K. Olsen

DIGITAL READING
•
DIGITAL MAYN
•
DIGITAL MAYN

DIGITAL CPL

SEPT 23
MESS 771

Elsa,

TO KEN OLSEN
FROM DENNY DOYLE

SEP 23 1965

WE ARE RUNNING INTO SERIOUS DIFFICULTY AT CHALK RIVE IT MAINLY CENTERS AROUND OUR DELIVERY PROBLEMS WE HAVE BEEN ABLE TO SELL THEM THE PDP8 STORY BUT I HAVE NOT BEEN GETTING NORMAL CUSTOMER TREATMENT FROM YOUR PEOPLE ON ITEMS WHICH WE CAN DELIVER THE RESULT IS THAT I HAVE BEEN WAITING SIX MONTHS ON PAPER TAPE PUNCHES READERS ETC THE FOLLOWING ARE PURCHASE ORDER NUMBERS TO INVESTIGARE --

OUR NUMBERS --
589 — 11093 (75A, 750, CAB-3) - (1W K) Shipping
688 — 11423 Cat 813 - Cat-3 - (1W K) "
570 - 10887 (75A) (1W K) "
681 - 11424 (2-170) = Oct 20

THE LANGUAGE FROM CHALK RIVER IS NOW SUFFICIENTLY STRONG THAT I THINK YOUSHOULD BE AWARE THAT WE ARE IN TROUBLE

TED IS LOOKING INTO THE TROUBLE FOR ME CALL ME IF YOU HAVE ANY QUESTION

équipement digital

65, RUE DU FAUBOURG SAINT-HONORÉ
PARIS 8e - *Tél. 256 13 28 - 256 11 37*
TÉLEX : 26.705 DIGITAL PARIS

Ken Olsen
Digital Equipment Corporation
146 Main Street
Maynard, Mass.
U.S.A

September 23, 1965

Dear Ken:

I spent two hours this morning with Bernard Josien, Lawyer with Cleary Gottlieb Steen & Hamilton.

The French Ministry of Finances refused the right to create an affiliate of Digital Equipment Corporation.

Arnaud de Vitry, whom I also saw this morning, as well as Bernard Josien think we shall make a second application later. We think that after the elections it is going to be easier.

Very truly yours,

Bernard Haus

INTEROFFICE MEMORANDUM

DATE 9.22.65

SUBJECT Grounding

TO Ken Olsen

FROM Dave Denniston, NYO

CC: Ted Johnson

One of the large systems groups associated with NIKE X at Bell Labs, Whippany, is now engaged in an argument on grounding philosophy. The engineers with the most hardware experience are firmly convinced that mesh grounding in any system is the proper approach; however, the system in question involves a fairly extensive analog front end, and the other school, which is mostly supervisory level, argues not so much from the benefit of mesh grounding but from the standpoint of compatibility with analog ground system. They would like to know if we know of any technical reports that were published at Lincoln Labs, M.I.T., etc., which will give them the theoretical support they desire for mesh grounding in the digital portion of the system.

DBD:BMP
NYO Ref: Chaves, Whippany

INTEROFFICE MEMORANDUM

DATE September 21, 1965

SUBJECT Small Computer Group Space Requirements

TO K. Olsen ✓
CC J. Hastings
T. Johnson

FROM N. Mazzarese

In response to your proposal for the Small Computer Group to move to the top floor of Building 5, I have taken a preliminary survey and found that the space will be adequate. This assumes that:

1. Field service does not need a large amount of additional space.
2. Ted Johnson will require only a few thousand square feet.

For your information, our requirements are as follows:

Small Computer Special Systems	4,392
Production	13,644
R. Wilson	1,600
L. Hantman	2,050
E. deCastro	2,860
J. Jones & Sales Adm.	7,000
N. Mazzarese, J. Hastings & B. Lizotte	750
	32,296

INTEROFFICE MEMORANDUM

DATE September 21, 1965

SUBJECT Production Schedule for Pilot Production of -3 Volt Strates

TO R Viscogliosi FROM T C Stockebrand

Attached is the schedule for the pilot production for your use.

TCS:ASJ
Encl.

CC

L Prentice
J Cudmore

STRATE PRODUCTION September 21, 1965

PRODUCTION SCHEDULE FOR PILOT PRODUCTION OF -3 VOLT STRATES

PRELIMINARY

Make sure that the ovens to be used each day are set up for proper temperature and belt speed the preceding evening. Make sure that inks to be used each day are on the rotating rack the preceding evening. The group of strates in process is to be large enough so that each step takes at least one full day.

In these first few production runs we want to keep rather more complete records than we will probably maintain at a later date. For this reason Engineering respectfully requests Production to use the record keeping technique described in the CONTROL print and expanded in the section of the specifications entitled Records and Reports. Any additional records such as log sheets which Production feels should be maintained are welcomed and encouraged. The ultimate goal is that all record keeping should be done by machine so as to keep up with the rather large volume of strates which is expected.

GENERAL NOTES

Time should be recorded in the various log books along with production quantities so that tentative price figures can be achieved. The screens used will be the 3V -E but refer to the 3V special production procedure for the latest revision information. The R screen must be done on the rotary screen printer and the run is designed to have C_1 and D also done on the rotary printer. The C_2 screen will be a manual printer screen. Rejects at every station will be itemized and recorded in the station log. Any extremely interesting or unusual rejects should be saved.

SPECIFIC PRODUCTION PLANS

Day Number	Item	Manpower
1, 2, 3	Screen C_1 - 8 continuous hours on the rotary screener. If more time is necessary to produce 3600 pieces use it. One girl to screen, one girl unloads (since feet must be painted) and one girl paints feet until the other two can join her on subsequent days. While the girls are catching up with screen painting and firing, the printer should be moved to the resistor oven.	3 G
4	Screen R until done (8 hours). Measure continuously the resistors as they come out of the oven. The computer program will plot histograms and R vs time. It is important that this run be done in one continuous pass. Move printer to the C_2 oven after hours if need be and make sure oven is set.	3 G
5	Screen dielectric until done (8 hours). Sample test the resistors only and record actual values. Nitrogen off (Note in Production write up). Print one-half the cans.	3 G
6, 7	Screen C_2 on the hand printer and set die. Inspect visually and reject both before and after firing. One girl should screen and keep the others supplied so that they need only place chips.	3 G

Day Number	Item	Manpower
8, 9, 10	Bonding. Use two mil gold wire and record model number of each tip used. Two girls should bond and one should keep them supplied continuously with materials and do the testing. The computer will indicate rejects and maintain histograms. Record production in bonding log. 646 coat immediately following testing those which are not rejects.	3 G
11	Insert pins. Print remaining cans and keep up on paper work	2G
12	Solder, wash and varnish (SR 17). These three must all be done on the same day.	2 G
13	Encapsulate. One girl loads 183. One girl loads strates. The third supplies primer and loads the oven.	3 G
14	Final test and final records and approval	1 G

TCS:ASJ

digital equipment corporation
MAYNARD, MASSACHUSETTS
TWinoaks 7-8822 TWX MAYN 816

September 21, 1965

Mr. Kenneth H. Olsen
Digital Equipment Corporation
146 Main Street
Maynard, Massachusetts

Dear Ken;

Attached is a Comparative Balance Sheet of the Company and its Consolidated Subsidiaries as at August 28, 1965. This statement was not available at the time of the Board Meeting.

Accounts Receivable decreased in this two month period as a result of collections against the substantial Billings made in the Month of June coupled with a low rate of billings during July and August. The resultant large influx of cash reduced bank loans temporarily. A continued build-up in inventory resulting from the lower billings and a planned increase in production of Modules and PDP-8's has required subsequently an increase in bank loans.

Backlog of unfilled orders as at September 4 were as follows:

Modules	$ 393,840.
Special Products	311,377.
Computers	8,752,696.
	9,458,186.
Letters of Intent	3,549,815.
	$13,008,001.

Sincerely yours,

Harry S. Mann
Treasurer

HSM/tr

Enclosure

DIGITAL EQUIPMENT CORPORATION AND SUBSIDIARIES

CONSOLIDATED BALANCE SHEET

as at August 28, 1965 and July 3, 1965

(000 omitted)

	8/28/65	7/3/65	Increase (Decrease)
ASSETS			
Current:			
Cash	$ 82.0	$ 340.7	$ (258.7)
Notes Receivable	41.6	43.6	(2.)
Accounts Receivable	2,527.8	4,421.9	(1,894.1)
Inventories	5,405.8	4,769.1	636.7
Prepaid Expenses	52.7	67.8	(15.1)
Total Current Assets	8,109.9	9,643.1	(1,533.2)
Investment in foreign affiliate	36.1	17.2	18.9
Plant and Equipment - less: Reserve for Depreciation and Amortization, respectively - 642.6 and 596.5	1,110.2	1,107.7	2.5
Other Assets	8.8	8.0	.8
TOTAL ASSETS	$9,265.0	$10,776.0	$(1,511.0)
LIABILITIES			
Current:			
Notes Payable	$3,366.3	$ 4,216.3	$ (850.0)
Accounts Payable	867.2	1,098.0	(230.8)
Accrued Taxes & Withholdings	160.8	223.2	(62.4)
Accrued Expenses	300.8	242.2	58.6
Federal Income Taxes	318.4	579.6	(261.2)
Total Current Liabilities	5,013.5	6,359.3	(1,345.8)
Deferred Income	12.7	12.7	
Long Term Liabilities	38.1	38.1	
Total Liabilities	$5,064.3	$ 6,410.1	$(1,345.8)
STOCKHOLDERS EQUITY			
Common Stock	$ 51.6	$ 51.6	$
Capital in Excess of Par Value	183.9	183.9	
Retained Earnings	3,965.2	4,130.4	(165.2)
Total Stockholders Equity	4,200.7	4,365.9	(165.2)
TOTAL LIABILITIES AND STOCKHOLDERS EQUITY	$9,265.0	$10,776.0	$(1,511.0)
Book Value Per Share	81.4	84.6	
Current Ratio	1.6	1.5	
Quick Ratio	.53	.76	
Debt to equity	1.2	1.5	

Kolsen

INTEROFFICE MEMORANDUM

DATE September 20, 1965

SUBJECT Analog Development

TO See Distribution List FROM R Doane

We need to set a policy about our analog future, in order to specify what kind of man (and how many) we should try to get for this area. I would like to propose that we consider increasing our concentration and effectiveness in some areas, and withdrawing from others.

MODULES

Just as the bulk of our digital module business will probably always lie below 1 Mc rep rates and fan-outs of 5, the bulk of our analog module business will probably always lie in moderately fast converters of 10 bits accuracy or less (0.1% resolution). Moderately high speeds and moderate accuracies are fully compatible with packaging appropriate for digital circuits and with the sales and applications effort required for selling digital modules. On the other hand, I doubt that state-of-the-art systems can be assembled and tested by the module customer with wiring, connectors, and production techniques designed to optimize digital systems, where noise pickup is by no means as troublesome as it is in analog areas and where no consideration of it at all is given to temperature transients or thermoelectric potentials. Besides, most module customers would lack the equipment or the means to get the equipment and skill necessary to test and guarantee state-of-the-art performance, even if we could provide it. My conclusion: DEC should make it as easy as possible for module customers who need more than 10 bit accuracy to use products built by the companies whose committment to state-of-the-art analog equipment is long-standing and successful, and we should concentrate our analog module development efforts on reducing costs, increasing speed in some cases, and making it easy to build run-of-the-mill systems from DEC modules.

COMPUTERS

Computer customers are different. They are buying a General Purpose Computer, and they want to be assured it will do everything without tinkering. As soon as they hear Company X can supply 15 bit analog interfaces, they are going to pressure us for the same, whether they need it or not. Is their attitude in this case any different from their attitudes about other computer peripherals? I doubt it. And I think the mechanical configuration of a state-of-the-art analog system is doomed to be just as different from the central processor structure as the mechanical configuration of a tape transport is different. Sure, there are some standard modules in each, but the hardest work in state-of-the-art analog equipment is in the areas where very little can be borrowed from our experience or routine manufacturing methods.

My conclusion: DEC should form a quasi-partnership with some full time analog house just as we have done with companies that build line printers, card readers, and paper tape punches for our computers; and we should do this not with vague feelings of inferiority, but as a matter of policy. If we offer any A-D computer interface built in-house, it should be a cheap system that lies well within the everyday capabilities of our module-customer products.

If we adopted these policies, we might still need a man full time for analog systems work, though he might very well not have to be much of a specialist. But more significantly, if we adopted these policies I think we would look for a circuits man who is a good designer, without asking that he have a history of state-of-the art analog development. I think reducing costs and planning for ease of use are tasks best done by a general practitioner; and next year we may need a different kind of circuit development, for which an analog specialist may be unprepared.

RD:ASJ

To:
S Olsen
N Mazzarese
H Anderson
W Hindle
K Olsen
G Bell
E DeCastro
R Sogge
R Wilson
L Seligman
S Dinman
R L Best
D White

INTEROFFICE MEMORANDUM

DATE September 17, 1965

SUBJECT COST FOR MOVING MACHINE SHOP & SHEET METAL FROM BUILDING #4 TO BUILDING #6D and 7

TO Ken Olsen

FROM Loren Prentice

cc: Dick Richardson

ELECTRICAL

Lighting	$3,100.00
Power distribution	900.00
Extension of 440 volt lines from Bldg. 4 to 7	300.00
ELECTRICAL TOTAL	$4,300.00

PAINT

Scrape ceilings, walls and paint Bldg. 6D	$1,971.00
Scrape ceilings, walls and paint Bldg. 7	1,634.00
PAINTING TOTAL	$3,605.00

PLUMBING

Install 1300 feet of new radiation fan blower type; reinstall approximately 6 blower units now there (these to be relocated and zoned with thermostats); reinstall & reconnect wall type radiation and install radiation now on hand.	$2,500.00

This includes some minor repairs in the toilets

BUILDING REPAIRS

Repair concrete floors	$ 150.00
Build two offices (labor & material)	556.00
Build a tool crib 22' x 30'	302.00

Repairs, removal of existing partitions and winterizing some outside wooden walls (labor and material)	404.00
BUILDING REPAIRS TOTAL.	$1,412.00
MOVERS & RIGGERS . . . . . TOTAL	$ 500.00

ITEMS DESIRABLE BUT NOT ESSENTIAL

Repairs to elevators - new gate	$ 630.00
Addition of one additional section to the paint booth (purchased price and installation)	2,171.00
DESIRABLE BUT NOT ESSENTIAL TOTAL	$2,801.00

INCIDENTAL EXPENSES INCURRED WITH THE MOVE

3 days lost time for employees in the Sheet Metal and Machine Shops	$3,912.00
Approximately 1/3 the cost of the extension of the fire alarm system	1,335.00
INCIDENTAL TOTAL	$5,247.00

ADDITIONAL OPERATION EXPENSES

Alloted expenses of an elevator operation	$ 66.00/wk
The alloted additional expenses of one additional guard per shift	300.80/wk
ADDITIONAL OPERATION TOTAL	$ 366.80/wk

(Both these additional expenses should be somewhat apportioned, but the major part of the $66.00 for the elevator operator would have to be chargeable to the movement of the shops to this area. The guard service would have to be extended when any further movement of personnel is made.

INTEROFFICE MEMORANDUM

DATE September 17, 1965

SUBJECT TOILETS IN PRODUCTION B AREA

TO Ken Olsen **FROM** Loren Prentice

Pertinent RULES AND REGULATIONS FOR TOILETS IN INDUSTRIAL ESTABLISHMENT, Bulletin #4, Department of Labor and Industries, Commonwealth of Massachusetts, paragraph II, Toilet Facilities:

"The number of seats shall not be less then one to every 25 persons, or fraction thereof, based upon a maximum number of persons of either sex, employed at any one time," etc.

In paragraph #III, Location - "In no case may a closet be located more then 300 feet distant from the regular place of work of the persons to whose use it is designated, except", etc.

If we abide by these rules, we are not in compliance with the present toilet facilities in the production "B" area.

Cost to install 3 stools This includes removal of some of the present plumbing	$ 950.00
Removal of the Bradley sink and installation of the new vents and three lavatories to replace the Bradley sink	550.00
Necessary carpentry - Approximately	100.00
	$1,600.00

These are quoted as "not to exceed figures" and the actual cost might be somewhat less.

INTEROFFICE MEMORANDUM

DATE September 15, 1965

SUBJECT SPACE ALLOCATION

TO Ken Olsen

FROM Jack Atwood

Three things you might want to consider regarding space allocation:

1. Your proposal to move us to an air-conditioned area is much appreciated. We do, however, have a quotation of $7,100 to air-condition the third floor (see attached). Since we are very efficiently organized now and since the space is improved for office use, it might cost less to put in air-conditioning than to move the department and to turn the floor into a storage area.

2. If we stay put and PDP-6 Sales moves out of the space opposite the art department, this might make an ideal meeting room for groups up to 80 or so. It would be easy to darken for movies and slide presentations. It is air-conditioned for comfort. It is convenient to the executive area in Building 12.

3. If we move our entire operation into Building 3, it would be good to consider relocating the photo lab and studio to improve the working conditions and the work flow. The present arrangement has been satisfactory for two and one-half years and can continue to serve well, but we are in need of new sinks and more space for certain operations.

J.L.A.

fd
enclosure

NEW ENGLAND ENGINEERING CO., INC.

41 - 49 LOCUST STREET, MEDFORD 55, MASS.
TELEPHONE EXPORT 5-9130

SHEET METAL
FABRICATION

HEATING
VENTILATING

AIR CONDITIONING AND REFRIGERATION

April 29, 1965

Digital Equipment Corporation
Maynard
Massachusetts

Attention: Mr. William Farnham

Re: Air Conditioning

Gentlemen:

We have made calculations for the two areas below and recommend installation of the following items of equipment and materials.

BUILDING 6, OFFICES

1. Deliver and set on roof one 50DA009 8 2/3 ton 208/3/60 air conditioning unit using proper supports.
2. Install roof curb and connect supply ductwork and fresh air ductwork to unit. Extend through roof and run supply ductwork length of area.
3. Insulate and make weather tight all ductwork above roof.
4. Furnish room thermostat and switch base, also wiring diagrams.
5. After others have completed wiring we shall start, test, adjust, and service for one year from start up.

QUOTATION: Four thousand two hundred ninety-five dollars.....$4,295.00

THIRD FLOOR, BUILDING 12

S. Atwood

1. Furnish and install on roof two 8 2/3 ton units exactly as described above.
2. Ductwork to be attached to unit and installed as described above. Plans to be submitted for approval.

3. Insulate ductwork above roof.

4. Furnish thermostat and switchbase, one for each unit.

QUOTATION: Seven thousand one hundred dollars.....$7,100.00

No wiring included but start up and service as described above is included.

The sum of above quotations is eleven thousand three hundred ninety-five dollars, $11,395.00. If both these jobs can be done at one time which will simplify delivery and installation we are pleased to submit our quotation for all three units installed at one time.

QUOTATION: Eleven thousand dollars.....$11,000.00

If we are favored with your order, work can be started at once.

Trusting you will find the above in order, we are,

Yours very truly,

NEW ENGLAND ENGINEERING CO., INC.

BY_____

John J. Dwyer

JJD/jg

K Olsen

INTEROFFICE MEMORANDUM

DATE September 14, 1965

SUBJECT Approval of Module Changes and Production Releases

TO Product Line Managers FROM D. White

In order to have change notices routinely signed, by product line managers, we are going to have to institute a formal routing.

All change notices and releases will carry the name or initials of the applicable product line manager(s). I will check for this when I approve the technical aspects of the change or release. Thus, people further along the line will know whose signature is required.

The critical time is just before the module reaches Production. The last person to see the module is Don Bevins. He can and will sort these changes and send them to the appropriate manager. These notices can then be signed by the manager and returned to Bevins, who will hold the model in the meantime. If you wish to speed up the process, you may approve the change earlier. If Bevins finds it is completely signed he will immediately send it in to Production.

Please do not destroy any change notice. If you are dissatisfied, append a note and send it to Bevins, George Gerelds, Norm Perryman or whomever you wish for action. If you wish to obsolete a notice, send the notice, together with a note to Almeda Jones. She will tell Bevins and me. Remember, Bevins has the model and will hold it unless he hears from you.

I am enclosing a list of all presently active modules, giving the appropriate product line managers; and will see that this list is kept up to date.

We will soon change the module change notice form and include enough extra copies to send a copy of each notice to all managers. In the interim, we will send a notice to only those managers directly responsible for the module.

DW/mro

CC: K. H. Olsen
M. Sandler
C. Kendrick
R. L. Best
R. Belden
I. Jacobs
R. Hughes
R. Doane
R. Sogge
J. Sutton
K. Doering
D. Bevins
N. Perryman
A. Jones
G. Gerelds

dec INTEROFFICE MEMORANDUM

DATE September 14, 1965

SUBJECT Core Pricing

TO Lewis Illingworth

FROM Henry J. Crouse

cc: Kenneth H. Olsen ✓
Nick Mazzarese

Ferroxcube's prices for their 30FC01 core are $9.50/M in 25 million quantities and $7.50 in 50 million.

They have "no desire" to sell untested cores, however, this is the first pass.

E. M. I.'s suggested price of a similar 30 mil core (tested) is $7.00/M in 100 million quantities. They will give us a firm price schedule on smaller quantities later.

Henry J. Crouse

digital MEMO

DATE September 10, 1965

TO K. Olson FROM L. Portner

As you requested, here is a list of projects currently underway in the Large Computer Programming Group.

LJP/blk
enc.

