dec INTEROFFICE MEMORANDUM

COMPANY CONFIDENTIAL

DATE March 31, 1965

SUBJECT Tentative Capital Expenditures through August

TO K H Olsen FROM R Brown

The following is a list of capital items with approximate dates of installation and cost in round figures.

ITEM	DELIVERED	COST
V/I Test Kit	April	$ 1100.00
Textronik Curve Tracer	April	1200.00
Inspection Microscope	June	400.00
Clean Air Station	June-July	900.00
Drying Ovens	July	500.00
Mask Align. Jig	July	6000.00
Furnaces (Planar) 6	July-August	22000.00
Sputtering Jig	August-September	6000.00

RB:ASJ
CC
R L Best
A H Hall

digital EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

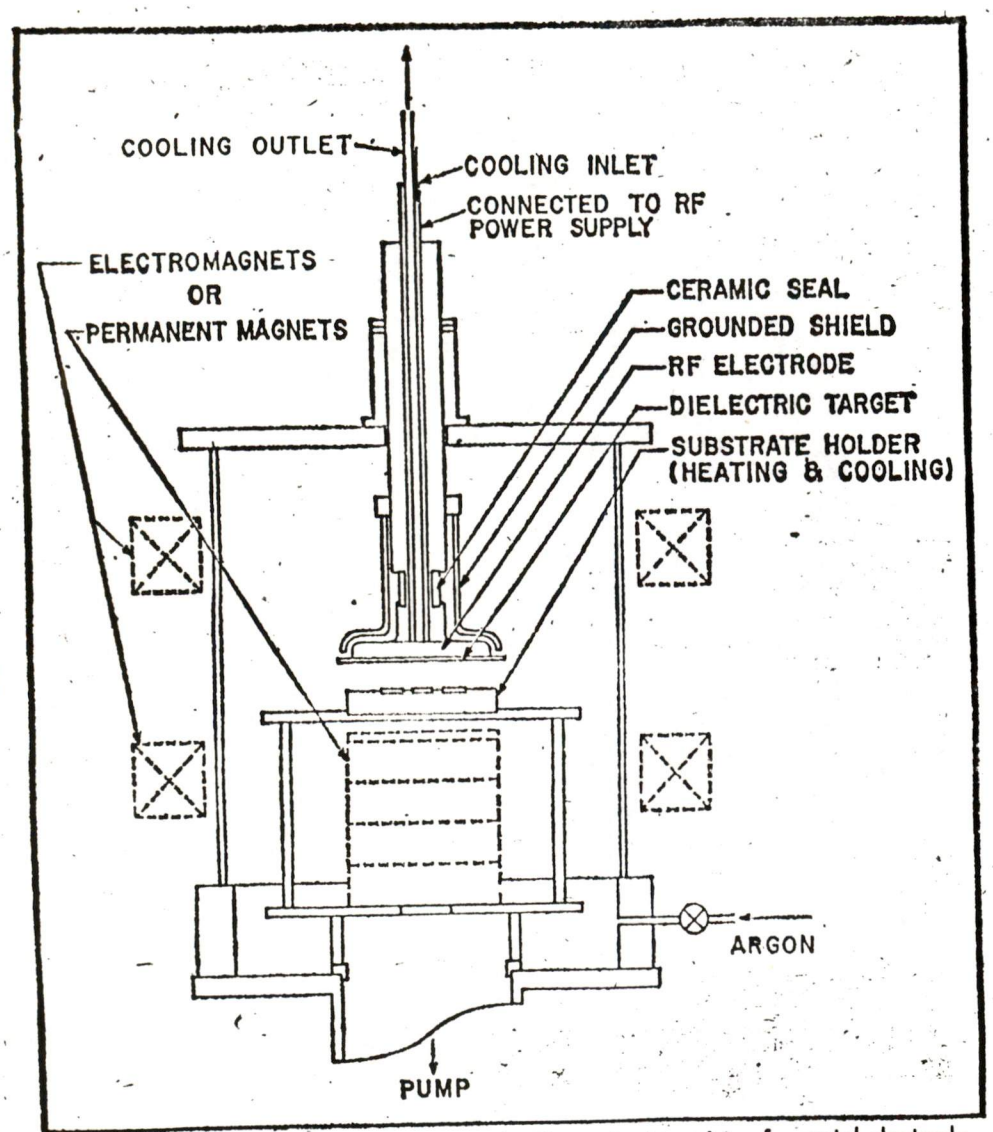
TO KENNETH H. OLSEN

THIS IS IN REFERENCE TO YOUR INTEROFFICE M. OF 3/22/65 & MY I.M. OF 3/31/65.

