{1} 10^{2} 10^{3} 10^{4} 10^{5} 10^{6} 10^{7} 10^{8} 10^{9} Value

Rated Tolerance of DEC Test Equipment