Projects Currently Underway
in Large Computer Programming
September 10, 1965

Project	To Whom Committed
Disk/Drum Swapping	Stanford Rand (?) Applied Logic (?)
Fortran IV:	Bonn Aachen Lab for Nuclear Science
Operating System Loader Compiler Monitor Interface	
Batch Processor	Australia Stanford DEC
Applications Programming	United Aircraft Corp. Lab for Nuclear Science Rochester Stanford plus those commitments arising from future sales.
Software Maintenance and Quality Control Editor Loader Assembler Fortran II Desk Calculator DDT Fortran Library DECtape Monitor	Everyone
Program Library	Everyone
Display I/O Routines	Australia
User Documentation of Multiprogramming System	Everyone
Diagnostic Programming	Everyone
Re-entrant Editor	DEC *
Lisp	Stanford (This program was written by three DEC programmers on their own time and debugged at MAC. We are providing the interfacing with the time sharing system.)

*The Fortran IV Compiler as purchased from Digitek contains several outstanding capabilities including the ability for one "core image" of the compiler to service many users, a sort of "space sharing within time sharing". This approach did not add any cost to the compiler but to use the feature requires minor facility to be built into the monitor. We intend to do our checkout of these new techniques using the Re-entrant Editor and thereby creating a useful program in the process. In addition, we require a more complete editing program to speed up internal operations.

LJP/blk

dec INTEROFFICE MEMORANDUM

DATE September 9, 1965

SUBJECT Disc Project from Technical Point of View

TO Ken Olsen
Small Computer Guidance Committee
Dick Best
Jim McKalip
Loren Prentice
Ken Fitzgerald

FROM Dan Wardimon

So far we have heard many pros and cons about DEC manufactured Discs for the small computers, in particular, Dave Cotton's marketing research memo that deals with selling prospects of selling some disc products. Nevertheless, the engineering general scope of problems was hardly adequately expressed and even to a lesser degree documented.

The purpose of this memo is to elaborate on these problems at least to the extent of my feeling and understanding on the subject. The memo will deal with general company attitude and problems regarding a disc project that might be everybody's concern and more particular technical problems that might be of a lesser concern to the sales people.

Following are the subjects that will be dealt with here:

1. A disc: an integrated part of Data Processing systems.
2. General disc types (with emphasis on technical aspects) and same technical notes.
3. Few words about disc vs DECtape.
4. Should DEC manufacture its own disc.
5. Pending a positive answer there is a definite suggestion for what to do and what specific disc projects to undertake and estimation of commitments.

1) Needless to mention that a disc (or a drum) fills the gap between fast, expensive low capacity core memory (or other static magnetic devices) and slow, inexpensive large capacity magnetic tape. Among these extremes of today's technology the disc is truly a medium speed, capacity and price per bit memory arrangement. As such it is indispensable part at modern data processing installation and will be so for many years to come.

As far as a disc vs. drum arguments go there is not much more than the volumetric saving per same capacity and modular construction which turns to be advantageous in case of a damage or failure. Nevertheless there is evidence that more discs are being manufactured today (especially by new comers) which gives one the impression that mechanically it is much less complex than a drum, better suited for mass production and easier handling. These are much more valid argument in favor of the disc than other theoretical aspects. Add to that the fact that a disc can be interchangable (in a form of single disc or a pack of discs) in some systems, thereby increasing many times the storage capacity something which is not practiced with drums.

(Some of the drums advocates will state uniform dinsities and therefore better surface utilization that offset somewhat a disc valumetric advantages. Also a uniform speed and therefore uniform signal as ~~proposed to~~ variable disc signal (both in amplitude and width)).

2) In short, these are the disc electromechanical parameters in consideration:

1. Movable head or fixed heads.
2. Single disc or a pack of discs.
3. Fixed disc cartridge or removal disc.
4. Contact head or flying head.
5. Ferro-oxide magnetic surface, or nickel cobalt one.

The above configurations are so interlaced and involved between themselves rendering a definite answer (as to what kind is needed or manufacturing feasibility) impossible, Obviously a logical comprise is being sought.

Following are some remarks on the above configuration and suggestions as for our needs. (Not necessary with same order as stated above.)

The bit density problem is very general: We would all like higher densities per square inch and thereby increasing storage capacity and lowering price per bit. The advent of nickel cobalt plating technology led to a better control of thinner magnetic plating thicknesses which is necessary for higher pulse resolution than those attainable with oxide layers. Some of the other advantages of nickel cobalt layers over oxide are:

1. 100% magnetic material

therefore

2. higher coercivity and permeability remanence
3. harder and therefore imperative when contact recording is contemplated.
4. the possibility of coating with another protective layer on top of the magnetic layer either chemically or electromechanically
5. nicer appearance (not detrimental at all)

At the present very few people would undertake the plating successfully as far as delivery yield, dependability, etc. As a matter of fact, I could establish only two sources that would meet some of the above requirements 1) Thin Film at L. A. and 2) Data Disc at S. F. A serious disadvantage because of the distance. It is reasonable that plated disc presently requires a preminum probably $100 to $200 per disc for few hundreds per year. It is expected that these will go down in the future as the plated disc will be more of a common place.

Even an oxide coated Disc source (if we will consider getting them) is hard to find. We have just learned that practically IBM would not sell us quantities of the 2315 oxide disc by stating a delivery time for a sample due at Sept. 1966. This almost dictates a use of a plated disc. Strangely enough IBM still does not incorporate plated discs in their products. Why, I cannot tell. GE on the other hand does. The bit density surface and head problems are closely related. Historically the advent of a flying head was necessary because the known oxide layer could not stand the contact head wear, also if faster access time (and hence higher RPM) was contemplated the wear problems were augmented considerably. As

a result the reliability was probably enhanced and better access times were attained. However, pulse resolution suffered. Now it seems that a plated layer with a lubricant coating such as rodium or gold (and others) invites back the contact head so full advantage can be taken of a thin magnetic surface, Thin head gap and contact recording. Unfortunately contact heads are also a novelty at the present. Again only Data Disc produces the famous three point contact head. They licensed GE and Frieden to use them. They would let us do the same at a ridiculous price that renders their usage out of the picture (the fact that GE uses them is a testimonial to the product). I think though that the legal aspect should be investigated further, that is if someone will like to build a similar head for our use.

We can see therefore that a key to high density is plated disc in conjunction with contact head. The bit densities attainable are in the order of 4,000 flux reversals per inch which will produce 4,000 or 2,000 bits to the inch pending of code selection which is another topic that could be discussed (and again legal aspects of using the so called Miller Code which requires one flux reversal per bit). From a practical point of view the flying head will be cheaper to buy and coupled to the fact that the problem of contact head source at the moment is not clear at all, leads to a tendency to solve the whole problem by not having it namely a flying head system with less density. The disc should nevertheless be plated because of a design latitude that will let us design heads that start and end with contact in case we want to (and also because of the facts that were mentioned before).

The rest of the parameters are closely related: when an access time is a most important design parameter a use of a fixed head per each channel is required. Both surfaces of the disc could be used and few discs could be packed together. (This design approach was incorporated in General Precision Discs) in this respect a disc function as a drum. When excess time is not crucial but mass storage is more important (and of course the total cost and design simplicity) then the moveable head is obviously the solution. If in addition the disc has to be removable or interchangeable the head movement mechanism tends to be more formidable especially when a gang of discs type of system is being used. Then the heads have to clear out before removing the pack. IBM solution is indeed a monstrous hydrolic system plus many leverages and latches which is enough to make one reluctant to duplicate or follow such a scheme.

If however only one disc is considered, then the head movement mechanism is much simpler: we could use a stepping motor to do the job (like the DATA DISC approach) the head could be underneath and the disc would be simply removed upwards. Should both side of the disc be available at the same time (that is 2 heads) then again disc interchangeability poses more complex mechanical problems. Again IBM uses this scheme in its 2310 disc drive where the disc slips in horizontally then the spindle and heads are moved to a locked position and vice versa when removing the disc, certainly a complex mechanism.

It should be remembered that the disc should have protective cartridge (or magazine) whenever iterchangeability is contemplated. The slightest dent or surface damage will render the disc inoperative. Any cost estimate concerning the disc development should include probably an injection mold for making said cartridge (that is when interchangeability is the scheme).

Total Storage Capacity

The following are optimistic figures based on what at the moment I believe we can do.

The basical parameter will be a 14 inch diameter disc, nickel cobalt plated. Pending on phase modulation (manchester) technique which is essential for self clocking (which is desirable at high bit density) we could do 2000 bit to the inch on the inner track (one clock zone) with a contact head or an estimated 1000 bit per inch with a flying head scheme with same conditions.

If one clock rate is contemplated, for sake of design simplicity, then it can be shown that the optimum inner diameter for maximum utilization at surface is 7 inches (using any other inner diameter total bit storage will be less.) If we further agree to have about 40 track to the inch, we could pack 280 tracks on the 14 - 7 = 7 inch disc slice. We choose 256 tracks. At the above assumed densities we will then have: $256 \times 7 \times 3.14 \times 2000 \approx 11$ million bits for contact head scheme or 5.5 million for a flying head scheme (per surface). The figures reveal that if we are to build a disc that is comparable to IBM 2310, the bit storage capacity attained in the first case is what we are looking for and on one side of the disc alone that is we could really get away with one side recording and dispense with complicated 2 head mechanism mentioned above. If the flying head scheme will be used then meeting IBM requirements means playing the same game. (See last section for definite disc configuration that might be tried.)

For sake of comparison here are some figures about "Data Disc" system designed M-4:

Inner diameter 6 inch outside diameter 12 inch. 128 tracks, 4 million bit per surface. This is achieved at a density of about 1600 bpi at the inner diameter about the same figure we are shooting for only with double the number of tracks.

Another fact to consider: DATA DISC offer to supply us with a simpler version of their M-4 disc drive that has only one disc, moving head mechanism and contact head and the turn table. Their price will be somewhat between $2000 to $2500 which is rather high if we have to sell our drive and electronics in the area at 10K. (Marketing tells us that IBM 2310 sells for 8K. I request that this figure should be rechecked. I know that it sells for 13K, and Dave Cotton suggests that the 8K price represents 40% educational discount.) As much as we cannot realize 2.5K worth of their drive for us we should give much thought to the time it might save us in putting a DISC on the market and save us the trouble of learning how to do it the hard way ourselves. As mentioned above their 12 inch disc could have 2 x 4 million bits which is in line with marketing request. Further: DATA DISC has developed a fix head version at their disc. It is called F-6, has 64 fixed heads (32 per side) and has total storage of 6 million bits. Heads are the same as in the M-4 model (that is contact head) bit density is higher but number of tracks is lower (that accounts to less total bit storage). The disc itself is fixed and not interchangeable.

"DATA DISC" Prices:

12" diameter quantity above 250: ~~$100~~ 140 with cartridge
16" diameter quantity above 250: $200 (provisional).

They could be regarded as another disc source. Their disc mechanical finish is excellent (I have data regarding its quality).

So much for technical notes and facts. They appear here in order to present the memo readers with the essential data concern, and hopefully would help to form their opinion about the matter. However, as will be seen in Section 4 of this memo it is my feeling that by committing ourselves (or at least trying) to produce a disc drive we are giving ourselves the chance to put a stake in the precision electromechanical aspect of business, which for the long run is more important than the DISC itself.

3) A disc versus DECtape: There are so many discs systems as to make the comparison meaningless. In particular we could compare the IBM 2310 which has about 8 million bits storage versus 3 million in DECtape. The excess time of the disc is of several magnitude better. The above two systems could probably serve the same applications. The above figures though do point the advantage of the disc compared to DECtape.

Nevertheless the DECtape has a unique feature namely the easy handling, storage and interchangeability of the reels which certainly is far more attractive than a cumersome disc. We have heard about the biomedical convention at which some of the participants brought their programs written on DECtape reels (tacked in their jacket pockets) to be run on the computer at the show. Imagine these people hauling 12 or 14 inch disc for some purpose. This is a very good sales story. Naturally most of computer applications are tied to an office environment and the above conveniency is not so much valid anymore.

There is talk about increasing the storage of DECtape. Technically the target could be attacked in 3 ways separately or even combined:

1) Kill the redundancy and thereby increase bit storage capacity and transfer rate by a factor 2.
2) Increasing bit density either by small head gap etc., or by using plated tape.
3) Increasing tape length.

Again there are pro and cons to these ideas. Before dealing specifically with the above mentioned suggestions I should make some general statement about DECtape. The 375 bits per inch density we have not is just about as good as we might try for this kind at mechanical drive. Indeed this is the simplest drive we can get away with and it is precisely the DECtape transport main feature. Higher bit densities will augment the problems associated with this type of drive: Tape buckle, skew and flutter.

In general attempting any of the above suggestions means a major project either electronically or mechanically. To be more specific:

1) Killing the redundancy means doubling the read write circuitry, buffers, and changing the head wiring, otherwise mechanically there is no change. I like this one best since the change over is the least involved. Whether eliminating the redundancy reduce reliability is a question mark that is not from theoretical point of view but rather the practical one. (We could by the way investigate this reliability problem on the existing DEC drive.)

This proposed scheme means 6 million bits per reel which still fall short of 8 to 10 million bits per single disc with much better access time.

2) Increasing bit density on existing tape or even trying new plated tape. With 800 bpi storage capacity is doubled, with 1200 bpi storage is tripled that is 9 million bits.

Frankly with the existing drive higher density is a hazard. The chance of a dropout because tape buckle and skew will go up.

Plated tape is not a commercial reality at the moment, although Thin Film Inc. (the firm mentioned before) could supply the required tape. The prices are far from being comparable to the oxide tape we use at the present. Due to the real thin surface on the plated tape, bit resolution could be even higher than 1200 bpi but again tape buckle and skew will enhance drop out even to a higher degree.

Electronically higher density means revising the whole electronics speedwise. From a technical standpoint this scheme is intriguing and deserve investigation. It is a question though for marketing research justifying the engineering efforts and expenses. Even more intriguing is a combination at schemes 1 and 2.

3) Increase in tape length means a mechanical face plate redesign and programming wise. It means slower excess times. Reels will not be standard size anymore.

Despite all the facts and arguments stated above it is well worth remembering that by coming at top with arguments about how wonderful is DECtape compared with a disc we might lose sales. The fact is that a disc is an established product on the market. Our competitors have it and our customers want it. Business wise, therefore, we got to have it. We might as well, manpower permitting, improve DECtape storage by one of the above suggested schemes. The disc should be regarded as a different job and sales should fight on both fronts. DECtape by itself is really a unique item and was never prompted enough and for some reasons never established its right position in the market.

4) Manufacturing a Disc

Mechanically this will be a new experience to DEC. There is an obvious tendency to produce electromechanical gear at DEC. Our real first try was DECTAPE TRANSPORT 555 and now the solid state transport.

If mechanical gear design and production is going to be successful at DEC we have to set up the games rules and prescribe the right policy and attain the right attitude.

DECtape Transport thought us that simply staing tolerances on the prints means actually nothing. The slack in quality control tends to deteriorate from the below minimum standard and requirements it established in the first place. After a while reasons are forgotten and malpractice is evidenced everywhere. Somehow the DECtape is not that sofisticated

mechanically and can get away with shimming here or there the head on a crooked face plate or wobbling reel hub etc. With a disc (and other products) this malpractice simply will not hold, and Jim McKalip's prediction that it will turn to be a nightmare at the field is absolutely true.

I suggest that a project of this kind means breeding another kind of technicians and set up separately a precision mechanical shop. Investing in delicate and accurate measuring devices we still lack. In other words a project of the first oder. Naturally this means also project mechanical engineers that will devote their time to the project with no conflicting projects.

Maybe, therefore, the question is not shall DEC make a disc but rather are we willing to expand towards the electromechanical side of the business. My answer is positively yes. The disc and magtape projects might turn to be pilot projects in this direction that might be eventually a great asset to the company. So far, the people I have discussed this subject with, tend to agree one hundred percent about the issues involved.

For me this subject is the most crucial and foregoes the decision about the disc itself. If the answer will be yes then the next step is more straight forward.

5) What to do?

Specifically the mechanical aspect of the project is more formidable than the electronics. A mature mechanical engineer is needed. He will have to devote his full time to the project. He should have working knowledge with gears and surface finish techniques. A mechanical technician is desired so he could be the first of new breed of assembly people mentioned above. The electronics design part will consist of one electronic engineer (myself) and experienced technician.

Fortunately we do not have to produce the heads and discs ourselves (somebody else will contract this headache).

This specific project that we will undertake will be a 14 inch disc movable head. Design will concentrate on both flying and contact head recording with probably flying head achieving results first. As a continuation we could investigate fixed head systems. The above will give us a foot hold in the disc business. Further and more complex projects can follow like disc packs and higher storage capacity systems pending results from the simpler systems. This fits well with Dave Cotton marketing research memo.

My time estimate is 6 months for some working mechanical model and another 6 months for a system prototype completion. Naturally the whole thing depends on good cooperation with all involved departments. I believe we could come with a 10 million bit disc within the 10,000 range. (Markering, however, should know for sure about IBM 2310 price, from what I understand it is more like $13,000. The $8000 we have heard about is probably a $40 to educational discount.)

I have no accurate estimate on the investiment capital required. Specifically, if some accurate measurement devices are required and in particular erecting a small department

for manufacturing and assembling precision parts. To date materials alone that were bought for investigating purposes amount to more than $10,000 that include a Data Disc turntable and disc, few plated discs from thin film (14 inch diameter) different heads and other mechanical components. This leads me to the rough assumption that the project might easily reach the $100,000 before we will have a working model of any kind.

This memo is directed to the company management, engineering heads and small computer guidance committee. It is wished that all the recipients will take some of their time to read it and form their opinion and have their remarks and notes ready at the time the subject is brought up before the committee.

dec INTEROFFICE MEMORANDUM

DATE September 7, 1965

SUBJECT PDP-6 Inventory

TO Kenneth H. Olsen

FROM Henry J. Crouse

cc: Harlan Anderson
Gordon Bell
Robert Beckman

The support data of my memorandum of September 3, 1965 was discussed with Andy and Bob and the obvious errors were corrected.

The 570 transports are treated as a unique item.

In House (570)

$299,685 + $17,804 = $317,489

On Order

$183,027 + $71,216 = $254,243

One additional correction:
Three central processers in house; one has 90% of its modules. Five are at outside contractors being wired. Estimated value of the five is $6,200 each.

Henry J. Crouse

PDP-6
INVENTORY

IN HOUSE

MEMORIES:

Fabritek:

		$
1	IN STK NOT usable mim cards removed for Rand	19 704.
1	IN STK NOT checked out	19 704.
1	Returned for repair	19 704
1	IN CHECKOUT	19 704
2	Adams	39 408
		118,224

Ferroxcube

1	ENGINEERING	12,124.
1	IN STK - NOT CHECKED OUT	12,124.
1	Prototype - returned to F. for modification	16,100.
2	NT Ferroxcube for modifications. total price not established.	24 248
		64,596

Total memory $ 182,820

LINE PRINTERS:

1	Adams	15,500

Total Lines 15 500

ON order

		$
1	11/19/65	18 234.
1	12/3/65	18,234
1	12/17/65	18,234
1	12/31/65	18,234
1	1/19/66	18,234
1	1/21/66	18,234
		$ 109,404

2	9/15/65		24,248.

Total memory $ 133,652.

1	12/15/65	IMPERIAL	$ 15 500
1	9/17/65	Berkeley	15,900.
1	9/30/65	Oxford	17,975.

Total Line Printer $ ~~49,375~~ 49,375

IN HOUSE

Memory Drum (VRC)

1	reject Adams To be exchanged ON 9-30-65-	$ 35,425.

Disc File (Burroughs)

1	IN ENGINEERING (INVOICE ON hold, may be returned?)	55,750.

Card Readers. (300cpm Burrough)

1	Benkely	5095.
1	Adams	5095.

* TAPE TRANSPORTS (570)

2	IN STK (potentially TO Oxford) (8902)	17,804

Total $ 317,489

* Excluding 570 Transports from PDP-6 INVENTORY would net $ 299,685

ON ORDER

3	en route	$ 26,706.
1	9/10/65-	8,902
2	9/24/65-	17,804
2	9/30/65-	17,804
		71,216
		254,243

→ $ 183,027

INTEROFFICE MEMORANDUM

DATE September 7, 1965

SUBJECT ELECTRICAL PRICING

TO Ken Olsen

FROM Loren Prentice

Lighting in Building 6D and 7	$ 3,100.00
Power distribution in 6D and 7	
Machine and Sheet Metal move distribution	900.00
440 welder transfer to 1st floor of Bldg. 7	300.00
Building #11, 1st floor silk screen power and distribution - connection of all machines	1,200.00
Lighting in Building #11, 1st floor	900.00
New service, lighting, power distribution in Building 8, 8A and 11 to include approximately 12 work stations for computers and computer check-out	7,500.00
TOTAL	$13,900.00

K Holsen

INTEROFFICE MEMORANDUM

DATE September 3, 1965

SUBJECT Diode Design Considerations Part One

TO R Brown
R Best
R Sogge
T Stockebrand
D White
G Wood
Other Interested Parties

FROM Walter Bonin

DIODE DESIGN CONSIDERATION PART 1

1. Forward Voltage

The forward voltage drop across a diode is the sum of the drop across the diode itself plus the voltage across the series resistance.

$$V_{forward} = VT + IR$$

Where VT = drop across diode junction

IR = drop across series resistance

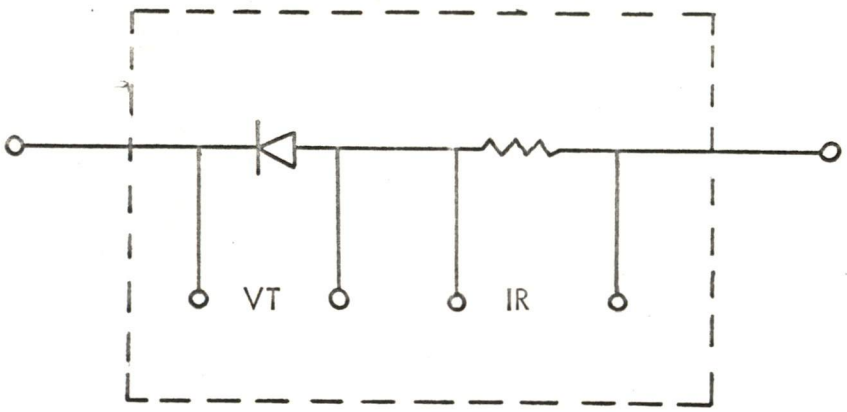


Fig. 1-1

1.1 Diode Drop

The maximum voltage that can be attained across an ideal diode (no series drop) is equal to the contact potential VT. The contact potential is the self bias of the diode with no applied voltage and is due to the higher energy electrons in the n material which traverses the junction into the p type material where they occupy lower energy levels. This causes a built in reverse bias across the diode which in order to secure a forward flow of current must be overcome by the forward voltage. When the forward voltage is equal and opposite this reverse contact potential all the carriers are free to cross the junction and excluding the series bulk resistance the device appears to have infinite conductivity. In practice this value cannot be obtained but for current levels on the order of 100 ma the forward voltage is approximately .2 volts less than this value.