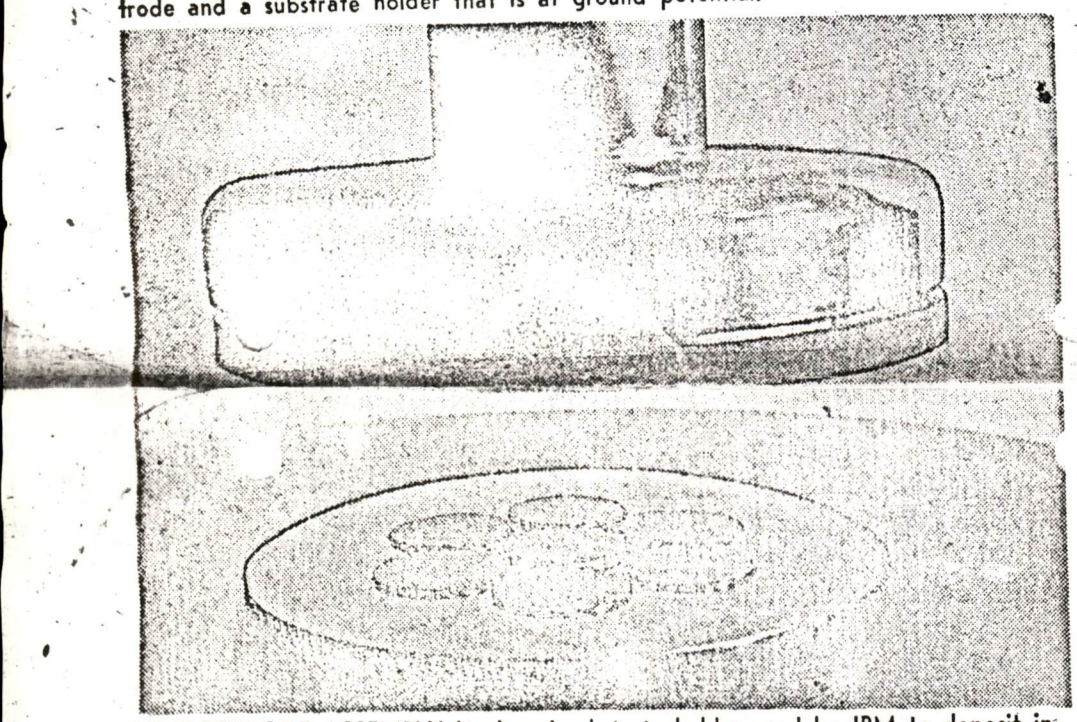
Bob Dawn

Ken - Above mentioned memos are attached.