The equation for the maximum contact potential is:

$$VT = \frac{KT}{q} \text{ Ln } \frac{ND \ NA}{Ni\ 2}$$

Where K = Boltzmann's constant

q = Charge of electron

T = Temperature in degrees kelvin

ND = Impurity concentration of n type material in atoms cm^{-3}.

NA = Diffused impurity concentration of p type material in atoms cm^{-3}.

Ni = Intrinsic conductivity in carriers cm^{-3}.

To give an example of the forward voltage considerations we will insert in the above equation the actual values used in making the DD2 diode. One example will be using epitaxial material while the other is non epitaxial material.

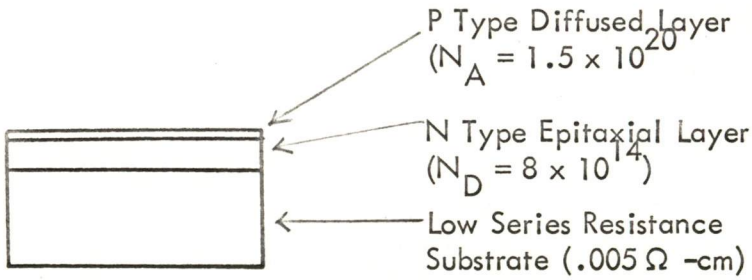


Fig. 1.2 Epitaxial Diode

For the above diode;

$$VT = \frac{KT}{q} \text{ Ln } \frac{ND \ NA}{Ni\ 2}$$

If $ND = 8 \times 10^{14}\ cm^{-3}$

$NA = 1.5 \times 10^{20}\ cm^{-3}$

$Ni = 1.5 \times 10^{10}$

$\frac{KT}{q}$ = .026 at room temp.

Then.

$$VT = .026 \ \text{Ln} \ \frac{8 \times 10^{14} \times 1.5 \times 10^{20}}{(1.5 \times 10^{10})^2}$$

$$VT = .026 \ \text{Ln} \ 5.33 \times 10^{14}$$

Since

$$\text{Ln} \ 5.33 \times 10^{14} = \text{Log}_{10} \ 5.33 \times 10^{14} \times 2.3$$
$$= 14.7 \times 2.3$$

$$\text{Ln} \ 5.33 \times 10^{14} = 33.8$$

Then $VT = .026 \times 33.8$

$VT = .88$ volts

This value represents the max. forward voltage at infinite current that can be developed across an ideal diode with the previous values of substrate and diffused concentrations at room temperature.

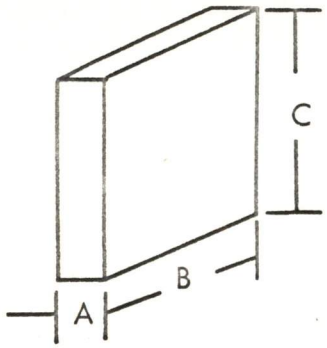
The following is a list of VT values compared to various substrate concentrations N_D with the diffused concentrations N_A constant at 1.5×10^{20}

N_A	N_D	P(ND)	VT
1.5×10^{20}	8×10^{14}	5Ω cm	.88
"	5×10^{15}	1Ω cm	.94
"	5×10^{16}	.3	.99
"	2.5×10^{18}	.015	1.10
"	5×10^{19}	.001	1.17

These values are somewhat high due to the assumption that the junction formed is an ideal abrupt junction which in practice it is not. The actual values are about from .8 to 1.0. However the examples do give a good approximate value and are very useful to show the relationship between forward voltage and impurity doping.

1.2 Bulk Series Resistance - for certain diodes the voltage drop across the bulk series resistance cannot be neglected primarily at high currents on the order of 100 milliamps. To avoid this additional voltage drop epitaxial material (see Fig. 1.2) is used. The single detrimental effect of this material is its high cost which is from five to ten times that for plain bulk material.

The following example lists a number of values of the IR drop for different substrate materials for a given set of diode dimensions.



A = .006"
B = .040"
C = .040"

Fig. 1.3 Bulk Substrate Material

Since $R = p \frac{L}{A}$

Where R = bulk resistance

p = resistivity in ohm-cm

L = length in cm

A = area in cm^2

Converting the above dimensions into centimeters yields:

$$R = \frac{p \ 15 \times 10^{-3}}{10 \times 10^{-3}} = p \times 1.5$$

Calculating the IR drop for various values of resistivity at 100 ma gives the following values.

P Ω - cm	N_D cm^{-3}	1 Amps	=	E
.005	1.5×10^{19}	.1	=	.00075
.01	5.0×10^{18}	.1	=	.0015
.05	2.5×10^{17}	.1	=	.0075
.10	8.0×10^{16}	.1	=	.015
.50	1.5×10^{16}	.1	=	.075
1.0	5×10^{15}	.1	=	.15
3.0	1.5×10^{15}	.1	=	.45
9.0	5×10^{14}	.1	=	1.35

The above values of E are the series IR drop that appears with the ideal diode (see Fig. 1.1). It appears that 3 ohm-cm is the highest bulk resistivity material that can be used. Even with this material the .006" diode dimension should be reduced to about .003 to .004".

Using 3 ohm-cm material (non-epitaxial) with a thickness dimension of .003 - .004" and a diffused impurity concentration of 1.5×10^{20} should give the following forward voltage drop at 100 ma.

$$V_f = VT + IR$$
$$= .67 + .25$$
$$V_f = .92$$

Other anticipated memos will concern the following subjects:

#II	Forward voltages at various currents
#III	Magnitude of stored charge
#IV	Magnitude of stored charge vs charging time and charging current
#V	Discharge time

WB:ASJ

INTEROFFICE MEMORANDUM

DATE September 3, 1965

SUBJECT Product line distribution of invalid job charges to selling and engineering expenses

TO Product Line Managers FROM B. Garvin

CC K. Olsen
H. Mann
R. Dill
E. Simeone

Invalid job charges wil be allocated to product lines on the basis of total valid charges (to product lines) to total expense for each category.

ie. $\frac{\text{Product line Total valid charges}}{\text{Total charges}}$ X Total invalid charges = Product line charge for invalid job numbers

The month of July will be adjusted to this basis also - reflected in the year-to-date numbers in the August operating statement.

This approach has been taken to equitably charge out bad reporting. It is not to be considered an accounting expedient rather a notification of a weakness in the report system which can be alleviated at the source. The monthly statement will contain in Note 2 the amounts allocated to your product line.

Please don't hesitate to call E. Simeone or myself with your questions.

INTEROFFICE MEMORANDUM

DATE September 3, 1965

SUBJECT Sales Lead - Martin Corporation

TO
H. Anderson
K. Olsen ✓

FROM
Pres Behn

Here is a lead from Skip Hickman who is asking whether we should proceed further. As you will see, special goods are required so I will assume unless I hear from you to the contrary that we should not bid it. An immediate answer is not required; Skip will be here on the 13th of September and is willing to wait until then for his answer.

Customer: Martin Corporation
Purpose: Titan 3-C Checkout System
Approximate Size of Sale: 1.5 million dollars
Competition: IBM 360/44 only.
Approximate Configuration:
2 PDP-6 Processors
65K Memory
Disc File
2 Data Controls
4 PDP-7's (with 8 to 16K of memory on each)
1 DECtape Control
3 DECtape Units
3 CRT Displays (Model 338)
1 120 column line printer

In addition to the above, the following special goods are required:

1 Burroughs Disc
1 Model 165 Computer Intercommunication System
1 In-Channel Comparator to handle DCM Telemetry Data (3 channels. Skip estimates the cost of the Flip-Chip Modules for this to be about 15K).
1 In-Channel Comparator for DRS Telemetry Data (750 channels. Probable cost of Flip-Chips 20 to 25K. Longest acceptable interval between channels 23 microseconds.)

In summary, Martin likes us. We have a price advantage and their delivery needs are tolerable: 6 months from a January order.

Please let me know if you think we should pursue this sale.

dec INTEROFFICE MEMORANDUM

DATE September 3, 1965

SUBJECT PDP-6 Inventory

TO Kenneth H. Olsen

FROM Henry J. Crouse

cc: Harlan Anderson
Gordon Bell

Per your request, I have gathered the following information concerning the PDP-6 inventory:

Total value of major components in house	$348,139.00
Total value of major components on order	316,243.00
	$664,382.00

Three central processors are in Production; one has 90% of its modules. Four processors are at outside contractors being wired.

The attached notes support the major component totals.

Henry J. Crouse

Enclosures

IN HOUSE

TAPE TRANSPORTS (570)

5	in checkout for MIT's PDP-7's	
2	in stock @ $8902.00	$ 17,804.00

MEMORY DRUM (VRC)

1	reject - Adams - to be exchanged on 9/30/65 for new unit	$ 35,425.00

DISC FILE (Burroughs)

1	in engineering	$ 55,750.00

CARD READERS - 200 CPM (BURROUGHS)

1	for Berkeley	$ 5095.00
1	from Adams	5095.00

TAPE TRANSPORTS (50)

2	Information Int'l @ $7575.00	$ 15,150.00

TOTAL $ 348,139.00

ON ORDER

3 -	en route	$ 26,706.00
1 -	9/10/65	8902.00
2 -	9/24/65	17,804.00
2 -	9/30/65	17,804.00

TOTAL $ 316,243.00

PDP-6 MEMORIES/PERIPHERALS

IN HOUSE

MEMORIES

Fabri-Tek (163)

1	in stock - not usable - nine cards removed from it for Rand	$ 19,704.00
1	in stock - not checked out yet	19,704.00
1	just returned to Fabri-Tek (as reject, to be repaired and returned	19,704.00
1	in checkout	19,704.00
2	in Adams machine	39,408.00

Ferroxcube (164)

1	in engineering	12,124.00
1	in stock - not checked out yet	12,124.00
1	prototype - returned to Ferrocube for modifications	16,100.00
2	at Ferrocube - we are paying for now because they are being held for DEC requested modifications $ not established yet!	24,248.00

SUB TOTAL $182,820.00

LINE PRINTERS

1	Colgate	15,500.00
1	in Adams machine	15,500.00

ON ORDER

1	-	11/19/65	$18,234.00
1	-	12/3/65	18,234.00
1	-	12/17/65	18,234.00
1	-	12/31/65	18,234.00
1	-	1/19/66	18,234.00
1	-	1/21/66	18,234.00
2	-	9/15/65	$24,248.00 plus?

SUB TOTAL 133,652.00

1	-	9/10/65	Westinghouse	15,500.00
1	-	9/17/65	Berkeley	15,900.00
1	-	9/10/65	MIT	15,500.00
1	-	9/30/65	Oxford	17,975.00
1	-	11/26/65	DEC	15,500.00
1	-	12/15/65	Imperial	15,500.00
1	-	12/15/65	MGH	15,500.00

dec INTEROFFICE MEMORANDUM

DATE September 3, 1965

SUBJECT University of Rochester

TO K. H. Olsen FROM Robert P. Bocek

I have had some problems with the buyer working for the University of Rochester. All have been cleared up now but one. I am asking for your help with this one.

He wants an Educational Discount for the University. Now he is speaking specifically about a PDP-8. I informed him that we did not give one on that machine. He did not accept my word as official. I sent him another letter stating this and had Nick Mazzarese sign it also. Mr. Walsh (the buyer) still did not consider this as official. He states that he wants the information concerning the Educational Discount to come from "an official of the company...someone on the board". I can think of no one more "official" than yourself, so I am asking you to please write to him and tell him what we can or cannot do for the University of Rochester.

He is used to the "discount" given by IBM and GE and feels we are treating him badly by not offering him one also. He stated in his last letter to me "...your acceptance or refusal of our request would have a great bearing on future computer requirements of the University".

Would you also sign the enclosed Contractor Price Warranty and return that to him. He wants this signed by an official also.

His name and address are as follows:

Mr. James B. Walsh
University of Rochester
900 Jefferson Road
Rochester, New York

Thank you very much.

Robert P. Bocek

RPB/ep
Attachment: Contractor Price Warranty Form

Ken wrote Walsh on 9/24/65 cc

THE UNIVERSITY OF ROCHESTER
RIVER CAMPUS STATION
ROCHESTER 20, NEW YORK

PURCHASING DEPARTMENT
S & A Building

PURCHASE ORDER NUMBER
20217-C

CONTRACTOR PRICE WARRANTY

The Contractor warrants that the prices of the items set forth in this purchase order do not exceed those charged by the Contractor to any other customer purchasing or leasing the same items in like or smaller quantities.

Digital Equipment Corporation

INTEROFFICE MEMORANDUM

DATE September 2, 1965

SUBJECT Unsilvered Ceramic Dielectrics for .01 mfd Capacitors

TO Ken Olsen

FROM Paul McGaunn

cc: Henry Crouse

American Lava Corporation can offer the T-128B material unsilvered in a wafer size of 1 5/8" x 3 1/4" x .010. The dielectric constant of T-128B is 7500-12000. This is the highest dielectric wafer available.

The 1000 lot price would be $2.65 per wafer.

American Lava states they can make the .01 using T-128B in a .2 square .007 thick size for $22.00/M, if we can use a poor tolerance and temperature coefficient unit.

The present cost of .0386/ea. is because of our temperature coefficient needs.

.125¢ each

Paul McGaunn, Purchasing

Enclosure

digital equipment corporation
MAYNARD, MASSACHUSETTS
TWinoaks 7-8822 TWX MAYN 816

September 23, 1965

Computer Consultants Limited
Colman House
Southbury Road
Enfield, Middlesex

Dear Sir:

Reference is made to your letter of September 7, 1965 regarding your invoice number 1230 and 1231 which were rendered for publications ordered by our Mr. Fadiman.

I have checked into this matter and found the following:

1. Digital Equipment Corporation paid J. B. Tratsart Ltd., 168A Greenford Road, Harrow, Middlesex on our check number 4915 the sum of $33.00 which covered the above publications.

2. Enclosed are copies of J. B. Tratsart's invoice and Digital Equipment Corporation's cancelled check number 4915.

3. Please note the notification at the bottom of the Tratsart's invoice which indicates publications will be dispatched from your firm, Computer Consultants.

It is hoped that the above information will be sufficient for you to consider that your letter of September 7, 1965 has been complied with.

Sincerely,

W. H. Farnham, Jr.

WHF/kge
Enclosures
CC/Elsa Carlson

NOTE: The attached letter is our answer to Computer Consultants invoice that Ken received

digital EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

No. 004915

5-20
110

CHECK DATE
3 1 15
MO. DAY YR.

PAID

AMOUNT
******3300

PAY EXACTLY 33 DOLLARS 00 CENTS

MAR 26 1965

TO THE ORDER OF
J B TRATSTART LIMITED
168A GREENFORD ROAD
HARROW-MIDDLESEX
ENGLAND

The National Shawmut Bank of Boston

Richard F. Mills

THE NATIONAL SHAWMUT BANK
BOSTON, MASSACHUSETTS

541450

"0000003300"

NATIONAL PROVINCIAL BANK LIMITED

:0110:00201: 054:022:6"

6/97

J. B. TRATSART LTD.

FEB 12 1965

3/14

168A GREENFORD ROAD
HARROW · MIDDLESEX
BYRon 8295

DIGITAL EQUIP. CORP.
RECEIVED
MAR 4 1965

ACCOUNTS PAYABLE

DIGITAL EQUIPMENT CORPORATION.
Order No. 41504.
Thompson Street.
Building. 5. Room. 15.
Maynard. Mass. U.S.A.

Date 5.1.65.

17191

Our Ref: CC/65/071. 200105

	PAGE	COST CENTER	ACCOUNT	OF	1	2		
INVOICE	15	1	0024	a	01		-	33.00

ORDER REC'D.	PRICE OK	PAYMENT O/K	CHECK NO.
✓	✓	3/4 dh	4915 3-11-65

1 copy each:

BRITISH COMMERCIAL COMPUTER DIGEST. 1965.
with up-dating service. £ 18.00

EUROPEAN COMPUTER USERS HANDBOOK. £ 15.00

£ 33.00 ✓

As per your Order No. 41504.

Items will be despatched direct from
Computer Consultants Ltd.,

EY: Stmt, Received 2/18/65

INVOICE No. **1230**

FEB 8 1965

Computer Consultants Limited

COLMAN HOUSE, SOUTHBURY ROAD, ENFIELD, MIDDLESEX.

Telephones:—ENField 7185, 9219

Books despatched to:		Accounts to, if different:
Mr. Fadiman, Manager, Inter. Marketing, Digital Equipment Corporation, 146 Main Street, Maynard, Mass, U.S.A.		
Previous order 32263 - 1964	Ref. Nos.	

31/12/64	1 British Commercial Computer Digest		$18	- -
	Copy Number 629			

Payment is requested on receipt of Invoice.
Statements are only sent for overdue accounts.

INVOICE No. **1231**

FEB 8 1965

Computer Consultants Limited

COLMAN HOUSE, SOUTHBURY ROAD, ENFIELD, MIDDLESEX.

Telephones:—ENField 7185, 9219

Books despatched to:		Accounts to, if different:
Mr. F. Fadiman, Manager, Inter. Marketing, Digital Equipment Corporation, 146, Main Street, Maynard, Mass, U.S.A.		
Previous order 32263 - 1964.	Ref. Nos.	

31/12/64	1 European Computer Users Handbook		$15	- -
	Copy Number 1101			

Payment is requested on receipt of Invoice.
Statements are only sent for overdue accounts.

INTEROFFICE MEMORANDUM

COMPANY CONFIDENTIAL

DATE September 2, 1965

SUBJECT

TO Salary Review Committee

FROM J P Hastings

1. Membership:

As a prerequisite for Committee membership, a member should represent a group of salaried personnel. Therefore, membership could be gained or lost when an individual's responsibilities change.

Suggested Committee Members:

R Lassen	Chairman
H Anderson	Large Computers
R Best	Mechanical and Some Electrical Engineers
W Hindle	Digital Test, LINC and C A D
T Johnson	Domestic and International Field Sales and Service
H Mann	Accountants and Financial Advisor
N Mazzarese	Small Computers
K Olsen	Ex Officio
S Olsen	Modules

With the exception of Harry Mann and Ted Johnson, all of the above are members at present. Buyers, technical writers and advertising personnel would not be represented by the proposed Committee but this deficiency accounts for 20 of the 225 domestic salaried employees. (As a point of interest there are 31 foreign salaried employees).

2. Nomenclature:

The Committee should be known as the Performance Review Committee. This title properly suggests a broader range of activities than salary review alone, and also helps to avoid the implication that increases are routine and automatic.

3. Proposed Review Procedure:

Because it is becoming increasingly difficult for members to know the performance of every individual under review and to administer the program, the following approach might help to solve some of these growth problems.

1. The Committee determines a sum of money (percentage of salaried payroll) to be distributed as the merit increase. An additional amount should be added to offset the cost of living increase, if any.

Department of Labor Statistics

Calendar 1957-1959 equals	100
Calendar 1963	106.7
Calendar 1964	108.1
Calendar 1965 (through July)	110.2

2. Group all salaried personnel into the following categories: (Same categories were used during recent salary survey).

Area A - Electrical and mechanical development engineers, engineering assistants.

Area B - Programmers

Area C - Department Heads and Salaried Supervisors

Area D - Field Sales and Service Engineers

Area E - Technical Writers and Advertising Personnel

Area F - Accountants

Area G - Instructors, Buyers, Sales Administration, Personnel, Senior Staff and Technical Administration.

3. Committee would allocate to each category above a certain number of dollars to be distributed among persons within that group.

4. Review each category as a unit and at separate times during the year. Each individual should be reviewed six (minimum) to fifteen (maximum) months.

5. Supplement the evaluation form with direct comments by each supervisor who should be present with the Committee when the subordinate is reviewed.

GENERAL OBSERVATIONS.

1. The performance review procedure should be better understood within the Company. Formal presentation on what the system is should be made at the next sales meeting, perhaps at product line and departmental meetings. There is a tendency for those who know the system to ask for interim reviews of their people while the uninformed do without.

2. In no case should increase notices be distributed before the start of the Christmas holiday. In the past we have created morale problems at the wrong time of year for those receiving small or no increases. If raises must take effect January 1st the notices could be distributed a month in advance.

3. Insignificant increases (less than $250) should be discouraged. Small amounts possibly do more harm than good. On the other hand, sizeable increases ($1,000 or over) should be broken into two parts and distributed at separate times.

4. Because the Committee disregards the formula recommendation anyway and the need for this control is eliminated by establishing initially a limit on the numbers of dollars you can distribute, the formula should be eliminated.