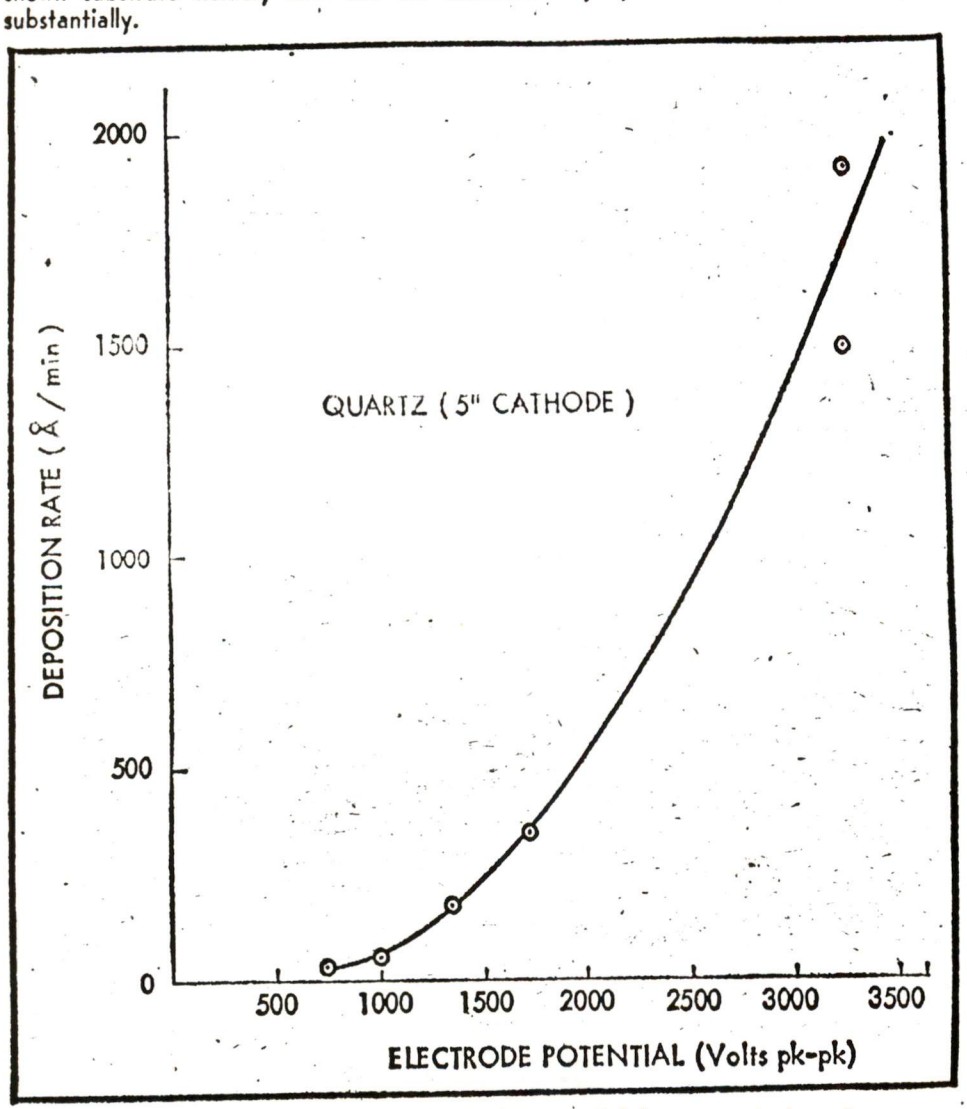
Elsa



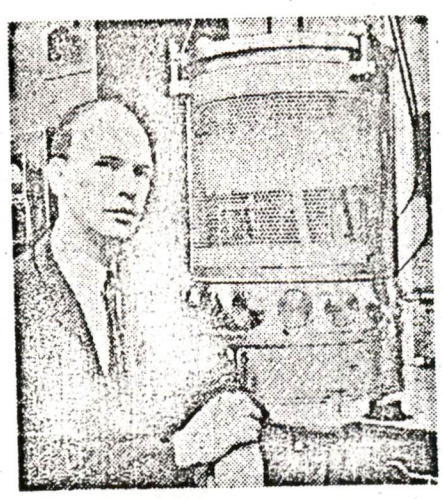
APPARATUS used by IBM for RF sputtering. The system consists of a metal electrode to which the insulator is attached, a shield to prevent sputtering of the metal electrode and a substrate holder that is at ground potential.



RF ELECTRODE ASSEMBLY (top) and substrate holder used by IBM to deposit insulator films on circuit substrates. In operation the assembly and holder are about 2.5 times closer. By scaling up the system, the number of silicon wafers (7 are shown substrate holder) that can be simultaneously sputtered can be increased substantially.



DEPOSITION rate as a function of electrode potential for a quartz target.



DEVELOPERS of IBM's new sputtering system are Dr. Pieter D. Davidse (left, shown with sputtering chamber), and Dr. Leon I. Maissel. Dr. Davidse, who received a PhD in physical chemistry at the Delft Institute of Technology, The Netherlands, joined IBM in January, 1963, and has been working mainly on the sputtering technique since then. Dr. Maissel, who received his PhD in physics from the University of London, hails from Cape Town, South Africa. He joined IBM in May, 1960, and has been working in the area of integrated circuits and thin film technology.

RF Sputtered Insulators Protect Integrated Circuits

POUGHKEEPSIE, N. Y. — Research into an RF sputtering technique, for producing insulators that can be used to protect integrated circuits, has been completed at International Business Machines Corp.

So far, it has been possible to make the insulating films from quartz, alumina, mullite, boron nitride and a variety of glasses, according to Dr. Leon I. Maissel, senior engineer, and Dr. Pieter D. Davidse, development engineer — both of whom developed the technique at IBM's component development facilities here.

At present, IBM insulates its silicon integrated circuits by fusing glass films atop the wafer, which is done before dicing. However, this approach is limited by temperature. Some glasses require high glazing temperatures, which could alter the characteristics of the circuits if they were used.

But there are no temperature restrictions with the new technique. Any desired insulator can be applied without regard to temperature.

Unlimited Layers.

RF sputtering is particularly applicable to monolithic circuits, according to IBM. Virtually an unlimited number of layers can be deposited on a silicon wafer, and the properties of these layers can be tailored to serve different purposes — such as matching thermal expansion coefficients, dielectric constant and moisture permeability.

IBM's first use of the new technique is expected to be on monolithic circuits—when they can outperform hybrid circuits.

RF sputtering, Dr. Davidse noted, allows the direct sputtering of "virtually any insulating material." Standard dc sputtering, on the other hand, can be used for metals only.

Describing the experimental apparatus used, Dr. Davidse said it consists of a metal electrode to which the insulator is attached, a shield to prevent sputtering of the metal electrode and a substrate holder that is at ground potential (see illustration).