5. I felt uncomfortable in deciding who should fill out the evaluation forms. Unintentionally or through design, one could influence the Committee's review by manipulating those who submit evaluation forms. This dictatorial power is dangerous in the hands of one individual; but the alternative of setting up a formal distribution list might prove less useful.

JPH:ASJ

dec INTEROFFICE MEMORANDUM

DATE September 2, 1965

SUBJECT Small Business Preference

TO Ken Olsen
Harlan Anderson
Stan Olsen
Win Hindle
Nick Mazzarese
Ted Johnson

FROM Harry S. Mann

We should decide whether or not to try to qualify as a "Small Business Corporation" under the rules of the SBA. There are certain advantages and government services available to those concerns which do qualify probably the most important of which relates to government procurements under the "set-aside" provisions. On the other hand as a matter of sales policy there may be objections to be classified as small business.

I would appreciate your thinking about this matter so a decision can be reached at the next Works Committee Meeting.

Harry S. Mann

dec INTEROFFICE MEMORANDUM

DATE September 2, 1965

SUBJECT Canadian Production

TO Stan Olsen
cc Ken Olsen
Harlan Anderson

FROM Denny Doyle

This memo reviews the performance to date of the Canadian production facility and suggests courses to follow in the future. It may be summarized as follows:

1. Module production has been successful and profitable, with production costs considerably lower than expected.

2. We have done a number of special systems. This work has been less successful, less profitable and only partially useful as a training medium.

3. Our future efforts should be channelled principally into the module area, but now is the time for some overall planning if it is to be profitable to the company as a whole.

Profitability of Module Production

The following are cost figures compiled on all module runs up to July 31:

Module	Average Can. Mfg. Cost/Unit	U.S. Unit Cost	Cost Ratio (with Can. dollars converted to U.S.
B104	$ 6.95	$ 5.80	Can. 11% higher
R001	2.93	1.98	Can. 40% higher
R002	3.05	2.26	Can. 25% higher
R107	13.60	10.13	Can. 20% higher
R111	7.97	5.92	Can. 22% higher
R113	12.62	9.12	Can. 27% higher
R141	9.25	5.74	Can. 47% higher
R202	17.80	10.16	Can. 62% higher
R302	28.46	21.76	Can. 21% higher
R602	19.47	11.13	Can. 60% higher

The above figures were compiled using an overhead rate of 2.5. This rate is expected to come down to at least 2. since the 2.5 rate reflected a lot of indirect labour required to set up the facility. Also, lot sizes were very small. They ranged from 10 to 100. Wastage was high on early production runs due mainly to poor soldering. Q.C. procedures are now well established, and high-quality modules are being produced with a low failure rate.

Our module production facility proved to be a real asset during the month of July when we delivered over $30,000 worth of flip-chips. Over $20,000 of this was supplied by us. Efforts to get modules from Maynard were nearly fruitless. We got only slightly more than $5,000. There is no question that we now have a facility which can contribute to our sales effort here in Canada.

Systems Work

This work to date has included a number of small systems for A.E.C.L. including a D-A network for the PDP-1, paper t tape readers and punches for the PDP-5's. We have also done three systems for Canadian Westinghouse. The latter company has been difficult to deal with due to bureaucracy, technical incompetence, and poor project administration. Instead of opening up new module markets, we seem to have ended up with a black eye. We could have done better on these jobs with more able contract administration at our end, a larger staff, and consequently higher prices.

The only thing gained was some staff training in logic checkout and trouble-shooting. This proved to be a little inefficient since much repetition was involved in the systems attempted, e.g., steering of signals through identical paths on all of thirty lines.

Systems work in the future will be confined to small computer inerfaces for the PDP-8. If Jim Milton remains with us, he will handle the engineering of such systems. A good systems house is being formed (an off-shoot of DCF Systems, Toronto) and it is our intention to funnel work their way. They know our hardware and our software extremely well.

Planning Required

There are three broad choices open to us so far as module production efforts are concerned:

1. Continue making about 20 module types as we are now, in quantities sufficient for the Canadian and eventually the U.K. market. This gives us the best market advantage since it allows us to break into commercial markets without the duty burden.

2. Take a few of the more complex modules and supply all of the market. The efficiency of this approach may well be offset by the customs problems involved and the extra sales administration problems imposed upon us.

3. Take one or two of the high volume types and make all of them. The problems involved fhere are the same as in the above case.

From our overall company standpoint, the first choice may not appear sensible since it means duplication of a highly efficient U.S. facility. However, it appears like the best course to follow for at least another six months as seen from our point of view.

1. We have built up our capability with this in mind, e.g., test fixtures and procedures are available only after much expense on our part.

2. It gives us in Canada the maximum market advantage.

3. It gives us maximum flexibility to act in harmony with U.K. production effort.

4. The problems of shipping things back to the U.S. have not been investigated and therefore choices 2. or 3. must be approached cautiously.

I have recommended that we continue as we are doing for at least six months and that Stan comes up to investigate our operation as soon as possible.

dec INTEROFFICE MEMORANDUM

DATE September 1, 1965

SUBJECT PERSONNEL REQUIREMENTS

TO Ken Olsen FROM Jack Atwood

We are facing a critical personnel shortage in Tech Pubs.

In the past few months, we have left six regular openings unfilled due to the tight money situation. Two of the people involved moved to other jobs in the company, and four terminated. We have also laid off all but one of our AID girls. We managed to get by with the help of summer replacements and outside contractors.

Within the next few weeks, three more people will move to other jobs, and five more will leave the company. In addition, we are laying off the remaining AID girl, and we are losing the young fellow who comes in after school to help with mail, literature shipments, etc.

The departure of the summer people leaves us extremely shorthanded - to the point where we are not able to give our customers the necessary service they have provided for in their budgets. And the amount of work we can farm out, which is at best a very expensive alternative, is reaching the limit.

Therefore, I request permission to recruit the 14 full-time replacements, the AID replacement, the part-time student helper, and the additional technical writer specified on the attached sheet.

J.L.A.

fd

Staff - Large Computer

1.	Large Computer Promotion Manager	Replace Howard Hubbard - being terminated	9,500-10,500
2.	Technical Writer - Large Computers	Replace Dave Gross - transferred to Large Computer Programming	9,500-11,500

Staff - General

3.	Technical Writer - Peripherals	* Replace Jim Padian - transferring to Large Computer Sales	9,500-11,500
4.	Technical Writer- Software	Reduce large volume of contract writing	9,500-11,500
5.	Advertising Specialist	Replace Alex Stephens - made acting Module Promotion Manager	7,500- 8,500

Hourly

6.	Secretary - Atwood	Replace Florence Dudzinski - leaving for Ohio	90-110
7.	Secretary - Grover and Stephens	Replace Beverly Cottrill - husband being sent to Vietnam	80- 90
8.	Secretary - Nangle and Gold	Replace Linda Marshall - leaving for California	80- 90
9.	Technical Typist	Replace Beverly Jenks - replaced Mary Sauler as secretary to product promotion managers	75- 85
10.	Direct Mail Clerk	Replace Carol Colburn - pregnancy termination	65- 75
11.	Bindery Clerk	Replace Barbara Nowowiejska - returned to Poland	65- 75
12.	Photo Lab Technician	Replace Joam Merrick - joined Dennison Sales	75- 85
13.	Production Control Clerk	Replace Doris Reihardt - AID worker terminating	70- 80
14.	Production Assistant (Part-time)	Replace Jack McNamara - going out for football	65
15.	Printing Specialist	Replace Warren Marshall - left for another job	90-110
16.	Stockman	Replace Alan Cremer - resuming education	70- 80

Hourly- Tentative

17.	Editorial Assistant	Replace Clair Lombard - will be offered a secretarial spot (maybe No. 6 above)	90-110

Submitted by JL Atwood

Date 9/1/65

Approved by _____

Date _____

INTEROFFICE MEMORANDUM

DATE September 1, 1965

SUBJECT 163C Memory Field Survey

TO K H Olsen FROM J McKalip

I have contacted the PDP-6 field sites using 163C memories and have received the following responses to my questions as to memory reliability, up time and serviceability.

Brookhaven (Bob Clements)

Our last failure was a MA 90 transistor in a 45521 sense amplifier about 2 months ago. This was the first failure in quite some time. I had no trouble locating and fixing the trouble. However, the new 1665 boards don't work here and we've gone back to the old ones which do.

Rand (Bob Brooks)

I saw no 163C problems at all until the factory people came out and began modifying things. There may have been one minor problem a month or so ago, but I don't really remember. In general, the memories were darn good.

LRL (Al Roberts)

We haven't had any real trouble since Al Kotok solved the multi-processor bug. We were down once about a month ago with a sense amplifier. I think we lost an inhibit driver a few months ago, but it was so long ago I'm not sure. With the exception of the multi-processor bug, we've had no real problems.

MAC (Roger Handy)

The 163C memory at MAC has been quite reliable. I have verified this from the log book.

Jack Shields agrees that this is an accurate status report.

J McK:ASJ
CC
H Anderson
R L Best

dec INTEROFFICE MEMORANDUM

DATE 9/65

SUBJECT

TO Ken Olsen FROM [signature]

Proposal for Memory Production in Portugal

This proposal considers the wiring and assembly of 30 mil cores into PDP-7 and PDP-8 memories and shows a saving of 1¢ per bit or approximately $500,000 a year assuming present rates of consumption.

There are three stages to the production:

1. Untested cores would be bought from our present memory suppliers and would be tested here at Maynard. These cores would be sorted into batches having controlled characteristic spreads and then shipped to Lisbon.

2. We start an assembly shop in Lisbon employing 50 girls and a technician to assemble the cores into planes. These planes would also be tested and the faults rectified there.

3. The wired frames would then be returned to Maynard for assembly into complete memories and final test.

The total capital expenditure for full production would be $100,000 and be made up as follows:

Core test equipment	-	$30,000
Memory test equipment	-	$75,000

These figures are the selling prices, the cost to us for both would be $50,000

Setting up jigs, tables, lamps, tools, etc. $50,000

TOTAL $100,000

These figures have a habit of increasing. A safe estimate for the capital expenditure would be twice this - $200,000.

The following table compares production costs in Maynard and Lisbon.

PDP-8 Memory Production in Maynard and Lisbon taking a total of 50 million bits a year in all types of memories.

1) Material Costs

50,000 cores at 0.5¢	$250
Frames, wire, etc.	50
Total	$300

2) Labor costs taking:

one tech. hr. to be	$ 3
one Maynard girl hr.	2
one Lisbon girl hr.	0.2

		Maynard	Lisbon
Core test	2 tech. hrs.	$ 6	$ 6
Plane wiring	100 girl hrs.	200	20
Plane testing	2 tech. hrs.	6	6
Fault rectification	8 girl hrs.	16	1.6
Final test	2 tech. hrs.	6	6
Stacking & assy.	8 girl hrs.	16	1.6
		$250	$41.2

3) Capital equipment
Assume $200,000, 4 year write off — 0.1¢ per core

4) Facility
5,000 square feet at $1/sq. ft. — 0.01¢ per core

5) Production overheads
Assume $100,000 a year — 0.2¢ per core

6) Total overheads - 0.2 ∕ 0.1 ∕ 0.01¢ — 0.31¢ per core
or $150 per memory

7) Final cost of Memory

Maynard	Lisbon
$700	$490

The comparison between Maynard and Lisbon shows a difference of $210 in production costs. This does not take into account the duty payable to the USA at a rate of 11% on the value increase of the cores due to their wiring in Portugal. This may be as large as $20. Added to this is the air freight charges to and from Lisbon, another $5 at the most.

Initial Production

Memory production may be started on a very small scale and we could own a pilot plant to produce one PDP-8 memory a week with the following equipment and personnel.

Equipment

Memory tester	$10,000
Core tester	$10,000
Setting up jig, tools, tables, etc.	$ 5,000
Total	$25,000

Labor

Core testing, 1 technician
Memory testing, 1 technician

Plane wiring and assembly - 3 girls

Total, 2 technicians and 3 girls

The girls take a couple of weeks to learn to wire the cores and 3 months to become really proficient. This first stage would take 3 months overall from receipt of the testing equipment and after that time we would have a sound memory design and a core of skilled people.

The second stage would be to set up a small plant in Lisbon for the plane wiring. A second memory tester would be installed there and run by the technician who had gained experience in the pilot plant. Two of the girls with core wiring experience would also be temporarily sent to Lisbon to train the girls there. The initial capital expenditure for this stage is for one memory tester and sets of tools, tables, jigs, etc., roughly $20,000.

Once this initial Lisbon venture is established production would expand until 50 girls are employed. The capital expenditure would also increase in proportion to the production and not come as an initial outlay.

The training time for the girls is short and full production may be achieved within 6 months of the move to Lisbon.

The expected profits are such that six months full production would recover the capital outlay, that is, the venture should pay for itself after a year to fifteen months.

INTEROFFICE MEMORANDUM

DATE 26 August 1965

SUBJECT Wage Disbursement

TO ~~Ken H. Olsen~~ FROM John Allen Jones

send copy to Harry Mann

If the company is considering changes in the procedure for disbursing wages, I would like to suggest two other services that we might begin to offer our employees in this area:

1. Systematic savings
2. United Fund contributions

Since systematic saving is only a matter of habit, a habit most people don't have because of inconvenience, it would be a help if Digital automatically sent part of an employee's wages to a place where withdrawal is inconvenient (e.g. Savings Bank or U. S. Bonds).

The United Fund is something I personally believe in and I suggest that many of our employees do also. If this is true, many DEC employees may presently be frustrated because an annual (or semiannual) contribution is seldom budgeted. I think the Fund would benefit far more if a weekly or monthly contribution could be made.

I make these suggestions recognizing that they will add burden and cost to the Accounting Department. However, the benefits accuring to the employees would seem to far outweigh the cost to Digital.

INTEROFFICE MEMORANDUM

DATE August 26, 1965

SUBJECT Monthly Product Line Statements

TO K. Olsen
H. Anderson
W. Hindle
S. Olsen
N. Mazzarese
D. Packer
R. Dill
E. Simeone

FROM H. Mann

At the Works Committee Meeting on August 24, general approval was given to the form of the Product Line Statement. Harlan Anderson observed, however, that the statement could be improved if certain key figures could be emphasized. The attached revision attempts to accomplish this emphasis.

We plan to discuss this form at the Accounting Meeting which will be held in my office on August 30. If you have any questions or suggestions they will be appreciated, and may be discussed at the meeting or before if you do not plan to attend.

At a later date we will attempt to modify descriptions to reflect more clearly what each line item covers and possibly drop the cents columns. We will number the lines immediately as suggested.

Harry Mann

DIGITAL EQUIPMENT CORPORATION AND SUBSIDIARIES

CONSOLIDATED STATEMENT OF OPERATIONS

PRODUCT LINE (S) PDP-1 & Misc.

	ACTUAL WEEKS ENDING 7/31/65		ACTUAL YEAR-TO-DATE ENDING / /	%	BUDGETED YEAR-TO-DATE ENDING 7/31/65	%
New equipment sales	$ 48,625	05			$ 33,300	-
Leased buyouts						
Rental income (Note 1)	390	00				
Gross Revenue	49,015	05			33,300	-
Less: Contributions						
Trade-in allowances						
Quantity discounts	588	00				
NET OPERATING REVENUE	48,427	05			33,300	-
Job charges	23,645	38			16,600	-
Late job charges						
Overhead center variance	239	34				
Standard variance						
Lease buyouts						
Warranty charges					700	-
Patent liability					700	-
Depreciation of rented goods	532	33				
COSTS DIRECTED TO OPERATING REVENUE	24,417	05			18,000	-
GROSS PROFIT	24,010	00			15,300	-
Marketing	907	92			300	-
Domestic sales	246	88			700	-
Overseas selling						
Advertising						
Trade shows						
Promotion literature						
Overhead center variance	894	61				
TOTAL SELLING COST	2,049	41			1,000	-

INTEROFFICE MEMORANDUM

DATE August 25, 1965

SUBJECT TUNNEL OVEN VERSUS TAPE SYSTEM

TO Ken Olsen
cc: Dick Best
Tom Stockebrand
Loren Prentice
John Viscolosi
Don White
Bob Hughes
Stan Olsen
Maynard Sandler
Jack Smith
Bob Brown

FROM George Wood

Discontinuing the tunnel oven completion in favor of starting the tape system, will leave me without a curing oven because too many other things follow the taping setup, i.e.; trimming on tape, washing on tape, etc. I do not recommend this because I lose process control during encapsulant curing.

I would very much approve of starting the taping device immediately (without cancelling the tunnel oven development) and this would mean shifting $5,000.00 from the 2nd quarter to the 1st quarter budget and give me a seven week head start with little additional time involvement on my part.

INTEROFFICE MEMORANDUM

DATE August 25, 1965

SUBJECT Tape Units for Service Center System

TO Kenneth H. Olsen ✓ FROM David Packer

We have experienced substantial difficulties in data processing work on our PDP-4 computer system because of hardware failures. System reliability (measured by the amount of re-processing required because of machine failure) has been running at 50%; i.e., it takes twice as long to do a job than it would if no failures occurred.

Analysis of failures shows that:

60% are caused by tape units
20% are caused by card reader
20% are caused by other items.

I am now of the opinion that the Type 50 (Potter) tape drives are inherently inadequate for data processing work. Maintenance has been increased to over 20 hours/week, with little appreciable effect on reliability.

We have a PDP-7 on order for December delivery. At the time this was approved, the question of what tape units would be ordered was to await a trial period of operation with both 570 (Midwestern) drives and 545 (Datamec) drives. To date, I have been unable to arrange a reasonable trial period with either type of unit.

We now have four 570 drives on order with no customer commitment, one to be delivered to us in August, three in September.

I propose:

1. These four drives be committed to the Service Center operation, to be used for a trial period of not less than three months. They will replace the Potter units on the PDP-4, then will be used with the PDP-7 when it is delivered.

2. If the trial period produces satisfactory results, these units will be permanently assigned to the Service Center operation.

This plan will yield both a solid in-house test of the 570's and alleviation of problems in doing internal data processing.

With your approval, I will generate a construction requisition for these units.

My reasons for bypassing a similar test of 545 units are:

1. The Datamec is a good, low cost transport, but, I feel, is not designed for heavy data processing loads. This is a general opinion, not substantiated by technical data.

2. The Datamec is slow (36 kc vs. 42 for the Potter, 90 for the Midwestern). It would increase processing time a minimum of 15% over what we now achieve with the Potter. It would likely increase many processing times 100% over what could be achieved with the Midwestern units.

D. W. Packer

DWP:ncs

INTEROFFICE MEMORANDUM

DATE August 20, 1965

SUBJECT Allocations on Product Line Statements

TO Ken Olsen, Harry Mann, Bob Dill, Ed Simeone, Dave Packer, Harlan Anderson, Stan Olsen, Nick Mazzarese

FROM Win Hindle

The rules followed in allocating expenses on the July product line profit statements were not the rules I thought we had decided upon. I think the procedures used caused unjustified variations in product line profits. I propose the following allocation rules:

I. Overhead Center Variance Allocations

Overhead centers are divided into five groups and variances allocated as follows:

1. Overhead centers wholly within a single product line (Overhead Centers 53-66). The overhead variance in each of these centers is given in total to the appropriate product line.

2. Overhead centers classified as "manufacturing". The total net variance for all of these centers is allocated to product lines on the basis of budgeted cost of sales.

3. Overhead centers classified as "sales". The total net variance for all of these centers is allocated to product lines on the basis of budgeted sales expense.

4. Overhead centers classified as "engineering". The total net variance for all of these centers is allocated to product lines on the basis of budgeted engineering expense.

5. Overhead centers classified as "G&A". No allocation required.

II. Standard Cost Variance Allocation

1. This variance is allocated to product lines on the basis of module usage, since standard costs are used only on modules. The variance is allocated on the basis of budgeted cost of sales for the module product line and 1/2 budgeted cost of sales for all other product lines.

III. General and Administrative Expense Allocation

1. G&A is allocated to product lines on the basis of budgeted total expense for the product line. Total expense is the sum of cost of sales, sales expense, and engineering expense.

W. R. Hindle, Jr.

WRHj:ncs

file

dec INTEROFFICE MEMORANDUM

DATE August 20, 1965

SUBJECT Power Supply Report

TO Ken Olsen
CC: Module Guidance Committee
Rod Belden
Dick Kennedy
George Geralds

FROM Irwin Jacobs
RE: Your memo dated August 4, 1965

Summary of Report

This initial report will deal with supplies needed by the module and computer lines.

Recommendations for Supplies Used with Modules

1. Modify H701 so that it can be used in place of 700D and 782 supplies.

2. Adopt Canadian technique for mounting the H701 in H900 panel so that 48 modules can be used instead of the present 32.

3. Because of versatility in mounting and use, the standard module supplies should be limited to the H701, 783, and 728.

Recommendations for Supplies Used with Basic Computers

1. Investigate further the design of a universal power supply to be used in place of the 728 or the 778 or the 779, since all are essentially similar in design.

2. Limit standard production of marginal check supplies or variable output voltage power supplies to the 734, or 738, since no other volume application exists for variable type supplies.

Introduction

I have spent the past week studying, in depth, our power supply requirements. Within the company, it appears that power supply requirements are generated by four major equipment groups. They are:

1. Modules
2. Basic Computer Design
3. Memory Design
4. Special System Design

This initial report will deal with supplies needed by the module and computer lines.

Module Power Supplies

At the present time, we manufacture approximately forty supplies that can be used to power both the system and flip-chip logic modules. With the exception of marginal check applications, there is no longer any need to make adjustable supplies specifically for module use. If we consider only fixed output voltage power supplies, a first approximation towards streamlining the line can be made by limiting production to five basic type supplies. This limitation will not present any hardships on future module users since, in the past, these supplies have accounted for the vast majority of module allied sales. These power supplies are listed below:

1.	H701	H900 Power Supply	+10 v at .4A, -15 v at 3A
2.	782	Rack Mounted	" " " " " "
3.	700D	Logic Laboratory	" " " " " "
4.	728	Plenum Door Mounted	+10 v at 1A, -15 v at 4A
5.	783	Rack Mounted	" " " " " "

Note that I have included the 700D, Logic Laboratory, power supply in this discussion since it is sure to be one of our fast moving items in the near future.

Supplies H701, 782, and 700D are all electrically identical and can drive about 1 1/2 1943 panels or 100 flip-chip cards. The 728 and the 783 are also electrically identical and these supplies can power four 1943 panels, each with 64 modules. It seems to me that these supplies give to the module user an excellent range in driving capability. However, I feel that only two of these supplies are really needed to give the module user the versatility in system design that he requires. These would be the H701 which can be mounted in either a 1943 panel, or on a plenum door, and the 783 supply which is designed for 19 inch rack mounting.

As stated above, the power supply used in the Logic Laboratory is electrically the same as the H701. Because of the 5 1/4 inch height limitation of the logic lab. panels, it was not convenient to mount an H701 supply in the 700D enclosure. Therefore, the supply was mechanically modified to conform to the requirements of the system. This, of course, added an additional power supply to the line. It would be advantageous to be able to use an H701, with modifications as described below, in the 700D chassis and thereby eliminate the supply now used.

At the present time, the H701 is one of the supplies being fabricated through the use of high speed techniques. There is one area in the fabrication process that can be modified to make more efficient use of quick disconnect wiring and lessen the assembly time. The input-output terminations of the supply are made via a terminal board on the underside of the chassis. This means that the supply must be turned bottom up during the assembly and again during the wiring operations. Quick disconnect wiring is not used on the terminal board. I would like to see the terminal strip mounted on a hat section on top of the transformer. If this is done, the supply can be assembled and wired from one side and quick disconnect terminations can be utilized throughout.

The H701 uses a chassis of 8" by 5 3/16" and is 5 1/8" high considering all protrusions on the bottom of the chassis. It can be readily seen why this supply could not be used in the logic lab. with only 5" allowable height behind the panel. I realize the packaging of components on the H701 is close, but I believe the components could be made to fit on a chassis 8" by 4 14/16" maximum. This can be done with more ease than ever before since we now use an encapsulated rectifier assembly which takes up less room than the four separate rectifiers used on earlier models. By cutting down on chassis size, the supply would fit nicely onto the left side of the 700D chassis, behind the dial. The H701 could be mounted on standoffs, making use of the four mounting holes available on its chassis.

Making further use of this smaller chassis, the H701 could be conveniently rack mounted and this would eliminate the need for the 782 power supply. All that need be done to rack mount the H701 is to attach it to one of our standard 5 1/4" x 19" mounting panel covers, such as the 1907, by means of four screws and standoffs. This would also make a much neater looking package since there would be no protrusions on the mounting panel.

Our Canadian facility has just sent in a design for adopting the H701 supply to a 1943 connector panel (H900 assembly) so that 48 module cards can be inserted instead of the present 32. The drawings received to date lack the details to make a good analysis, but it appears that the end plates of the 1943 panel have been extended with the supply mounted vertically on the left end plate. The H701 supply, with modifications, could be mounted in this fashion also, thereby eliminating shipping problems.

Power supplies 728 and 783 are the high power sources. Since June, 1964, we have manufactured nearly 700 of the 728 supplies. However, 80% of these supplies have been used in house; that is, for computers, memories, and special systems. The 783 is better suited for module use, but the 728 may be used as well.

Recommendations for Supplies Used with Modules

1. Modify H701 so that it can be used in place of 700D and 782 supplies.

2. Adopt Canadian technique for mounting the H701 in H900 panel so that 48 modules can be used instead of the present 32.

3. Because of versatility in mounting and use, the standard module supplies should be limited to the H701, 783, and 728.

Computer Power Supplies

The following is a tabulation of power supplies used on computers.

PDP-1

1-735	Memory
9-728	+10 v and -15 v
1-734	Marginal Check

PDP-5

1-735	Memory
1-779	-30 v, +10 v, -15 v
1-734	Marginal Check

PDP-4

1-735	Memory
1-779	-30 v, +10 v, -15 v
5-728	+10 v and -15 v
1-734	Marginal Check

PDP-6

1-739	Memory
6-728	+10 v, -15 v
3-778	+15 v, -15 v
1-734	Marginal Check

PDP-7		PDP-8	
1-739	Memory	1-708	Supply specifically made because of space limitation in PDP-8.
3-728	+10 v, -15 v		
1-778	+15 v, -15 v		
1-779	-30 v		
1-738	Marginal Check		

Considering the PDP-6, PDP-7, and PDP-8 for this discussion, it can be seen that only a limited assortment of power supplies have been used in the basic computers. Through analysis of the circuits and components used on several of the supplies, it becomes apparent that the 778, 779, and the 728 are similar in design. The 779 supply, for example, is made up essentially of a 728 and one half of a 778. In addition, all three supplies use identical components. The ideal situation here would be to make a universal supply that would be capable, with a minimum of rewiring, of duplicating any of the outputs of these three supplies. However, I do not think this is practical with our present designs because the added components required to exactly duplicate all outputs would be reflected in the price of a universal supply. The idea of the same type supply to power logic, solenoids, and other accessories on the larger computers, is still appealing and bears further investigation.

Two types of marginal check supplies are used in the computers. The 738 and 734 supplies, once again, are similar in design except that the 738 requires an external variac and meter. In the PDP-7, the variac and meter, along with the marginal check switch, are located in the front section of the computer. The 734 incorporates the variac and meter in its design. When marginal checking is required for a system made up of modules alone, the 786, which is the rack mounted version of the 734, can be made on special order.

With exceptions of marginal check and in house testing requirements, I cannot see a market for our line of adjustable voltage power supplies. Therefore, I recommend that we discontinue stocking all other adjustable power supplies.

Recommendations for Supplies Used with Computers

1. Investigate further the design of a universal power supply to be used in place of the 728 or the 778 or the 779, since all are essentially similar in design.

2. Limit standard production of marginal check supplies or variable output voltage power supplies to the 734 and 738, since no other volume application exists for variable type supplies.

At the present time, the price schedule set up for the power supplies is not consistent. The mark-up varies from under 2 times the cost for a 735 supply to 3.3 times the cost for the 728. This came about either because the actual cost data was not available at the time the prices were set, or the manufacturing costs have risen since the original pricing date. The pricing of these supplies should be re-evaluated when the new production method cost information becomes available. In any case, the selling price for supplies made on special order only should be raised to at least 4 times the manufacturing cost.

It has been further noted that a typical cost of converting a power supply from 60 cycle to 50 cycle operation is about $18.00. On the average, we sell the 50 cycle units for only $10.00 more than standard supplies. The selling prices of all 50 cycle supplies should also be re-evaluated.

Plans are being formulated now on ways to deplete our stock of odd power supplies. As soon as the recommendations in this report are firmed up, our field people will be informed by means of the sales news letter and direct communication.

The recommendations presented in this report are the result of data obtained through meetings with individuals involved with power supply design and production, and represent a first pass at making more efficient use of supplies. It is my intention to continue looking into the power supply situation and to find additional ways to slim down the number of supplies manufactured. Within two weeks, enough information should have been evaluated to allow us to re-evaluate the entire power supply line without affecting customer or our own internal requirements.

Irwin Jacobs

Irwin Jacobs

IJ/sb

INTEROFFICE MEMORANDUM

DATE August 17, 1965

SUBJECT Hired Car Insurance

TO K. Olsen

FROM Fred Mariani

The insurance and damage protection afforded cars rented from Hertz or Avis is summarized below:

1. PUBLIC LIABILITY & PROPERTY DAMAGE -- As stated in the Rental Agreement, the renter and authorized drivers are protected to limits of $100,000 for any one person killed or injured, $300,000 for all persons killed or injured, and $25,000 for damage to vehicles or property of others. Coverage is PRIMARY, which means that such insurance carried by Digital would not be involved in settlement of a loss until the Avis or Hertz provided limits are exhausted.

2. INJURIES TO RENTER/DRIVER OR PASSENGERS -- Avis or Hertz do not provide Medical Payments Reimbursement for injuries sustained by the renter or passengers in the rented car. If the renter has Medical Payments coverage on his own car it will follow him on any car he drives; if not at fault in the accident Digital would have a claim against the other party. If a guest passenger in the rented car should make claim against Digital, Avis or Hertz's policy will protect Digital for our legal liability to the policy limits.

3. FIRE OR THEFT LOSS OF RENTED CAR -- DIGITAL is not liable to Avis or Hertz for non-collision losses normally covered by a standard comprehensive policy which includes fire and theft losses.

4. COLLISION DAMAGES TO RENTED CAR -- Under the Rental Agreement, Digital agrees to be responsible for the first $100 of collision damage to the Avis or Hertz car, regardless of whose fault the accident may be. Our experience has proven that we have saved money while pursuing this policy.

INTEROFFICE MEMORANDUM

DATE August 16, 1965

SUBJECT Foreign Orders

TO Ken Olsen

FROM Gerry Moore

For your information, foreign orders booked during the 13 week period ending 8/6/65 were:

$900,048

This does not include Canada's bookings, and it does not include any PDP-6 bookings. Further, this is not a consolidated figure. That is, it is the dollar value of orders placed with the parent firm by (or through) the subsidiaries. This means that modules are taken at 78% of list price and computers at 76% of list price.

Bookings during the last 6 weeks of this period were more than double bookings during the first 7 weeks of the period, reflecting the larger sales effort overseas.

It is, of course, impossible to project to a full year with any degree of accuracy. However, I think that it is entirely reasonable to expect consolidated foreign bookings for our current fiscal year to be on the order of $7,000,000 to $8,000,000.

GTM:nlz

Distribution:
Ken Olsen
Harlan Anderson
Ted Johnson
Stan Olsen
Nick Mazzarese
Pres Behn
Win Hindle
Jon Fadiman
John Leng
Guenter Huewe
Ron Smart

INTEROFFICE MEMORANDUM

DATE August 12, 1965

SUBJECT

TO K. Olsen
H. Anderson
S. Olsen
H. Crouse
E. Harwood
W. Hindle
B. Hughes
T. Johnson
N. Mazzarese
J. Shields
J. Smith

FROM Bill Farnham

The company has presently outstanding with Tektronix, a letter of intent to purchase in a one year period, 26 of the new Model 453 portable 50 MC oscilliscopes. This letter of intent reflects Field Service's requirements for 16 units and our anticipation of internal requirements for an additional quantity of 10 units. (This increase takes advantage of a price break.)

Suddenly, Jack Smith has an immediate requirement for 10 of these scopes to be used in PDP-7 & 8 checkout. Jack Shields has an immediate requirement for 10 scopes to be used in Field Service. This leaves a balance of six units on the letter of intent. We have, as of August 11, 1965, released 10 scopes at $1,950.00 for delivery in early September.

In order to evaluate the company's needs for the coming year, it is necessary that those areas that will have scope requirements submit them to the Test Equipment Committee, c/o Bob Hughes. One of the reasons for the Test Equipment Committee's existence is to act as a clearing house and to recommend a sound procurement policy that is consistent with the company's needs. If the anticipated requirements are not received by the Test Equipment Committee, we run the strong risk of not committing ourselves to the proper number of scopes and thus losing quantity discount, which would be in this case $200.00 per scope. We can also expect delivery delays.

It is, therefore, requested that the addressees give the above their early attention so that a firm order can be issued by August 23, 1965.

INTEROFFICE MEMORANDUM

DATE August 12, 1965

SUBJECT TROUBLES ENCOUNTERED WHILE INSTALLING THE BONN AND AACHEN PDP-6's

TO Jack Shields
Bob Savell
Bob Beckman

FROM Ken Senior

1. The memory bus cables couldn't be plugged in properly to the 166. The reason for this is that power supplies were mounted in poor positions on the rear plenum door. The memory bus cables were, as a result, plugged into the top slots in the 1665's and do not have the benefit of the nylon holding block.

2. The memory bus cables were not soldered very well, in fact some points had no solder in the joints.

3. We found a terminator in the 6205 section of the 166 that was not soldered to ground. We did not find this as a result of a trouble, but just as a result of inspecting the machine.

4. The 516 and 136 IO bus connecting scheme is different from all other IO devices. It has been this way since time began. I thought a mod had been generated to change this.

5. The fan wires from the memories were too short. When we were able to get some more AC power cord to plug the fans in, it was found that the purple power control, which supplies the 117 volt transformers, would blow its circuit breaker. The fans in the memory were, as a result, wired in series directly across the 220 line.

6. There were extra wires in the CP power wiring and 551 power wiring which caused a short circuit because these devices were on different phases.

7. The KSR-33 was fouled up. The line feed and one of the function code bars had to be fixed.

8. One of the 6205's went bad after the machine was on two days. It was bit 7 and an MB swap gate that went bad.

9. A regulator module in 570 serial 17 was out of the socket. There were no schematics for this power supply.

10. Q1 a 2N627 power transistor shorted in one of the 570's power supplies, causing one of the 6 volt voltages to fail. We couldn't find a replacement so we temporarily jumpered both six volt supplies together. This seemed to work and we eventually got the proper replacement transistor. We couldn't see load point on 570 number 17. Pin E of the terminal strip at the bottom of DEC logic was shorting to ground. The terminal strip was held on by screws which were right next to the Pin E 12. A DEC 1309 transistor in the Read signal filter network of the 521 went bad. We used the spare network because we didn't have the exact 1309 replacement. Both 570's were shipped with the capstans removed and there was no suitcase to set Start/Stop time. We did manage to get the 6 to simulate the suitcase enough to do the same functions.

11. We broke a wire in the filter network on the 521.

12. The odd 161C memory failed, dropping bit 18. We reseated some modules that looked as though they were out a little and the problem went away.

13. The Line Printer died. The alarm status light was on, but no other light on the rear power supply panel was on and there was no obvious cause for the alarm. This trouble was reported by Bob Reid to have happened several times in Maynard, and each time the Printer boys would return the printer saying it was "O.K. now." We found the trouble to be a pair of alarm contacts on one of the circuit breakers. It was intermittently opening. The circuit breaker itself was not blown and the circuit which the breaker was protecting was alright.

14. The University of Bonn had provided a power panel with magnetic breakers of the values suggested in the installation manual. They were quite peeved when we told them they would have to change their breakers to ones that would accept a higher surge. They put in thermal breakers that would accept a 100 amp surge.

15. We had display trouble. The pin cushion test would not work properly. Steve Midulski reported that it was the same trouble that had occurred at DEC twice before. People at Maynard told us it was probably a 6115 in one of several slots. I looked the circuit over quite carefully and found there was no clamp in the circuit in question. By adding a clamp it fixed the problem permanently.

16. One of the control boxes in the 570 has a strange trouble. When in the LOCAL mode and you press forward or press reverse, the tape will move forward or reverse only as long as you keep the button depressed. By tapping the box it then works properly.

17. We had to retune both memories.

18. One of the 570's blew the +9 volt fuse. There was a one amp in the fuse holder, but we had no schematics to insure that this was the right value.

THE INSTALLATION AT AACHEN

1. One half of the word in one of the quadrants in one of the memories was bad. We found an open in the stack. It was on a common tie point for the X2 Read/Write drive line. It had been intermittent but was solid long enough for us to find it.

2. The address stop switch had noise on it. This has not been fixed yet.

3. One of the DECtape units, the lower left one, gave some trouble. This was the same DECtape unit that had been in and out of the Console of this machine many times. I checked delays in the 551 and found a 30 milisecond delay where the 35 milisecond delay should have been.

4. The Line Printer would run the test program as it usually does, but would not run the system programs. The trouble being all sorts of extra form feeds as the printer was printing. Steve Mikulski knew of a delay that Bill Scales had adjusted one time. We wiggled this and the printer worked properly for both system programs and the test program.

5. One of the memories was hanging up occasionally. We found one of the 6131's was oscillating and the wrong memory was being selected. This was in the non-interleaved mode. We tried swapping 6131's from the unused positions into the position that was bad, but this would not fix the problem. Every 6131 was oscillating to some extent. We had to extend the memory timing in order to obtain any reliability with the machine. Bit 21 was the bad bit.

6. Keys for one of the 570 tape units were missing. We had to remove the door and have new keys made for the lock. We might do just as well if we had a wrench or a common key for all 570 doors.

7. The "C" rings that hold the capstan fly wheels on were lost but we were lucky enough to find some at Aachen's machine shop.

8. There was a very bad crack in the air tube that runs from the compressor to the compressor air tank. On this particular 570 this tube was run differently than usual. The tube, besides being cracked, showed signs of abuse because the heat seams were bent out of shape in many places.

9. The whole power hook-up on the Aachen 570's was very confusing. We had no good prints to go by and it took us some time before we finally got everything hooked to its proper AC supply.

10. The minus 6 in both power supplies on the 570's at Aachen read from -1 volt to -2 volts. Evidently it was found later that this is an unused supply.

11. We had to readjust the servo control for loading and unloading tape from the columns on one of the units.

12. The front wheels on the 570's should be able to turn. This is a source of aggravation, both when trying to unload the 570's from their skids and also in trying to maneuver the 570's in cramped areas.

13. The nylon blocks, in one of the 161 memories at Aachen that the memory bus cables use as a guide, were not the proper distance from 1665 boards. You could see where the cables had been forced onto the boards. The edge of the blue amphenol connector had been broken. Someone did it this way as the easiest way to get the cables plugged in. The symptom of the trouble was that Address Acknowledge was not getting from the memory furtherest away back to the computer. The trouble occurred in the midst of other memory troubles which was quite frustrating.

14. There was no ALT Mode key on the KSR-35.

CONCLUSIONS

1. During the acceptance test the PDP-6 should be hooked together exactly as it should be at the site with power cords coming out the exact hole that they will be at the site, all doors closed, all outside doors mounted, and all end panels mounted. If necessary, the machines should be removed from the skids in the plant to accomplish this.

2. Tools for unpacking the equipment should be sent in a box, that is easily accessable. The Bonn machine was unpacked without the benefit of a claw hammer or crow bar. Large wooden crates were opened with screw drivers and any other tools that could be improvised.

   Equipment should also be sent that is suitable for removing a line printer from its skid.

INTEROFFICE MEMORANDUM

DATE August 11, 1965

SUBJECT Field Service Inventory

TO Jack Shields
cc. Joe Rutschman
Ted Johnson
Ken Olsen

FROM Ed Simeone

The results of the physical inventories as of July 3, 1965, shows the following materials in your area or under your responsibility:

Parts in Stock	$ 54,901.86
Modules in Stock & Sales Offices	81,027.83
Modules at PDP-6 Installations	13,183.96
Total	$149,113.65

We will require monthly reports indicating additions and usage which will effect the above values. I have gone over the procedures with Joe Rutschman and I want to be certain that it is understood that we must maintain control over these materials.

INTEROFFICE MEMORANDUM

DATE August 11, 1965

SUBJECT Joss Console

TO K. Olsen ←
H. Anderson
S. Mikulski
R. Beckman

FROM J. Smith

Joss Console wire wrap panels have been bussed, packaged and are awaiting shipment to Raytheon. To date, a corrected card deck has not been received. Jan is about two-thirds (2/3) through checkout, he expects to complete checkout Friday, August 13. Drafting has been alerted to give the deck updating top priority.

dec INTEROFFICE MEMORANDUM

CONFIDENTIAL

DATE 6th August, 1965.

SUBJECT Memory Production in Portugal.

TO Ken Olsen. FROM Lewis Illingworth.

Having recently joined DEC in the UK as head of the new production group I bring with me experience of the British computer industry which John Lang believes may be of interest to you your future manufacturing programme. I am writing here about my experiences in starting up a memory plane production line in Lisbon, Portugal with the Plessey UK Ltd., the largest British manufacturer of computer memories.

Three years ago Plessey's took over the Automatic Telephone and Electric Co. Ltd., a large telecommunications manufacturing organisation centered in Liverpool but with small branch factories scattered over the globe. One of these is Automatica Electrica Portugueses in Lisbon, a factory of the order of 50,000 square feet floor space employing a couple of hundred people. A year or so after the takeover Plessey's Dielectric and Magnetic Division took 2,000 square feet of this and with 50 girls started a memory plane production line. The cores are fired and tested at their English matrix unit and together with the frames and wire are air freighted to Lisbon for assembly. The wired frames are then flown back to Towcester for testing and assembly into complete memories. At first sight this system seemed to have an overwhelming advantage in that the girls were paid as little as 10 cents an hour compared with 70 cents in England. A typical 30 mil 4K planes takes a girl 6 hours to wire so the saving on a plane wired in Lisbon is $3,60 and on a 12 bit 4K memory, on just the plane wiring alone, is $43.20 or approximately 5% of the memory selling price. The cost of the air freight of the cores from England to Lisbon and the return to England of the memories is less than one per cent of the selling price.

However, the first years production failed to cut the cost below that of memories manufactured completely in England although the production line ran smoothly with very little capital outlay. This failure was due to the distance between the wiring and testing of the planes which suffered from chipped and mixed type cores, bad insulation and interweaving. All these faults had to be rectified by the people in England, a procedure which took up a lot of highly skilled labour and test gear time both in taking out bad cores and retesting the planes. The Lisbon people were ignorant of their manufacturing faults and naturally considered that they were wiring planes extremely cheaply, which of course they were, but the extra expense at the English factory cancelled all their gains. To be fair to the Lisbon people their planes were wired neater than the English ones and looked better, the faults only showed up on the tester. The next logical

step was to move the test equipment to Lisbon so that the plane testing and fault rectification could be effected there. However, it was not thought practicable to move all the test gear as a good deal of plane wiring for small and special jobs, and for the memory development department, was still to be done in England. One plane tester was eventually shipped to Lisbon and installed in June of this year. The intention was that this should only carry out the tests for core uniformity and interweaving and the more detailed tests were to be carried out by the English plant. It was hoped that the machine would be maintained by the local Portuguese technicians to save the expense of sustaining an English maintainance engineer in Lisbon. The project was however doomed to failure. The Portuguese had never seen electronic equipment more complex than a television set and so an English engineer has been with the gear since its installation six weeks ago and a replacement has had to be found for him to look after the test gear in England. The plane tester itself has never taken a liking to Portugal and is capable of fusing transistors at a remarkable rate, due to its slaphappy design and construction three years ago by my predecessor. The total testing to date is four planes!