The target (insulator plate) was soldered to the RF electrode after it was metallized with a chromium-copper film. (If sputtering is done in an upward fashion, it was noted, the dielectric target can be placed on the metal electrode.)

Copper Block.

The substrate holder, continued Dr. Davidse, consists of a copper block with a heater and a cooling duct. The substrates used were silicon wafers with a diameter of 3.2 centimeters. The wafers were placed on molybdenum pedestals brazed onto the copper block. (Molybdenum does not alloy with gallium, used between the wafer and the pedestal to ensure good thermal contact.) A total of seven wafers could be coated in each experiment.

In all experiments, the distance between the surface of the substrates and the surface of the target was kept at 2.5 centimeters. Argon gas was used for the sputtering atmosphere, and pressure was maintained at 5×10^{-3} Torr. The temperature of the wafers was maintained by an electronic controller.

Among the first targets tried was a fused quartz plate, 0.65 centimeter thick and 17.5 centimeters in diameter. The electrode had a diameter of 15 centimeters and was water-cooled.

A high dc resistance between the RF electrode and ground was maintained by using at least 5 meters of [illegible] between the electrode and the water line. The RF frequency was 13.56mc.

Ion Bombardment.

What happens during sputtering, essentially, is that the insulator surface is bombarded with argon ions during one cycle of the RF power (during the next cycle, electrons neutralize the positive ion buildup on the insulator surface).

During bombardment, insulator atoms are ejected. They then diffuse to the substrate, where they reassemble in the form of a thin film insulator.

Dr. Davidse said that during experiments, he achieved "excellent" compositional control and uniformity. Deposition rates up to 2000 Angstroms/minute were attained.

It was observed, in the initial phase of experiments, that a superimposed magnetic field greatly increased the deposition rate, Dr. Davidse pointed out. To study this effect, a pair of large electromagnets were used in the Helmholtz configuration, and the deposition rate was evaluated as a function of magnetic field intensity. The study was made for two RF power levels at a substrate temperature of 300°C.

It was found a superimposed magnetic field gives up to twice the zero-field deposition rate. The magnetic field, explained Dr. Davidse, causes the electrons to spiral around the lines of force, thus increasing ion density. Also, electrons that would otherwise be lost to the walls of the system are confined inside the glow.

A saturation effect was also found to take place. As would be expected, this occurs at lower magnetic-field intensities for low power levels than for higher levels, said Dr. Davidse.

It was noticed, too, that an increase in substrate temperature produces a significant decrease in deposition rate. The effect is larger for higher-input power levels. The decrease of the sticking coefficient with temperature is most likely the main reason for this, it was said.

—LNT

INTEROFFICE MEMORANDUM

DATE March 31, 1965

SUBJECT Hot Cathode Dielectric Sputtering

TO K H Olsen FROM R Brown

I have delayed in replying to your interoffice memo on glass coating until more information was available.

The technique which is used by Burroughs for glass coating is similar to the system which Texas Instrument has adopted as a production coating.

I have used sputtering in the past for coating with metals and with dielectrics. The system which is available from R.D. Mathis Company differs in that it makes use of a hot cathode and R.F. to ionize the heavy gas molecules. This is an advantage over the diode system of sputtering in several respects.

1. There is no damage to the substrate due to accelerating potential since the substrate floats.
2. The pressure at which high speed sputtering takes place is more than an order of magnitude lower.
3. The target to be sputtered does not need to be of conducting material.

The companies which are using hot cathode, R.F. cathodic sputtering feel that this makes them immune to the Planar patent. This allows the use of glass which is ideally suited to the particular doping levels of the material to which they are to be applied.

RB:ASJ

CC
R L Best
T Stockebrand

INTEROFFICE MEMORANDUM

DATE March 31, 1965

SUBJECT Booth for Interdata

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

FROM T. Johnson

We have a 30 foot booth used at Wescon, Fall Joint and IEEE.

We have a 40 foot space and apparently 20 feet extra for the PDP-6.

I suggest we have a modular booth designed and built which can be used for 40, 30 and 20 feet spaces. At any rate, we need a new booth.

We don't have a good 20 foot booth and I would like to know what those requirements are.

Our Exhibits Manager will be on board on April 12. (Tim McInerney)

Target shipping date is May 17.

TJ/mr

INTEROFFICE MEMORANDUM

DATE March 29, 1965

SUBJECT Mass Memory

TO Kenneth Olsen
Gordon Bell

FROM Harlan Anderson

Today Mr. Edward Rogal of 80 Mann Lot Road, North Scituate, Mass., Zip Code 02060 telephoned me. He had read an article a year ago in Business Week magazine concerning the PDP-6 and wanted to talk to us about an invention that he has. His telephone number is 545-1254. He has apparently invented a system for retail store automation known as Uni-Tote which is distributed by the American Totalizer Corporation. The particular device that he has in mind would be used he thinks for an expanded retail store system. It is covered by eight patents and a prototype has been constructed for him by Jackson and Moreland Engineering Company in Boston. Its characteristics are capacity of 300 million bits with an access time of approximately one second and a cost of $30,000. His system ideas have been discussed with someone named Ferguson at Project MAC. I would think we might be able to get some further background on Mr. Rogal there. He called with the idea of trying to talk us into marketing his total package to retail stores which I indicated we were not interested in but that we might be interested in hearing more about his memory device. One important characteristic that I failed to ask him about was the transfer rate after access has been made. I promised we would call him back in a week or so to indicate if we had any further interest in this. Mr. Rogal is an older man in semi retirement I would guess.

Andy

HEA:ncs

cc: Follow-up File 4/5/65

INTEROFFICE MEMORANDUM

DATE March 29, 1965

SUBJECT Preliminary PDP-7 Disc Proposal

TO N Mazzarese

FROM L M Hantman

The following is a broad preliminary outline of proposed software implementation of disc hardware using the small, single cartridge Data Disc on a PDP-7. Future memos will include more detailed implementation of various systems as well as applications for the PDP-8. Format and basic methods used were determined mainly by an attempt to provide a simple hardware means to provide the minimum requirements with the overall aim of keeping the basic cost as low as possible.

1. Brief general specifications of the Disc:

a. Bit Capacity (Single Zone Recording - 5000 b.p.i.):		10,048,000 per side
b. Time per Revolution	:	50 milliseconds
c. Number of Tracks	:	128
d. Time for Track Accessing	:	5 milliseconds per track
e. Average Access Time (On current track)	:	25 milliseconds
f. Average Access Time (Over entire disc)	:	343 milliseconds
g. Word Transfer Time (5000 b.p.i.)	:	12 microseconds

2. Proposed Format:

   a. One Zone Recording, i.e., 5000 b.p.i. on inner track with the same number of bits on all tracks.
   b. Sixteen 258-word sectors per track.
      1. Each sector consists of 1 address word, 256 data words and one end of sector word.
      2. Each word consists of nineteen bits, 18 data bits plus an odd parity bit.
      3. Three words mark the end of track zone.
   c. The total disc consists of 128 x 16 sectors or 2048 sectors (4000_8).
   d. Sectors would be immediately addressable from 0-3777_8 as follows:
      1. Bits 7 thru 13 indicate the track (0-177_8).
      2. Bits 14 thru 17 indicate the sector (0-17_8).

Thus with an eleven bit register both track and sector can be indicated by merely indicating a sector number and no detection hardware for illegal sector numbers is needed.

e. File protection is done by means of the program not the hardware, unless the entire disc is to be protected in which case the disc itself has a file protect switch.
f. No separate mark or timing track is used; all information is self clocked.
g. The address word is read in either the read or write mode and is never overwritten except in write mode with an overwrite switch set, to allow creation of the original disc format.

3. Proposed IOT Commands:
(Flow charts of each are attached)
a. Disc Seek (DKSK) - Moves contents of accumulator (bits 7-17) to track and sector selectors and positions arm at proper track.
b. Disc Read (DKRD) - Transfer N words from disc to core storage.
c. Disc Write (DKWR) - Transfers N words from core storage to disc.
d. Disc Word Count (DKWC) - Transfers word count (-N+1) from accumulator to disc Word Count Register.
e. Disc Starting Address (DKSA) - Transfers core starting address from accumulator to disc Current Address Register.
f. Disc Read Address (DKRA) - Transfers current track and sector address to bits 7-17 of the accumulator.
g. Skip on Parity Error (DKPE) - Skips if Disc Parity Error Flag is a "1".
h. Skip on Disc Error (DKER) - Skips if Disc Error (track error, parity etc) Flag is a "1".
i. Skip on Disc Job Done (DKJD) - Skip if the Disc Job Done Flag is a "1" (See flow charts and note 6 below).
j. Disc Clear Flag (DKCF) - Clears all disc flags.
NOTES:
All data is transmitted via the data break system.
All registers described are in the Disc or Disc Control Hardware.
Program Interrupts occur as a result of either the Disc Error Flag or the Disc Job Done Flag.
DKSK, DKRD, DKWR and DKCF clear all flags.
The first Read or Write must be preceded by a Seek Command but successive Reads or Writes need not be.
For each mode End-of-Job is caused by the following conditions:
    a. READ: Word Count Overflow (WCO)
    b. WRITE: WCO and End of Sector (EOS)
    c. SEEK: Track Comparison Equal
    d. WRITE w/ Over-Write Switch): Track Counter Overflow