Plessey's are determined to make a success of their portuguese production and are now realising the importance of having good test equipment and operating staff with their production line. They are considering purchasing a couple of DEC testers hoping that they will be reliable and that the local engineers will be able to maintain them when they do go wrong. Whether this will work in practice is debatable and in my opinion the only practicable solution is to move the whole manufacturing and testing unit to Lisbon, thus avoiding duplication of staff and equipment. Most of the work can be done by the Portuguese guided by an English manager and engineer. Unfortunately this solution is unacceptable to an established British manufacturer as it renders to many people redundant.

Plessey's experience has shown that Lisbon is an ideal place to establish routine assembly work of this nature. The girls are excellent and probably better than the English. Their jobs are well sought after as the work is clean, and to them, well paid. The English managers and engineers also favour Lisbon which is indeed a beautiful modern city.

I notice that the PDP-7 and PDP-8 memories are electrically similar apart from the number of planes and I imagine that the PDP-6 uses the same core type as well although I have no information about this here. This is a very important factor in memory production for the whole range can be made using only one set of jigs and tools. A production line could be set up in Portugal to satisfy Digital's memory requirements having as a capital outlay three core setting up jigs at $1,000 a piece, three simple purpose built memory testers at $25,000 each and one D.C. resistance and insulation tester at $15,000. Together with wiring benches, seats, lamps and tools the total outlay would be of the order of $100,000.

digital

Experience with Plessey's shows that a girl takes 6 hours to wire a 4K plane, as mentioned before. Now, John Leng estimates the total Digital demand for memory is 75 million cores a year; with this figure and assuming a 40 hour week these cores could be wired into planes by 60 girls. Added to this would be 10 girls in training and 3 for setting up the cores. A total 73 girls paid approximately 10 cents an hour.

The planes take an average of 10 minutes to test and so two testers would be required to cope with the full production. In addition a tester is needed for the complete memory and these three machines could be operated by three highly skilled portuguese men earning about 25 cents an hour.

Depending on the memory construction 10 to 20 women would be required for stacking the planes and making connections to the output sockets. Again the rate of pay would be 10 cents an hour.

The total cost per year for the 86 to 96 personnel described so far is $18,100 to $20,100.

Core production poses different problems to the memory wiring in that it has a small highly skilled labour force. The secret of success here is the powder mixer who produces the required characteristics in a process closely allied to cooking and alchemy. There seems little to be gained from manufacturing these in Lisbon as the freight charges are extremely low in sending cores from the States to be wired in Portugal. The core manufacture seems best situated close to the memory system design unit as the drive and sense circuits can be developed together with the core characteristics to produce the best, fastest, and most economical system.

Memory production can be started gradually. For the first stage cores can be bought and the wiring line established. Then the core mix can be bought and cores manufactured under licence for a time. Finally the mix can be made and the memories manufactured from start to finish.

I hope that these ideas will be of use to you and that DEC will venture into this highly specialised but profitable field. Although the cost of each memory is small compared with the cost of the complete computer the overall saving would probably be of the order of $200,000 a year, and the entry into the field would breed improved memory systems and reduced cycle times.

Lewis Eggebrecht

digital

INTEROFFICE MEMORANDUM

DATE August 6, 1965

SUBJECT Inventories

TO Ken Olsen

FROM Ed Simeone

Attached is a summary of the physical and book inventory as of July 3, 1965, which is self explanatory.

If you would like any additional information or more detail, please call.

DIGITAL EQUIPMENT CORPORATION

Summary of Inventories

July 3, 1965

Type	Location	Source	Physical Inventory	Book Inventory	Inventory Adjustment Up (Down)	Adjustments: Due to Change in Standard	Adjustments: Due to Physical Count
Raw Materials							
Class 10-20	Stockroom	Tab Cards	$ 719,883.55				
10-20	Incoming Inspection	Listing	73,531.25				
10-20	Invoiced - Not Received	Listing	16,607.78				
30-34	Stockroom	Tab Cards	266,093.23				
30-34	Incoming Inspection	Listing	2,443.75				
30-34	Invoiced - Not Received	Listing	2,173.60				
Total Raw Materials			1,080,733.16	1,092,512.82	(11,779.66)	(75,282.84)	63,503.18
Work in Process - Modules							
Class 50-54	Stockroom	Tab Cards	167,957.58				
Modules on Floor	In Process	P.C. Board	528,861.70				
Parts on Floor	In Process	P.C. Board	11,480.00				
Total Modules in Process			708,299.28				
Work in Process-Sys. & Comp.							
Class 70-74	Stockroom	Tab Cards	420,141.76				
Manufacturing Jobs	In Process	Cost Ledgers	1,069,607.15				
Customer Jobs	In Process	Cost Ledgers	292,434.91				
Total Sys. & Comp. in Process			1,782,183.82				
Total Work in Process			2,490,483.10	2,449,033.59	41,449.51	(64,926.64)	106,376.15
Parts in Field Service			54,901.86	54,901.86			
Finished Goods							
Modules	Stockroom	Tab Cards	310,354.73				
Modules	PDP-6 Installation	Listing	13,183.96				
Modules	Field Service & Sales	Listing	81,027.83				
Modules	Checkout	Listing	4,743.32				
Miscellaneous	Receiving	Listing	369.60				
Total Finished Goods			409,679.44	416,879.02	(7,199.58)	(5,720.83)	(1,478.75)
Total Inventories			$4,035,797.56	$4,013,327.29	$ 22,470.27	$(145,930.31)	$168,400.58
Consignments		Ledgers	$ 431,593.33	$ 431,593.33			
Loans		Ledgers	91,372.29	91,372.29			
Total Loans and Consignments			522,965.62	522,965.62			
TOTAL			$4,558,763.18	$4,536,292.91	$ 22,470.27	$(145,930.31)	$168,400.58

E. Simeone
8/5/65

équipement digital

65, RUE DU FAUBOURG SAINT-HONORÉ
PARIS 8e - *Tél. 256 13 28 - 256 11 37*
TÉLEX : 26.705 DIGITAL PARIS

INTEROFFICE MEMO

to : Harlan Anderson
Ken Olsen
Gerry Moore
from : J. Fadiman

August 6th 1965

Based upon my past experiences in Italy, and the amount of correspondence and interest which we now have from possible Italian Customers, I am planning a rather extensive trip through Italy at the end of August and for the month of September.
Incidentally, I will also be combining this with my vacation, for which I will take about 10 days or so in Italy.

I will be away from August 21st to September 29th. I plan to visit customers in Geneva, Ispra, Torino, Padova, Bologna, Roma, Pizza, Milano, Bari, Napoli, and Zurich.

Potential customers in each of these places already expressed interest in our systems, and we must now follow up on the interest which we have generated plus generate some new interests.

Thus, there are 2 purposes to this trip :

1) - to do sales work in Italy and hope to sell some equipment there.

2) - to assess the Italian market completely and try to determine what our future policy ought to be for the Italian sales i.e. how soon should we open a sales office ? Should we work through a representative, or should we leave the market entirely to IBM ? At the end of this trip, I will have covered sufficient territory and spoken to a sufficient number of customers to have a good idea about our future in this country.

Jon Fadiman

INTEROFFICE MEMORANDUM

DATE August 6, 1965

SUBJECT Labor & Overhead Rates

TO K. Olsen
H. Anderson
S. Olsen
W. Hindle
N. Mazzerese

FROM E. Simeone

Attached are the average direct labor rates and predetermined overhead rates for all the Overhead Centers.

The direct labor rates are based on an average of all employees assigned to the center.

The overhead rates are based on historical data, when available and/or projected costs for the new fiscal year.

We anticipate that these rates will require review and possible changes during the next three months as actual data becomes available. This is due primarily to several changes in interpretation and accumulation of overhead costs.

Average Direct Labor and Applied Overhead Rates Fiscal Year 1966

Code	Overhead Centers	Direct Labor Rates	Overhead Rates
2	Los Angeles Sales	$5.00	160%
3	Palo Alto Sales	4.40	150
4	Washington Sales	3.75	175
5	New York Sales	3.70	115
6	Pittsburgh Sales	3.95	220
7	Illinois Sales	3.75	265
8	Ann Arbor Sales	4.15	165
9	Orlando Sales	3.45	170
10	Denver Sales	4.80	170
13	New England Sales	4.40	115
14	Huntsville Sales	4.75	145
24	Model Shop	2.65	75
25	Drafting	2.50	130
27	Q. C. - Engineering	2.90	85
30	Mechanical Engineering	3.90	155
31	Printed Circuit Design	2.60	85
33	Board Processing	2.00	380
34	Module Assembly	1.90	230
35	Final Test	2.25	180
36	Sub System Assembly	2.20	175
37	Sheet Metal	2.50	245
38	Machine Shop	2.50	190
39	Strate Processing	2.60	120
40	Semi Conductor Processing	4.30	145
41	Peripheral Test	2.55	85
42	Field Service	3.00	145
49	Tech. Pub. - Photo	2.95	135
50	Tech. Pub. - Printing	2.50	335
51	Tech. Pub. - Tech. Writing	3.15	70
52	Tech. Pub. - Adv. & Pub. Rel.	3.20	90
53	Digital Test Systems	3.65	120
54	Computer Aided Design	3.60	60
55	Linc	3.70	115
56	Module Sales	3.70	130
57	Module Engineering	3.50	335

Code	Overhead Centers	Direct Labor Rates	Overhead Rates
58	Large Computer Sales	$8.45	65%
59	Large Computer Engineering	4.75	150
60	Large Computer Programming	4.10	60
61	Large Computer Checkout	3.35	80
62	Small Computer Sales	4.60	100
63	Small Computer Engineering	3.85	155
64	Small Computer Checkout	2.95	85
65	Small Computer Programming	3.40	55
66	Small Computer Special Systems	3.90	65
67	Storage Devices	3.95	135

dec INTEROFFICE MEMORANDUM

DATE August 5, 1965

SUBJECT

TO Ken Olsen

FROM Ted Johnson

Reminder

The man I know at Consolidated Electrodynamics Corp., Pasadena, is Jim Crosby. He has worked there in tape transports for at least nine years. I don't know him well, but he had solid reputation at Caltech and amongst some of my cohorts.

TJ/mr

INTEROFFICE MEMORANDUM

DATE August 5, 1964

SUBJECT Manufacturing Cost - PDP-6 Central Processor Construction

TO K. Olsen
H. Anderson
G. Bell

FROM J. Smith

cc: D. Packer

Labor Costs

	Hours	
Mechanical Assembly of Panels	28 3/4	
Gnd Loop Prep 1 and 2	12 3/4	
Gnd Loop Wiring 1 and 2	37	
1B-1C Logic	30	
Buss Wire Prep	13 1/2	
1D-1E-1F Logic	35 1/2	
1H-1J-1K Logic	42 1/2	
1L-1M-1N Logic	32 1/2	
1 Bay Vert. Interwiring	87	
1 Bay Cable Prep and Wiring	23	
1 Bay Components	19 1/2	
1 Bay Checkout	77 1/2	
2B-2C Logic	28 3/4	
2D-2E-2F Logic	39	
2H-2J-2K Logic	20	
2L-2M-2N Logic	37 1/4	
2 Bay Vert. Interwiring	67 1/4	
2 Bay Cable Prep and Wiring	62 1/4	
2 Bay Components	20 1/2	
2 Bay Checkout	55 1/4	
1 Bay to 2 Bay Interwiring	48 1/2	
1 Bay to 2 Bay Checking	17	
Harness	7	
2 Bay to 1 Bay Interwiring	39 1/2	
2 Bay to 1 Bay Checking	19 3/4	
Solder and Clean-up and Inspection	31 1/2	
Total Wiring Labor, Bay 1 and 2	933	Hours
Power Wiring and Final Construction	176	Hours

Cabinet Assembly		20 Hours
Quality Control Inspection		10 Hours
Total Hours		1,139 Hours
Total Direct Labor and Overhead 1,139 @ $6.50		$ 7,403.50
Material Costs		
Cabinets and Associated Trim	$1,010.00	
Control and Indicator Panels	1,371.00	
Main Frame and Harness	250.00	
Mounting Panel Hardware	800.00	
Total		$ 3,431.00
Modules and Power Supplies		$19,214.00
Total Manufacturing Cost		$30,048.00

3500 Reader	$2,145.00
BRPE 11 Punch	717.00
ASR-33	460.00
Total	$3,322.00

Reader, Punch, Typewriter Logic and Modules

Material	$ 115.65
Labor & O.H.	$1,020.00
Modules	$1,920.00
Total	$3,155.65

Total Manufacturing Cost	$36,525.65

INTEROFFICE MEMORANDUM

DATE August 4, 1965

SUBJECT ASSOCIATED INDUSTRIES OF MASSACHUSETTS SURVEY (7/65)

TO K. H. Olsen FROM Bob Lassen

This will give you an idea of what other organizations think of AIM:

National Metal Trade - Art Sesserman, Vice President

Worthwhile organization
Lobbying activities have been effective
Recently fought the "Striker Bill"
Presently fighting 16 union bills

Other AIM members contacted were Raytheon, Honeywell, Scott and Sylvania. The following comments represent their opinion of AIM:

An effective watch-dog for industry.
A protective association for industry in regard to legislative proposals.
Presently fighting many bills in the legislature that could prove a hardship to industry.
Dues are minimal for protection and voice representation given.
Organization with very effective lobbying activities.

/jfr

INTEROFFICE MEMORANDUM

DATE August 4, 1965

SUBJECT

TO Ken Olsen

FROM Ted Johnson

The hold on people additions only increases a tendency toward what has been called "lower level politicking". Good procedure is to check with the supervisor before discussing another opening for an individual. Problems, as I see them, of avoiding this rule are:

1. The present supervisor might not be confronted directly with decisions and possible managerial weaknesses.

2. The employee becomes confused and his relationship with his supervisor is undermined.

If I face this problem, it will likely be in Field Service. I think it is a very probable problem for many and should not be encouraged.

TJ/mr

équipement digital

65, RUE DU FAUBOURG SAINT-HONORÉ
PARIS 8e - *Tél. 256 13 28 - 256 11 37*
TÉLEX : 26.705 DIGITAL PARIS

INTEROFFICE MEMO

to : Ken Olsen
Harlan Anderson
Gerry Moore
Nick Mazzarese

from : Jon Fadiman August 4th. 1965

On Friday 30th of July , we had the first of our European managers' meeting in the Paris Office.

Present were : John Leng
Günther Hüwe
Bernard Haus
Jon Fadiman

A large part of the meeting was devoted to a general interchange of sales information. It is apparent that each of us is able to obtain various bits of information from Maynard which when shared among all of us greatly benefits us in European market.

Each manager was able to provide information of use to the other managers, both in terms of the sales experience that they had had, and customers that should be contacted in the various areas. John Leng gave us some new information on the PDP-6. Günther Hüwe discussed the competition he is feeling with the CDC 1700 machine and also discussed the needs of his German customers.

It appears that there is a definite need for wired double precision in the PDP-6.

Many of the French customers have mentioned this and also DESY who is seriously considering the PDP-6, desires 72 bits. At least what we could do, is to provide a sub-program for double precision. Bernard Haus obtained some more details on the CDC 1700 which appears on first glance to be a serious contender to the PDP-7. The other serious contender is the IBM 1800, which

.../....

.../....

seems to be having a considerable success in France and Italy.

The general market for the PDP-7 in Europe seems to be among the electrical engineering institutes and in the field of Hybrid computation. Simulators should be a market for our equipment but so far this has been largely preempted by Computer Control Corporation.

From our discussions it appears that one of the main uses for the PDP-8 computer is to process data coming from either Aaalog or Digital signals, to do some computation upon this data, and then to output this data on magnetic tape. All of our customers would rather have DECtpae than IBM compatible tape because the greater reliability, cheaper cost, and greater ease of use. However none of them can use DECtape because they have to process their data later on large computers such as IBM 360 system, IBM 7094, or particularly the machines of CERN, such as the CDC 6600. Consequently all of them are requiring magnetic tape and this greatly increases the price of the system required. One solution might be to provide time on a PDP-6 in Europe which will process the data on DECtape and put it out on IBM tape. Perhaps some time could be bought from Bonn or Aachen to do this job. Probably a better solution is to set up a PDP-8 somewhere which would contain both DECtape and a 545 tape transport. This PDP-8 could then do the conversion from DECtape to IBM tape for all of the customers in Europe requiring a service and we can then sell just the PDP-8 with DECtape to all of these customers. The ideal place for such a system would be at CERN since by far the largest amount of processing seems to be done atŒRN. I will make an attempt to talk with the people in the data division at CERN about the possibility of buying a PDP-8 for such a job.

All of us here in Europe are extremely unhappy about the delivery situation, not only because the delivery time is very long which puts us at a great disadvantage when opening up new market such as in France, but also because promised delivery dates are not kept. We realized that one of the reason for this is the difficulties in production over which we have no control except to urge the management of DEC to do as much as possible towards solving the problem of flip-chip ~~module~~ production. The other problem is one of reshaffling the purchase orders so as to provide faster delivery dates to US customets who are closer and therefore pressing more constantly for earlier delivery. This is a situation which is absolutely intolerable. In Europe we are trying to present an image that the European customer is not at any disadvantage whatsoever with respect to American customers when he orders our equipment. We try to show him that we have good service in Europe, and that except for such things as duty, the prices in Europe are the same as the prices in the US, and that the European customer will get equally good attention at his US counterpart.

We want him to have the most up to date sales information, equal prices, good service both before and after delivery, and a delivery time no longer than other customer in the US. If these facts are not true then we have no right to be trying to sell our equipment outside the US. The telex addressed to Ken Olsen and Harlan Anderson on the day of our meeting clearly expressed our feelings on this matter.

The other problem is of course one of getting information from Maynard. In spite of the best efforts of Gerry Moore, there are still long delays in the answering telexes. Very often there are no answers at all, and one must ask 4 or 5 times by telex for some piece of information. All of us realize that this lack of support is certainly not deliberate on the part on any of the personnel in International Marketing in Maynard. There are simply not enough personnel to do the job which is required. Therefore it is immediately necessary for Gerry Moore to have someone else working with him. It is also necessary for him to have adequate space and adequate secretarial help. The European managers would appreciate an answer from DEC within the near future as to exactly what is being done to provide the required support in Maynard.

Jonathan Fadiman

Jonathan Fadiman

cc. John Leng
Günther Hüwe
Bernard Haus

Date of Meeting July ~~1965~~ 30th 1965
Date of Report August 4th 1965

dec INTEROFFICE MEMORANDUM

DATE August 3, 1965

SUBJECT

TO Stan Olsen
CC/ Ken Olsen
Dick Kennedy

FROM Frank Kalwell

I'd like to see us incorporate in our next set of Terms & Conditions, a"Minimum Billing"portion. At the moment, we have an influx of orders, consisting of small items such as Transistors, Pulse Transformers, Tape Trays, etc. This type of order is time consuming and costly.

A minimum billing of $15 would seem reasonable on all spare parts and module orders.

I'd appreciate any comment you may have on this. Thank you.

Frank Kalwell

dec INTEROFFICE MEMORANDUM

DATE August 3, 1965

SUBJECT

TO K. Olsen
H. Anderson
N. Mazzarese
H. Crouse
R. Savell
D. Smith

FROM D. Kuyamjian

Additional information on Teletype's new Inktronik Printer:

1. Print Method: ink is sprayed from nozzles and directed by means of a charged grid (8x10 matrix) to form the character. One matrix and nozzle per two print positions.
2. Speed:
   a) The military version now in production operates at 1050 words/minute as a terminal station.
   b) The commercial version will have a print capability of 2400 words/minute.
   Both the military and proposed commercial units have been designed for terminal applications receiving dat serially over voice grade communication lines. Teletype engineers feel the design characteristics of the printer will permit much higher speeds when used as a computer output.
3. Electronics: A complete operating printer will be offered, but without storage provisions as they are not particulary shooting at the computer output applications. Means for printing other than standard ASCII characters must be provided by customer. Data is entered serially and is converted to parellel; prints a character at a time.
4. Line Width:72 characters; 130 under consideration.
5. Price: Commercial version about $10K
6. Delivery: 1-11/2 years. Demonstration units are being made available now through L. Angellini. If you wish to make arrangements for an evaluation; please contact me.

INTEROFFICE MEMORANDUM

DATE August 2, 1965

SUBJECT

TO R Cajolet FROM R Doane

I understand there is a new cabinet under development for a future PDP-7 mod, which will have under the table space for a special all-system power supply; and that this space will be adaptable to hold mounting panels and/or standard power supplies when extra cabinets are added to the basic system.

In the middle distance, I see the possibility of obsoleting the 2" by 17" mounting module in favor of the industry standard 1 3/4" by 19" module, should this new cabinet gain company-wide acceptance. As a step in this direction, may I suggest that the convertible under-table space in the new cabinet be designed to convert to a 19" wide space with 1 3/4" mounting centers?

RD:ASJ
CC
R Wilson
K Olsen
G Bell

INTEROFFICE MEMORANDUM

DATE August 2, 1965

SUBJECT Responsibilities during vacation of H. E. Anderson (August 3-17)

TO Kenneth H. Olsen

FROM Harlan E. Anderson

1. Keydata

   Technical Performance of Machine – Jack Shields
   Legal and Contract Matters – Bob Beckman, Dick Testa.

2. Module Production Planning – (Product Line Coordination)

   Bob Beckman - Key Meeting 10 August.

3. Memory Pricing

   Pres Behn

4. Customer Delivery Date

   Bob Beckman

5. Marketing Questions

CONFIDENTIAL

INTEROFFICE MEMORANDUM

DATE July 30, 1965

SUBJECT Recommended Procedures

TO Ken Olsen
Harlan Anderson

FROM Ted Johnson

My recommendations for the steps to take in announcing my new role with regard to International Sales are as follows:

1. Harlan Anderson should write a letter today to the Managers of each of the foreign offices. I would appreciate a statement which would be as clear-cut and firm as possible. A recommended statement to be included in such a letter:

   "Because of the demands on my time as PDP-6 Product Line Manager and consistent with the Product Line Organization we now have, Ted Johnson has been assigned as Sales Manager. As such, he will assume management responsibility for all field sales activities both domestic and foreign".

2. I can see no clear alternative to the title of Sales Manager and feel that any personnel problems we are concerned about would only be aggravated by allowing a situation of uncertainty or rumour. However, if it is not possible to get a firm definition at this point, the last phrase of the above paragraph could read:

   "Ted Johnson will henceforth assume the responsibility of Manager of all field sales both domestic and foreign."

3. I feel that this letter should be followed up with a telephone call from Ken Olsen to John Leng and a special call to Denny Doyle in order to clarify my role to them. Denny, as a case in point, considers his direct employer to be the Board of Directors and his operation and I feel that he should recognize they clearly report to me in their sales functions and administration (reporting, etc.) and report their manufacturing and engineering functions to Product Line Managers concerned (Stan Olsen for Module Production, etc.)

4. Harlan Anderson should discuss the change with Gerry Moore and as soon as this is done, I would like to be informed of the discussion and get together with Gerry as soon as possible to establish my position.

5. Since, at the present time, I am gathering and completing our results for the previous year and am responsible to the Product Line Managers for planning and expenditures and effort for the coming year,constituting the need to immediately establish forecasted sales guidelines, I must be involved with the foreign operations immediately and urge that a general announcement be made as soon as possible.

I believe the above procedure is simple, straightforward, presenting a minimum of personnel problems. I am prepared to deal with any individual organizational problem having been given clear-cut authority.

TJ/mr

INTEROFFICE MEMORANDUM

DATE July 28, 1965

SUBJECT Computer Installation Univ. of Bonn, Univ. of Aachen

TO K. Olsen
H. Anderson
R. Beckman
J. Shields
K. Senior
F. Fortin
J. Sullivan
Ron Smart - Australia
PDP-6 Sales (3)

FROM Steve Mikulski

1. This memo is a summary of the installation work in Germany. It indicates some of the problems encounted but mainly illustrates the complete cooperation of the DEC organization at Maynard. Generally speaking the equipment could not have been successfully installed in the short amount of time without the cooperation of PDP-6 Checkout, Field Service and in particular assistance from the foreign offices. (Germany and Australia)

2. The 2 systems consisted of processors, 2-mag tapes each, 32K of 5 μsec memory, DECtapes, line printers and card readers. All of this equipment was delivered in the last 2 weeks of June and all was satisfactorily running by the end of the fiscal year. Both customers were very pleased with the work done by DEC during the installation.

3. The main problems encounted were line adjustments on the tape transports--which is understandable considering shipping techniques. We may consider shipping units with capstans in them. We had a run of cold solder joints on IO bus connectors and quad-sized modules. QC should assure proper inspection of these items. There were minor memory problems which required retuning or replacement of modules. One 6205 gave problems and was replaced. Both computer sites are air-conditioned therefore, temperature was not a problem. The Aachen line printer required one delay adjustment. Both machines were essentially plug in and run installations. A week's delay was encountered at Bonn because of improper wall circuit breakers. One broken wire was discovered in the main frame; other than that, all module connector problems or adjustments.

4. To give you an idea of the speed of installation at Aachen:

A.	Computer arrive	- Monday
B.	Complete AC wiring	- Tuesday
C.	Complete adjustments	- Friday
D.	Complete acceptance	- Saturday

5. Again, I would like to point out the excellent work by the crew:

Ken Senior
Bob Reid
Juergen Kesper

SM/jc

c.c. K.Olsen.

27th July, 1965.

UK Module Situation.

Stan Olsen. Geoff Shingles.

I felt that a memo on our module sales position in U.K. might at this moment not be out of place. There are two main points that I would like to highlight. The first is an unfortunate situation which has arisen concerning one of our best U.K. customers being placed in an embarrassing position. The order in question is DEC order No. 11028 from ours DECUK M8/65/41. Mr David Lord of Rutherford High Energy Laboratory at Harwell, the customer mentioned above, persuaded one of his Colleagues to place the large order with us and one of the deciding factors used in the argument was that we quoted (after referencing Maynard) a delivery of 4 weeks. The order was then enlarged and we again checked with Maynard and the delivery quoted was 5 weeks. This was acceptable to Harwell although on their outside limit.

The order is now 8 weeks old and we have just received a partial consignment. Telex messages stating the priority of this order have been sent to try and hasten things along and these have been answered but things have still been embarrassingly slow, and the order not treated with the priority it deserves. If we are to make any success of U.K. Module sales we must be able to rely on Maynard quotes on delivery for important orders. We cannot afford to embarrass anyone in this way especially one of our best customers when he is getting a sale for us.

This brings me to the second point. Shortly after taking over Module Sales I placed a large order (our No DECUK MS/65/50) for U.K. office stock. It was not as complete a stock as I would like, but adequate in view of the fact that field service had placed orders also. (In future we hope Field Service will be able to buy from our stock so that we have one stock centre and not each section having its own). We have received none of this order yet, and it is vital that we should, for the clinching factor in many sales is to be able to quote on small orders and at least start large orders with an 'Off the shelf' service. We could have relieved the pressure on Mr Lord if we had some of this stock order, but were unable to do so as our present small stock is mainly in service kits.

Anything you could do to help us in this respect of the items mentioned would be much appreciated as I feel that in view of the sharp competition from monolithics we have to offer the best delivery in the field. Our documentation is already widely accepted as being first class and potential customers expect our delivery to be the same.

Cont/d.....

27th July, 1965.

I should add that I appreciate you must have the same problems with high priority orders at your end but we are in the situation that unless we get co-operation when we ask for help we can do nothing as its impossible to go along to the person concerned and extract some assistance. I would appreciate your comments.

Thanks.

GEOFF SHINGLES.
DEC(UK)LTD.

INTEROFFICE MEMORANDUM

DATE July 23, 1965

SUBJECT CAPITAL EQUIPMENT PURCHASED FOR PRODUCTION

TO

K. Olsen
S. Olsen
L. Prentice
M. Sandler
H. Crouse

FROM B. Farnham

The purpose of this memo is to review equipment purchased for production in approximately the last thirty days.

INSERTING EQUIPMENT — Universal Instruments

Effective July 21, 1965, we have a blanket order for 12 machines with the following delivery dates.

1	C frame received 7/16/65
1	DEC owned head due 8/6/65
1	on 8/15/65 (this machine is a #1/2 head for 1/4 watts. We are to send our USMC head on Monday, August 2, 1965)
3	on 9/1/65
2	on 9/15/65

Letter of commitment calling for one per month commencing October 15, 1965, unless DEC cancels 30 days prior to delivery.

Total commitment $93,568.37

DRILLING MACHINES: Nashoba Engineering

1. 10 head Rapi-drill, delivery possibly by 8/27/65 $14,200.00
2. Addition of 2 heads to present machine, delivery August 6, 1965 $ 1,800.00

VAPOR DEGREASER

1 - Detrex Stainless Steel
Received 7/21/65 $ 750.00

DATE: July 23, 1965
SUBJ: CAPITAL EQUIPMENT PURCHASED FOR PRODUCTION
FROM: B. Farnham
TO: K. Olsen
S. Olsen
L. Prentice
M. Sandler
H. Crouse
PAGE: 2

SOLDERING EQUIPMENT

Hollis Engineering - 9" soldering machine, delivery 7/23/65 $ 2,000.00

PRESS

Rouselle Model 3, due July 21, 1965	$ 1,281.00
Tooling for above	$ 4,250.00

Harry

SC

dec INTEROFFICE MEMORANDUM

DRAFT

DATE July 23, 1965

SUBJECT Module Production Policy

TO H. Anderson
W. Hindle
Works Committee
S. Olsen
N. Mazzarese
M. Sandler

The following policy statement was devised on July 23, 1965 by K. Olsen, H. Anderson, S. Olsen, W. Hindle, N. Mazzarese, M. Sandler, and D. Packer.

Please sign and note comments at the end.

MODULE PRODUCTION POLICY

1. Six Month Projections of Module Needs

Each Product Line Manager will prepare a 6* month statement of module needs quarterly. The projection will give for each module type:

A. Normal usage of modules over the period (the number of modules necessary to supply continuing demands).

B. Modules needed to fill back orders at the start of the period.

C. Modules needed to replenish inventory to the desired level at the end of the period. This number can be determined by subtracting the current stock level from the desired stock level.

Standard sheets for tabulating this projection will be supplied by manufacturing.

* The first forecast should be submitted by August 10, 1965 and cover the five month period, August–December (inclusive), 1965.

II. Allocation of Production Capacity

Manufacturing will determine the labor hours required to fill each product line's needs from the above data (I). Each product line will then receive a proportionate share of module production each month, measured by labor content of finished modules.

III. Production Scheduling

Production schedules for each month will be determined in the first week of the preceding month. At that time, manufacturing will propose a detailed production schedule to the Product Line Managers, showing what finished modules they will receive during the month and the week of receipt. The schedule will conform to the labor hour allocations determined above (II).

Product Line Managers will review the schedule and make changes if labor hour constraints are not violated and materials are available. Changes that cause violation of the predetermined labor hour share require approval of all Product Line Managers.

IV. Stockrooms

Separate stockrooms will be established for each product line by August 16, 1965. Each Product Line Manager is responsible for: setting up his stockroom, paperwork flows (requisitions), and determining stock levels.

Computer and System product lines will supply from their stockroom modules for construction of computers, peripheral equipment, special devices, and initial sets of spare modules for new installations.

The Module product line stockroom will supply customer modules and small orders of spare modules for computer installations.

V. Production Planning

The production goal is to correct any excesses or deficiencies in module inventories over a six month period.

After receiving all six month projections (I), manufacturing will analyze capacity (labor, machinery, etc.) and develop plans to meet production needs over the period. These plans will be reviewed and revised or approved by the Product Line Managers.

Note: "Manufacturing" means all organizational segments involved in module production.

I concur with this statement, except as noted below:

Name

Comments:

From: M. Sandler
D. Packer

PROPOSAL

MODULE PRODUCTION PLANNING

1. Production Planning

Each Product Line Manager will submit to Production a 5 month Projection of module usage for the period August 1, 1965 – January 1, 1966 in the format shown below:

Module Type	Normal Monthly Usage	Units to Fill Existing Orders

This statement of need will provide the basis for production planning. The production objective is: To regain our module inventory position by January 1, 1966. Specifically, this means:

Maintaining Inventories of:

3 x Normal monthly usage for customer FLIP CHIP Modules.

1 x Normal monthly usage for customer System Modules.

1 x Normal monthly usage for internally used modules.

Past experience shows these inventory levels will provide acceptable flexibility and delivery performance. Projections are due by August 10. Similar projections should be submitted every six months for a six month period starting January 1, 1966.

2. Production Scheduling

Each Product Line Manager will submit monthly to manufacturing a detailed statement of changes from normal monthly usage expected the following month. Such information will be the input for detailed production schedules. If needs cannot be met, manufacturing will inform the product lines of the quantities of each module they will receive during the month.

3. Stockrooms

Separate stockrooms will be established for each product line by August 16, 1965.

4. Allocation of Common Modules

Modules used by more than one product line will be distributed to the stockrooms in the same ratio as normal monthly usage, incorporating changes.

D. W. Packer
July 22, 1965

DWP:ncs

INTEROFFICE MEMORANDUM

DATE July 21, 1965

SUBJECT What I'm Doing

TO Ken Olsen

FROM Jim Hastings

1. Reviewing Incoming Resumes - Because it is generally known we are not hiring, few resumes and applications are received. Requires 30 minutes per day to process inquiries.
2. Patent Administration - Sparodic; averages one hour per week.
3. Treasurer Recruiting - Temporarily helping Andy to coordinate and speed up effort to hire a Treasurer; two man days.
4. Consulting Salaried Employees - Requires 30 minutes per day.
5. Salary Review - Sparodic; 30 minutes per week at present.
6. Scrounging job from Ted Johnson, etc. - An hour per week.

Conclusion - The total man hours do not come any where near 40 hours per week.

JPH:ecc

INTEROFFICE MEMORANDUM

DATE July 20, 1965

SUBJECT Tax Consequences of Contributions of Catalog Items

TO K. Olsen ✓
H. Anderson
S. Olsen
W. Hindle
N. Mazzarese

FROM B. Garvin

The tax advantage aspect of contributions can be misused and the advantage lost if care is not exercised in scheduling contributions.

The IRS statutes grant corporations a tax deduction (to the extent of 5% of taxable income, when filing annual corporate tax returns) for contributions to non-profit institutions. The deduction is based upon the sales value of the items donated (IRS Code Section 1, 170-1 c). In certain instances the lease value of equipment on loan is eligible.

Although any excess (over the 5% limitation) is eligible to be carried over to following (5) years, the current years contributions must be considered first, then the prior years carry forward is eligible.

However, the amount of eligible contributions DEC has to carry forward to subsequent taxable years at July 3, 1965 required some $6,200,000 in pretax income over the next 5 years to absorb the governments yearly limitation. This figure does not consider any contributions granted after 7/3/65.

EXAMPLE: below illustrates how contribution deduction can be used on a tax return and also lost through expiration.

	Fiscal Year Ending					
	1965	1966	1967	1968	1969	1970
1. Taxable Income	2,000	3,000	4,000	5,000	8,000	10,000
2. 5% of line 1.	100	150	200	250	400	500
3. Sales Value of total contributions (estimated)	220	140	300	280	300	500
4. Carry forward to next year (line 3-line 2)	120	Ø	100	30	Ø	Ø
5. Carry forward from prior years line 2 - 3) (+line 4 or)	Ø	10	Ø	Ø	100	Ø
6. Balance forward (- line 5)	120	110	210	240	140	140
7. Expired (Lost as contribution deduction)	Ø	Ø	Ø	Ø	Ø (A)	10

(A) 1965 excess (120) less amounts used in subsequent years (10 in 1966 and 100 in 1969).

There are technicalities too numerous to mention here involving the administration, filing and presentation of non-cash contributions deductions for federal tax returns. I would urge you to give more consideration to scheduling contributions and direct any questions you have concerning this area to Bob Dill or myself.

cc: B. Dill
J. Myers

INTEROFFICE MEMORANDUM

TO: Ted Johnson

FROM: Dick Musson

DATE: July 20, 1965

SUBJECT: SDS

COPY TO: Ken Olsen & Nick Mazzarese

I learned from a quite reliable source, a vendor to SDS, that they are definitely going to make an announcement of a new family of Computers this Fall.

The best information I have is that they will persue the concepts of the IBM-360. They are definitely going to persue (vigorously) the commercial data processing application areas.

I am not too sure what has brought on this decision, however, frankly, I feel it is all to our benefit.

If I am able to pick up any further information on this, I shall immediately advise you.

Dick Musson

/d

COPY

Ken Olsen

COPY

Bonn, Germany, July 20, 1965

Dear Andy:

Reference the cable I sent Saturday July 17 to Ken Olsen:

"Need to come and see you and Andy as soon as possible about:

1. Organization of French office.

2. Help I can or cannot expect from Maynard.

3. Cost of trip will be recovered by work I will start in Maynard.

Please send me telex before Wednesday to Hotel Guellenhop, Aachen Germany, Telex 832864."

Here are some more details:

What I have in mind is the success of DEC and only this. Please do not consider the following as an attack toward somebody, it is not. My intentions are only to help you and, of course, to help me doing my job as it has to be done, that is: to sell computers and modules, to satisfy our customers, to have a good reputation (I mean DEC reputation) and to make profit (DEC).

1. I know exactly what has to be done in France, how it has to be done, where it has to be done, why it has to be done and by whom it has to be done.

   Even if I am working 15 or 17 hours a day, 6 or 7 days a week, this is not enough, there is still too much work for me, I need to be helped.

   This is the main reason of my cable. I have some ideas. I would like to tell them to you, and I would appreciate very much your comments and your decisions.

   Last month, we had a short interview. I had at that time some ideas. Now, after a few weeks, it is much more precise.

2. Will DEC Maynard help the French office about:

- Shows: material, demo, people ...
- Provide Paris with brochures, materials, pictures...if Paris asks for.
- What is the policy about Telex...

3. If possible, I would like to have some brochures as the 61, 71, 81, 61B, etc. printed in Maynard next month. I will do the translation myself during my vacation.

If possible, I would like to meet Tim McInerney, about theSICOB show in Paris.

If possible I would like you to tell me more than what I know about the company policy, long and medium range planning, sales policy, sales administration, etc.

I am sure that Jon Fadiman knows about this.

There are some more details I would like to know.

Before I left Maynard, Ken Olsen asked me to report directly to you or to him if I think it is necessary.

I have nothing here to make copies. But tomorrow (Wednesday, July 21) I will call Jon and tell him about this letter.

I am to tired to make another copy of this letter, and still have a lot of work to do tonight.

I'll be in Paris next week (July 26).

Best regards,

Sincerely yours,

/s/ Bernard Haus

INTEROFFICE MEMORANDUM

DATE July 20, 1965

SUBJECT Summer Employees

TO K. Olsen

FROM N. Mazzarese

At your suggestion, we have initiated a program to better utilize our summer employees. The enclosed memos detail what we are doing.

INTEROFFICE MEMORANDUM

DATE July 6, 1965

SUBJECT Summer Employees

TO Len Hantman
Jack Ridgeway
Tom Whalen
John Jones
Mike Ford
Ed Harwood

FROM Nick Mazzarese

In the past, our company has not been successful in the rehiring of summer employees as permanent personnel. The cause of this is not completely clear, however, some of the following factors probably contribute to it:

1. Lack of a clear plan for the employee and what he is expected to accomplish.

2. Not keeping him completely busy.

3. Not adequately supervising him while he is here.

The summer employees that we have hired in the Small Computer group are costing us a fair amount of money and it is hoped that they will yield useful results and also that they will carry away an impression of DEC as an aggressive and dynamic well-run company. The responsibility for this largely lies with each of the individual supervisors for whom they are working.

As an aid in getting the maximum benefit out of the summer program, I am asking each supervisor to present to me, within one week from the date of this memo, the following information about each summer employee working for them:

1. An abstract of the job that they are expected to complete during their term of employment.

2. A brief schedule for the completion of this job.

3. A plan for reviewing their performance. This should include as a minimum three work sessions with the summer student:

a. The first or initial one should be to orient them as to the company and the job that he is expected to complete.

b. A midway performance review to determine if he is on course and to correct him if he is not.

c. A termination review which is to let him know what we as a company think of him as an employee.

Len Hantman

John Berenberg
Walter Bilofski

Jack Ridgeway

Martin Hoffman ✓
Mark Stein ✓

Tom Whalen

Don Gunn ✓

John Jones

Karen Tomlinson ✓

Mike Ford

Barry Wessler

Ed Harwood

Bob Collins ✓
John Elsbree ✓

INTEROFFICE MEMORANDUM

DATE July 15, 1965

SUBJECT Summer Employees

TO N. Mazzarese

FROM Leonard M. Hantman LMH

The following is a breakdown of the present assignments of the two summer employees indicated. Two ground rules should be noted:

1) Both were hired by R. Belden and my agreement with him was that we would make a conscious effort to do some active programming for the 340 display to help in sales and demonstrations.
2) As far as possible they are to make maximum use of both the paper tape and DECtape (DEC SYS) Fortran systems to determine as many problems as possible with the PDP-7 Fortran.

In addition, the completion dates are dependent on computer time availability which, as we all know, is extremely hard to come by especially where peripheral equipment is concerned.

	Current Jobs	Completion Dates
Walter Bilofski:	Generalized Text Routine	July 12, 1965
	340 Simulator of 34 and 30 Displays	August 2, 1965
	One-Armed Bandit Demo Program	July 23, 1965
	340 Generalized Subroutines	August 16, 1965
	340 Text-Writing Demo	July 21, 1965
John Berenberg:	340 Tic-Tac-Toe Demo	July 23, 1965
	Curve Drawing Demo	July 23, 1965
	Additional Work on 340 Subroutines	July 23, 1965
	Fortran Corrections	Sept. 15, 1965

Their current work is reviewed almost daily through personal contact and review of their documentation. In addition, written guidelines have been presented to them in areas I felt advisable.

INTEROFFICE MEMORANDUM

DATE July 16, 1965

SUBJECT Summer Employees

TO Nick Mazzarese

FROM Mike Ford
Summer Employee: Barry Wheeler

Abstract:

Barry Wheeler is working under the direct supervision of Dave Brown as an Applications Programmer. He is writing programs for the 338 Display and guiding the designers from a programmers point of view. Specifically, Barry is working on two demonstration programs for the 338 and 340 displays and a revised Sales brochure among other small debugging routines. He is a very capable programmer and is extremely independent in carrying out his assigned duties.

Schedule:

1. 340 Rotation Program
   Coding completed July 1
   Debugging completed August 1

2. 338 Demonstration (extended graphpad)
   Coding completed September 15
   Debugging completed November 15

3. Revision of Sales brochure for 338 display September 15

As his schedule permits, Barry plans to work part-time for DEC in the fall.

INTEROFFICE MEMORANDUM

DATE 13 July 1965

SUBJECT Summer Employee, K. Tomlinson

TO Nick J. Mazzarese FROM John Allen Jones

Objective: Improve differential linearity of our successive approximation A→D converters.

Approach:
1. Measure existing differential linearity
2. Build Gatty correction system (cost of parts ~$600)
3. Remeasure
4. Build Jones's correction system (cost of parts~$100)
5. Remeasure
6. Prepare notes for publication.

Key Problem: Differential linearity is hard to measure.

Discussion: Karen now has a working, aligned F/C A→D converter. She has written programs to use the I/O depts' PDP-4 and the Julie Research tester.

By 1 August step one will be done. Step 2 is ½ done now; checkout will take 'till 15 August. Step 3 should take one week. Step 4 says correction can be done just by using more A→D bits. Little hardware change is required. Step 5 will be done by 1 September and Step 6 by 15 September.

Tom Whalen

Don Gunn

Duties:

1. Assist in coordinating all computer shipments.
2. Follow up and trouble-shooting current computer orders in house.
3. Limited customer contact concerning customer orders.

Comment:

Don is presently handling most of the domestic computer shipments. This involves setting up the proper paper work, coordinating with the individuals constructing the system, and supervising the crating and loading of the equipment on to the mover's vehicle.

When not shipping, Don spends his time trouble-shooting individual orders. This was difficult at first because he was not well known. He presently seems to be getting good results.

Don seems very interested in coming to DEC upon graduation next June. He would certainly be an asset to the company as an administrator. He has worked as a summer employee for four consecutive years. Three of these were spent in the Production stockroom as a stock clerk. He is very happy with his present position because it allows him to observe the interaction of departments throughout the company.

INTEROFFICE MEMORANDUM

DATE July 9, 1965

SUBJECT Summer Employee - Mark Stein

TO Nick Mazzarese FROM Jack Ridgeway

Mort Ruderman and I have been sharing the responsibility for supervising Mark with Mort having most of the contact with him. Most of Mark's efforts have been of a sales support nature where he has been getting his direction from Mort.

I think the official responsibility for supervising Mark should be transferred to Mort Ruderman.

INTEROFFICE MEMORANDUM

DATE July 9, 1965

SUBJECT Summer Employee - Martin Hoffman

TO Nick Mazzarese FROM Jack Ridgeway

Task Description

Investigate statistical analysis requirements by working with selected customers, field salesmen, and Jim Langley for the purpose of defining the "typical" program requirements for a statistical program package.

Develop math model for program to solve the typical applications. Provide background mathematical analysis of the statistical applications so that Jim Langley can continue the effort after the end of the summer term.

Provide us with well documented descriptions of the statistical applications, math analysis and small computer applicability.

Write computer programs on the PDP-5/8 to solve the typical requirements determined by the investigation. This will probably be auto or cross correlation.

Schedule

Terminate full time investigation and analysis by July 16. Continue part time investigation and working with customers until end of summer term.

Develop math model and design computer program by July 30.

Write and debug computer programs during the month of August. Only undertake those programs that can be debugged with test data by end of August.

Complete documentation during the first two weeks of Sept., and terminate summer employment on September 10.

Plan for Reviewing Performance

Mid-point review about July 30 to evaluate program specifications and program design of programs to be written during August.

Termination review September 3 to evaluate summer performance.

Martin will be working closely with Jim Langley and Henry Burkhardt throughout the summer. They initiated his placement in our group and have both had some experience in this field.

INTEROFFICE MEMORANDUM

DATE July 9, 1965

SUBJECT Utilization of Summer Employee

TO N. Mazzarese
cc: E. Harwood

FROM Dan Grill
Dick Mangsen

Summer Employees:

a) John Elsbree 6/15/65 through 9/10/65 inclusive (PDP-7)
b) Bob Collins 6/15/65 through 9/10/65 inclusive (PDP-8)

Reference:

Letter dated 7/6/65 - same subject

The utilization of summer employees for a limited time period of thirteen weeks cannot consist of more than an introduction to basic hardware as associated with existing methods and procedures.

The response exhibited by each summer employee will determine to what extent the introduction can be pursued. The enclosed schedule is construed as a guide toward practical utilization with maximum effect. Toward this end the summer employee will be asked to formulate and write a final report pertaining to his experiences, thoughts, and opinions while with the Systems Checkout group. Suggestions for improvement will be invited.

An informal opinion of each employee will also be forwarded together with the employees report to your office.

Week

1 - Introduction to group purpose and function.

2 - Introduction to administrative procedure.

3 - Introduction to logic definition as utilized by DEC.

4 - Introduction to checkout procedures - theory, and class participation.

5 - Take an active part in developing checkout aids.

6 - Midway interview-listen to suggestions-make necessary changes.

7 - Hardware-machine exposure-on the job training.

8 - Continuation of "on the job" training technique.

9 - Help improve machine checkout procedure.

10 - Developing machine experience and introduction to program software.

11 - Machine trouble shooting.

12 - Machine trouble shooting.

13 - a) Summer employee
   1) Write report outlining experiences, thoughts, and opinions covering summer employment period.
   2) List suggestions toward improving the summer employment program as you see it.

   b) Exit interview reviewing interests and objectives.

équipement digital

65, RUE DU FAUBOURG SAINT-HONORÉ
PARIS 8e - *Tél. 256 13 28 - 256 11 37*
TÉLEX : 26.705 DIGITAL PARIS

INTEROFFICE MEMO

July 19th 1965

CONFIDENTIAL

to : Ken Olsen
Harlan Anderson

from: Jon Hadiman

When Ron Smart was here in Paris last week, we had the chance to talk together about what to do about Günter Hüwe and the German Office.

This was before Ron went to Germany and you will probably have some independant report from Ron concerning his opinions.

Ron is willing to come to Europe and work in the German office for a while. However, both Ron and I fear greatly about what would happen if we essentially let Günter go. I am afraid that we would very much loose the continuity of the German Office. If the German customers find the manager of the German Office has been fired, and the person responsible is temporarily an Australian, they are certainly going to loose a lot of confidence. It is alright to change the lower personnel in an office, but if the top man is let go, this definitely presents a problem. American companies have a reputation in Europe of starting work there and then changing their mind about it or changing their personnel and not providing good service and good continuity. The only exception to this is IBM, and this is to a large extent the success of IBM in Europe.

The second point is that Ron Smart will not find it easy to work in Germany because of the language problem. This should not be under estimated. It is true that many of the German engineers speak english, but it is very difficult to work in a country without a basic knowledge of the language. Ron will have to be dependant upon other of our German personnel to lead him around and make the contacts for him.

Nevertheless, I am convinced that Ron could do a superior job in Germany.

.../.....

He would have to learn some German very quickly. He has an attitude for Europe which to my mind is both understanding and helpful. His attitude is not that he will immediately go and show everybody how to run things in the German Office, but that he will both teach people about the intracasies of our computers, some of which knowledge is certainly lacking, and also try with the help of the German personnel to make new contacts of the right sort. I think Ron feels that he is frustrated in Australia because he knows that he is doing a first rate job and he knows he is a good man. Yet the market possibilities are such that the sales simply do not come in. I think Ron was very excited over working with the people here in France, such as CERCI, and would be enthusiastic about the time spent in Europe. I think he will make a real effort to get along with the German people, both customers and DEGmbH personnel, and not simply impose his way upon them.

What would be ideal is if we could in some way keep Günter on as a technical engineer but have Ron Smart entirely in charge of sales for Germany, Holland and German Switzerland. His job would be : a) provide greater technical assistance, b) organize the sales efforts and contact more of the right customers and, c) find a good replacement for himself.

I have not discussed this situation with anyone here in the Paris Office except Ron Smart, and I feel that we should definitely keep this discussion confidential. It is certainly not a good idea for Günter to learn that we are considering letting him go before a decision has been made. Unfortunately, I think that perhaps John Leng was not as prudent since evidently Geoff. Finch already knew about some of these discussions so they may reach Günter anyway.

Bernard Haus and Steve Mikulsky have just come back from Germany last week and they will be going back again on Monday.
Steve Mikulsky's feeling is that Jürgen Kesper is not sufficiently versed in the total system applications to maintain the 2 PDP-6's adequately to our standard. He knows the central processor well, and some of the peripheral equipment, but not all of it. This was because check out of the equipment was done in 2 shifts in Maynard, and since he was responsible mostly for the central processor, he was not working at night on the other peripheral equipment. Probably, the immediate solution is better training either of Jürgen Kesper or some other German engineer with more systems analysis experience and better programming knowledge.

.../.....

Jürgen is a very good salesman and should probably concentrate on that. We should train a very good service engineer now for the PDP-6's who would take over from Jürgen .

Evidently, Professor Deutschman of Technische Hoschule in Aachen feels a bit left out of it by Günter Hüwe . Apparently, Günter has not visited him sufficiently or kept him happy. This is a severe lack on Günter's part for which there is no possible excuse.

I would like to know what your feelings are on this matter so that we can come to a decision. The fact that we have 2 PDP-6"s in Germany makes it imperative that we have a good PDP-6 engineer in the Cologne Office. Perhaps this is an opening for Ron Smart to come to work there, but in order to be effective, he will have to be clearly put in charge of sales work as well as the PDP-6. If there is some way in which Günter could be left as a technical engineer, strictly concerned with small computers, this would be the ideal situation. Is Harlan Anderson coming to Europe at any time this fall ? If so, please let me know. I plan to take my vacations and combine it with a business trip to Italy and Switzerland during the last 2 weeks of August and first 2 weeks in September.

Best regards,

Jaretha Fardlmeier

INTEROFFICE MEMORANDUM

DATE July 19, 1965

SUBJECT Contact with Investment People

TO Dorothy E. Rowe, AR&D

FROM Harlan E. Anderson

On Wednesday, July 7, Walter Gutman telephoned and spoke to me in Ken's absence. He had no particular question in mind and was given no specific information.

On Thursday, July 15, David Lawrence of Colonial Management Associates in Boston, visited the plant and had a tour and again received no specific information about our financial results.

Andy

HEA:ncs
cc: K. Olsen

WU2 INTL VIA RCA PARIS JULY 17
LT KEN OLSEN DIGITAL EQUIPMENT CORP MAYNARDMASS

NEED TO COME AND SEE YOU AND ANDY AS SOON AS POSSIBLE
ABOUT: 1 - ORGANISATION OF FRENCH OFFICE STOP 2 - HELP
I CAN OR CANNOT EXPECT FROM MAYNARD STOP 3 - COST OF
TRIP WILL BE RECOVERED BY WORK I WILL START IN MAYNARD
STOP PLEASE SEND ME TELEX BEFORE WEDNESDAY TO HOTEL
QUELLENHOS AACHEN GERMANY TELEX 832864

BERNARD HAUS

849A

CLR

RWU1&2

INTEROFFICE MEMORANDUM

DATE July 16, 1965

SUBJECT High Production Meeting Minutes

TO Ken Olsen
Stan Olsen
Loren Prentice
Dave Widder

FROM Ken FitzGerald

Item #1 - Beveling - It was decided that beveling would be done on the top floor of building #5 an additional stand-by Beveler would be built.

Item #2 - Drilling Machine-Stan Olsen would investigate the availability of an additional drilling machine to be delivered as soon as possible. As soon as the requisition is placed, Dave Nevala will be assigned to work out all the final details for getting it to our plant.

Item #3 - Insertion Machines - The insertion machine presently in building #4 is the first for the new high-production area. A second one will be available in a week . As soon as the "C" frame arrives and the head is installed the head will be obtained from production. The third machine will be available approximately Aughust 15, from Universal. These machines should be immediately reworked to take the new templates and push-button control. Dave Widder will be responsible for that.

Item #4 - Conveyor - A conveyorized system of handling the boards, the drilling machine to a central control area for redistribution to both hand and machine insertion, will be laid out by Ken FitzGerald.

Item #5 - Tapeing - A semi-automatic tape machine will be designed and built by Ken FitzGerald to be fed by conveyor from the central control area previously mentioned.

Item #6 - Solder Machine - A new solder machine will be built by Ken FitzGerald, sized to be approximately 11' long, capable of being loaded by no more than four people. Probably, only one.

Item #7 - Preliminary Cleaning - Additional tri-soak tank must be built and placed at the solder machine along with the first one which is already built. Responsibility - Ken FitzGerald

Item #8 - Inspection and Touch-up - This area was discussed but no firm decisions were made as to size, number of people, or method of handling. I recommend that the inspection and touch-up people, act as compilers, picking boards off a horizontal conveyor one at a time doing their inspection, touch-up, and loading into racks to be used in the dereasing.

Item #9 - Degreasing - It was decided to pruchase the degreaser, get it delivered and set up as soon as possible and start experiments on racks or baskets for degreasing. Responsibility - Ken FitzGerald

Item #10 - Punch Separation - It was decided to immediately purchase a new die set to use the spare tooling which we presently have. Also, the availability of a press for this operation must be investigated. Responsibility - Loren Prentice

Item #11 - Handle Attachment and Number - This was not discussed but should be discussed at our next meeting.

Items for discussion at next meeting

1. Inspection and touch-up area
2. Handle attachment and marking
3. Method of handling boards from solder cleaning operation through degreasing to punch separation.
4. Handling of boards from punch separation to handle insertion and method of handling after handle insertion.

Breakdown of responsibilits is as follows:

Loren Prentice
1. Investigate availability of 40-ton press.
2. Purchase die-set for a four week delivery using our present carbide dies.

Stan Olsen
1. Investigate availability of drill machine and dust collector.
2. Try to locate programmer for Dave Widder.
3. Check with Bob Hughes on the availability of standard capacitors on reels for machine insertion.

Ken FitzGerald
1. Build solder machine.
2. Buy degreaser and experiment with methods of cleaning.
3. Finish design of scrubber and build.
4. Buy tapeing machine and build necessary equipment for operation of it
5. Continue with the Jumper wire inserting machine with low budget.

Dave Widder
1. Continue working on programs and templates for the insertion machines.
2. Get information from Dave Nevala and Ron Cajolet so that tooling plates and template holding plates fur all the new insertion machine will be available as soon as possible.

K. Olsen

INTEROFFICE MEMORANDUM

DATE July 15, 1965

SUBJECT Cost Allocation of Flexowriter Operations

TO K. Olsen
N. Mazzarese
D. Packer
E. Simeone

FROM Leonard M. Hantman LMH.

In the interest of improved cost analysis, a method is desired for the proper allocation of the cost of the Flexowriting operation among the users of the service. In trying to accomplish this, certain apparent problems with the present accounting system have been uncovered and therefore, the purpose of this memo is two-fold:

a) to indicate the problems, and,

b) to request a final determination on how to charge the Flexowriting activities.

For information purposes I might note that there are at present four operators working on punching, editing, duplicating, and assembling programs for many areas in the company. Some of these areas include:

Small Computer Programming
Large Computer Programming
Applications Programming
Sales Programming
Chuck Stein's Computer-Aided Design Group
Tom Stockebrand's Module Group
Jim Cudmore's Module Test Group
Accounting
Etc.

1. At present, since all of the operators are in my overhead center, their cost appears as an indirect labor cost to Small Computer Programming and this, therefore, raises the overhead factor applicable to actual programming activities. It was for this reason that the alternatives below were considered. Present figures indicate approximately 35% of all work is done for persons outside Small Computer Programming with the expectation that the percentage will rise in the future.

2. The operators could be physically assigned to each of the groups concerned. This was dismissed as being inefficient and undesirable especially since it would require increased personnel and duplication of supervision for the non-programming areas whose needs are normally fairly sporadic.

3. The girls could fill out job tickets charging their time to particular job numbers. In checking with Ed Simeone however, I find that though the charge would be counted in the cost of the job, the work would be charged as a direct labor cost to me and the money would come from Small Computer Programming. This approach then makes it appear that I am paying to provide a service rather than the user paying to receive the service.

4. The operators could fill out job tickets charging not only a job number but indicating a "Charge To" cost center (overhead center). A thorough check of this approach indicates that the cost to the user would be a direct labor cost calculated by multiplying the girls; salary by the overhead rate of the user. Though this may have merit in cases of people being borrowed, (though even here it is debatable as the major portion of overhead, namely vacations, social security, insurance, tool kits, etc., would still be charged to the home cost center) it certainly does not make sense to charge differently (by user) for the services of a person remaining in the same area, using the same machines and doing the same job. The users are, therefore, definitely (and it seems, rightly) opposed to this method.

5. The operators could have their own cost center with their monthly charges apportioned to the users. The objection here is that the cost would be counted as an indirect labor cost to the user, thereby raising his overhead factor. If this approach is used it probably should be counted as a direct labor cost to the indicated job.

It appears then that under the present system the fairest approach is that outlined in paragraph 5 but, as it requires additional bookkeeping to establish a new cost center, I am not recommending this as a solution. The fairest (and most accurate) approach is probably that outlined in paragraph 4 with the exception that the cost be calculated by multiplying the girls' salary by me (other than the users) overhead rate.

Records are being kept of the work done for the various jobs but none of this information will be sent to accounting until a determination is made on what approach should be used. I would, therefore, appreciate it if this matter could be cleared up as soon as possible.

INTEROFFICE MEMORANDUM

DATE July 15, 1965

SUBJECT Power Supplies and Power Controls

TO Gordon Graham

FROM George Gerelds

It has been decided that the following components can be mounted with #6 Perma nuts: all capacitor brackets, 25 watt resistors, DM 1-10 diode packs, and Jones terminal strips. These components are to be mounted with #10 Perma nut transformers if possible, Kulka terminal strips, and capacitor enclosures. These Perma nuts are fed automatically from a machine-like eyelet. They should help Production's assembly time. The screws have the lock washers mounted on them and they are called Sems Pan head screws with external washers.

If you have any comments, please let me know.

GG:jw
cc: K Olsen
S Olsen
R Best
D White
K Doering
R Hughes
J Cudmore
D Bevins
C Kendrick
M Sandler
Paul Green
R Brackett
D Nevala
L Prentice

INTEROFFICE MEMORANDUM

DATE July 8, 1965

SUBJECT Bell Telephone Co. of Canada

TO Nick Mazzarese FROM Jim Burley

CC: Ken Olsen

Dear Nick:

For Fiscal 1967, Bell Telephone of Canada has budgeted eleven million dollars for purchase of PDP-8 size computer systems with extensive input gate logical packages. The PDP-8 is being seriously considered by Bell as is also the IBM 1800.

Principally, the job to be done is to read in from 10,000 to 50,000 binary points into the computer and store the data words on a drum. The requirement initially is to read in 10,000 points with the capability to expand at a later date to 50,000 points.

Mr. Rene Fortier will be visiting DEC probably the week of July 19, and at that time would like to talk with a representative of our corporate management to investigate the future stability of DEC. Hopefully, Ken Olsen will be able to spend some time with him.

Jack Richardson of our Canadian Office has been handling this sale and promises more applications detail soon.

Regards,

JB:eb

dec INTEROFFICE MEMORANDUM

DATE July 6, 1965

SUBJECT JOSS Consoles

TO
K. Olsen
H. Anderson
P. Behn
T. Whalen
R. Musson

FROM
R. Lane

Following your call (Ken), I discussed production of the JOSS Consoles with:

Dave Nevela - Mechanical
Jan Stenberg - Logic
Alan Kotok - Project Engineer
Dick Musson - Sales Representative (RAND)

We will have two models completed about July 15, providing we get the modules. We have received the JOSS tty's from IBM, they require modifications which as yet have not been authorized by RAND. Dick Musson expected to get that release on July 2, 1968.

Except for the modification, we are going ahead at full steam on the first 30. I am requesting that we build 1 additional for DEC and 5 for "on the shelf stock".

I estimate our selling price as follows:

Console		4500.
Typewriter		3000.
Typewriter	Rework	850.
	Total	8350. each

RAND has one extra typewriter which I recommend we procure from them at a price less than we can buy it for. (Dick Musson should do this.) This will be the one for our demonstrator here at DEC and also at Trade Shows.

Therefore, if you approve, please advise T. Whalen to release a construction requisition for 6 additional JOSS Consoles (Complete).

CC: R. Beckman
J. Smith

INTEROFFICE MEMORANDUM

DATE July 6, 1965

SUBJECT Customer Service at Radiation Inc., Melbourne, Fla.; by R. Fuentes and K. Doering

TO S. Olsen
K. Olsen
R. Hughes
R. Best
C. Kendrick
F. Kalwell
J. O'Connell
D. White

FROM K. Doering

This was our second trip. The testing of DEC modules by Radiation had been stopped temporarily because of failures due to transistors being loose in their terminals (this applied only to the fork-type terminals).

The bad connections had shown up under vibration during the electrical test (the air conditioning at Radiation had been "rattling" causing a jittery waveform).

There were about 9 modules we could look at. Though it was very difficult to detect by eye, pulling showed that the leads could be moved. We reinspected all modules having this type terminal (approx. 650) and found 5 more with this defect and 77 others with indications of it. The list below is a summary of all the rejects:

TYPE	4603	4410	4401	4301	4216
AMT.	54	3	3	38	3
INSP. NO.	83, 84, 111				

We could rework all unacceptable material and complete our work within one day.

The people at the Air Force seem quite worried whether there are more of these defects in the field, and they are going to make some spot checks.

I promised that we will take steps at Maynard to prevent recurrence of this problem and that we are already redesigning our boards to eliminate the fork type transistor terminal; also that I would suggest some kind of a vibration test on our modules similar to the one we are already using for systems check-out. This method would be more reliable than visual inspection. Pulling on the transistor leads does not seem advisable because it could damage the components or their leads. Besides, it is a very slow process.

I promised to keep Capt. Evans informed of the corrective steps taken by us. His visit to DEC might take shape after July 14.