4. Possible Softward Implementation:

a. Basic user subroutines to allow use of the functions of the disc in the interrupt mode. These subroutines would be basic to all higher Systems applications of the disc.

b. Maintenance and Diagnostic programs to get the disc on-line, work out any programming problems and for field service use.

c. Systems Applications:

1. Complete FORTRAN Operating System.
2. Implementation of a 2-pass Macro-Assembler.
3. An improved Disc Business Package (Bus-Pak?)
4. Sorting.
5. Graphics.
6. Multiprocessing.
7. Information Retrieval Systems.

5. Recommendations:

a. A basic set of user subroutines and maintenance programs (items 4a and 4b above) should be implemented in that order, as soon as a definite committment is made to provide the disc option.

b. A definite committment to Systems implementation should be delayed for the time being while the following considerations are made for each of the possible applications in paragraph 4c above.

1. It appears that we could implement a disc version of our presently contemplated PDP-7 FORTRAN fairly easily especially since each side of the disc equals about 3 1/2 DECtapes in capacity. Operational characteristics would certainly be better than for DECtape in any case. However, we have no experience whatever with Dave Fellows' current system to determine its adequacy or to compare it with other systems. There is general agreement however, that we have been stuck with the format of a previously written FORTRAN which has grown slightly out of proportion. This may be an excellent time therefore to look closely into re-writing FORTRAN for the disc and eventually for DECtape. A study of this could be made by Dave Fellows with some help from Applications Programming but should not be done until the present FORTRAN system has been tried.

2. Again there is general agreement that the current PDP-4/7 assembler is pretty poor for a machine with the PDP-7's characteristics. With the availability of a disc as a cheap option, I would recommend a serious study of a good 2 pass Macro-Assembler which could run via paper tape, DECtape, or disc. Charles W Adams could probably make an excellent proposal for us in this area.

3. Gino's Bus-Pak can be modified fairly easily for the disc. If the disc becomes a standard option I recommend that it be so modified. The higher operating speeds of the PDP-7 over the PDP-4 and the disc over DECtape combine to produce in my estimation, a highly salable item.
4. Sorting techniques (highly problematical on DECtape) are very much applicable to the disc. Many business applications without extremely large volumes of data could do quite a bit of data manipulation with the disc and without expensive additional magnetic tapes. As adapted to Bus-Pak, here again we have a highly salable item, and I recommend that it be looked into after the items above.
5. Graphics was mentioned in connection with the disc mainly because of the storage space required for list or ring structures in graphical input programs and because of the speed in which information can be retrieved. I don't think we have to do anything in this area at the moment, but it should certainly be kept in mind if an application pops up.
6. The disc does allow a small degree of multiprocessing for fairly small applications. In terms of time-sharing the disc is fairly slow however, with the proper executive program simple batch or command and processing could be done. It would require Directory Handling, Space Allocation, Garbage Collecting, Command Processing, and File Protecting Subroutines among others and should be considered only if the Application area shows a large immediate market for such a complicated but fairly small capacity system.
7. For small files the disc is usable in an information retrieval type application. There is a large need in this area, but the immediate market for our computers in this area should be determined before we jump into it just because of the disc.

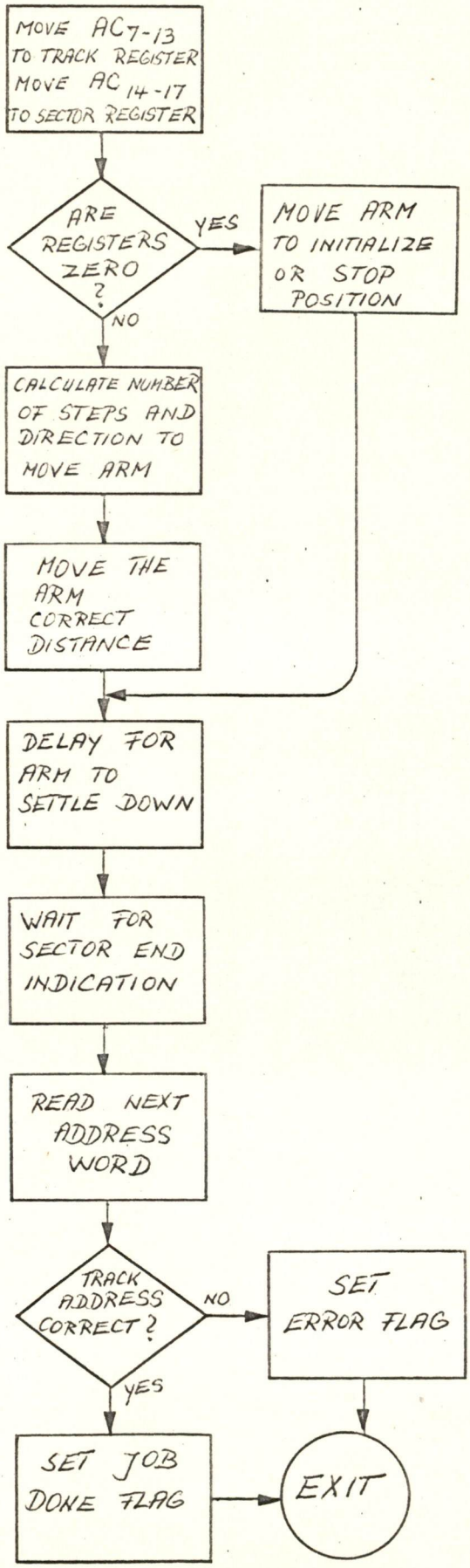
6. Comments:

a. The main idea behind the disc was one of producing an inexpensive item. It is true that we can sell more if we have good supporting software, however the profit margin on a cheap item may not be great enough to cover the programming costs of fairly sophisticated systems. Unless there is really a very large market we should make some exhaustive studies before we jump. There is no reason why the customer cannot do some programming in individual areas. DEC is not equipped to do all we would like and still keep costs at the bare minimum.

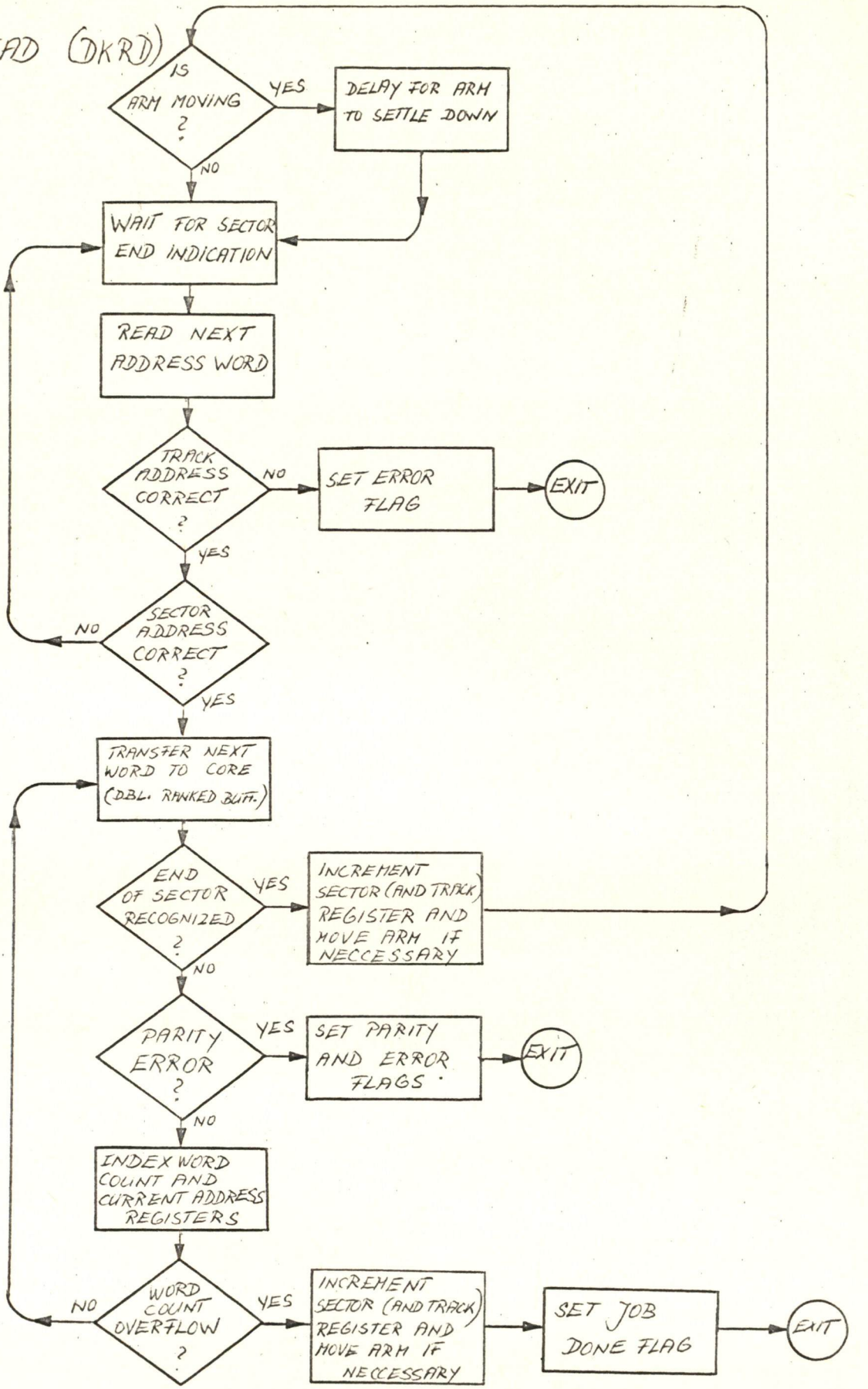
LMH:ASJ
Encls

PRELIMINARY FLOW CHARTS OF DISC COMMANDS (PDP-7)

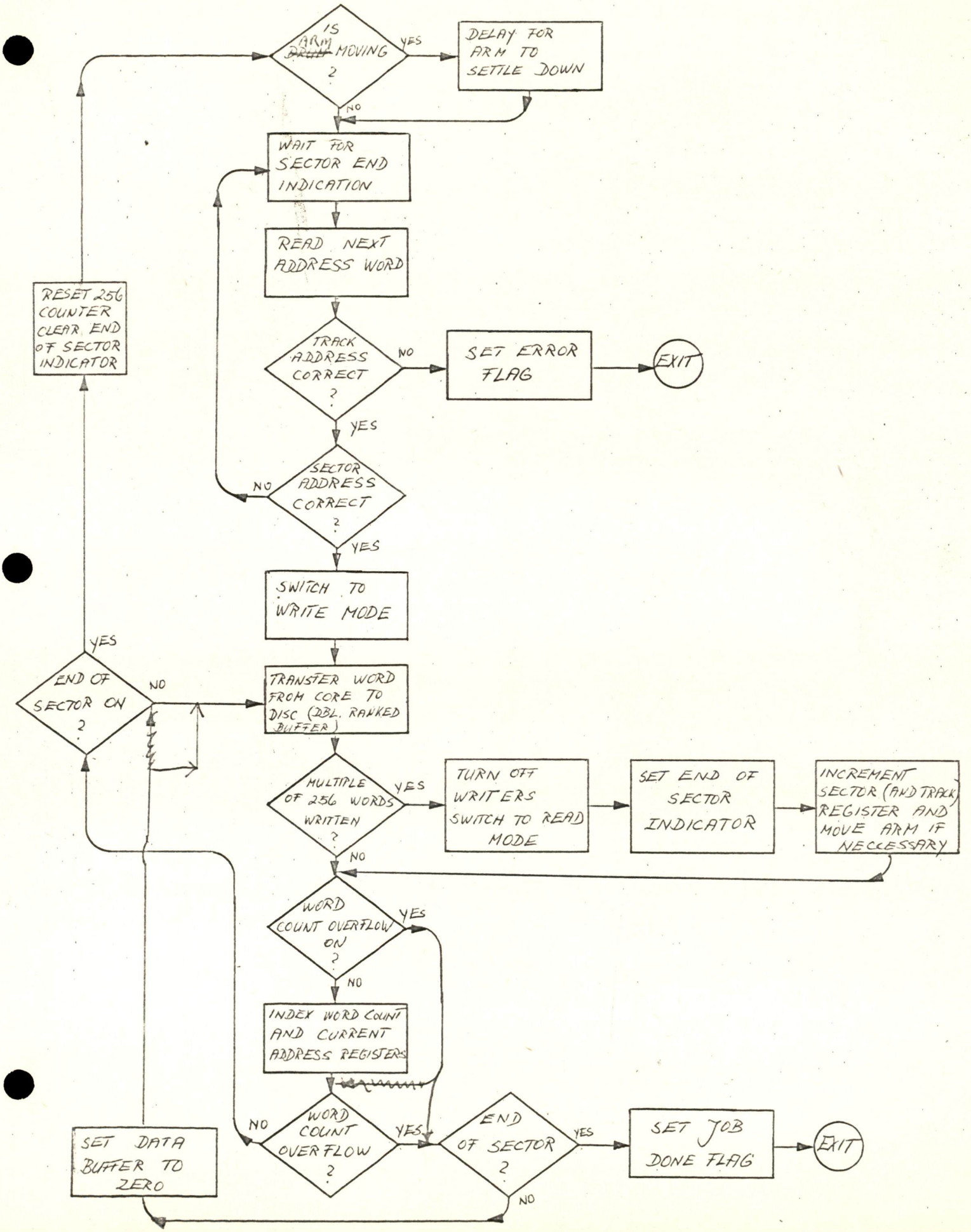
1) DISC SEEK (DKSK)



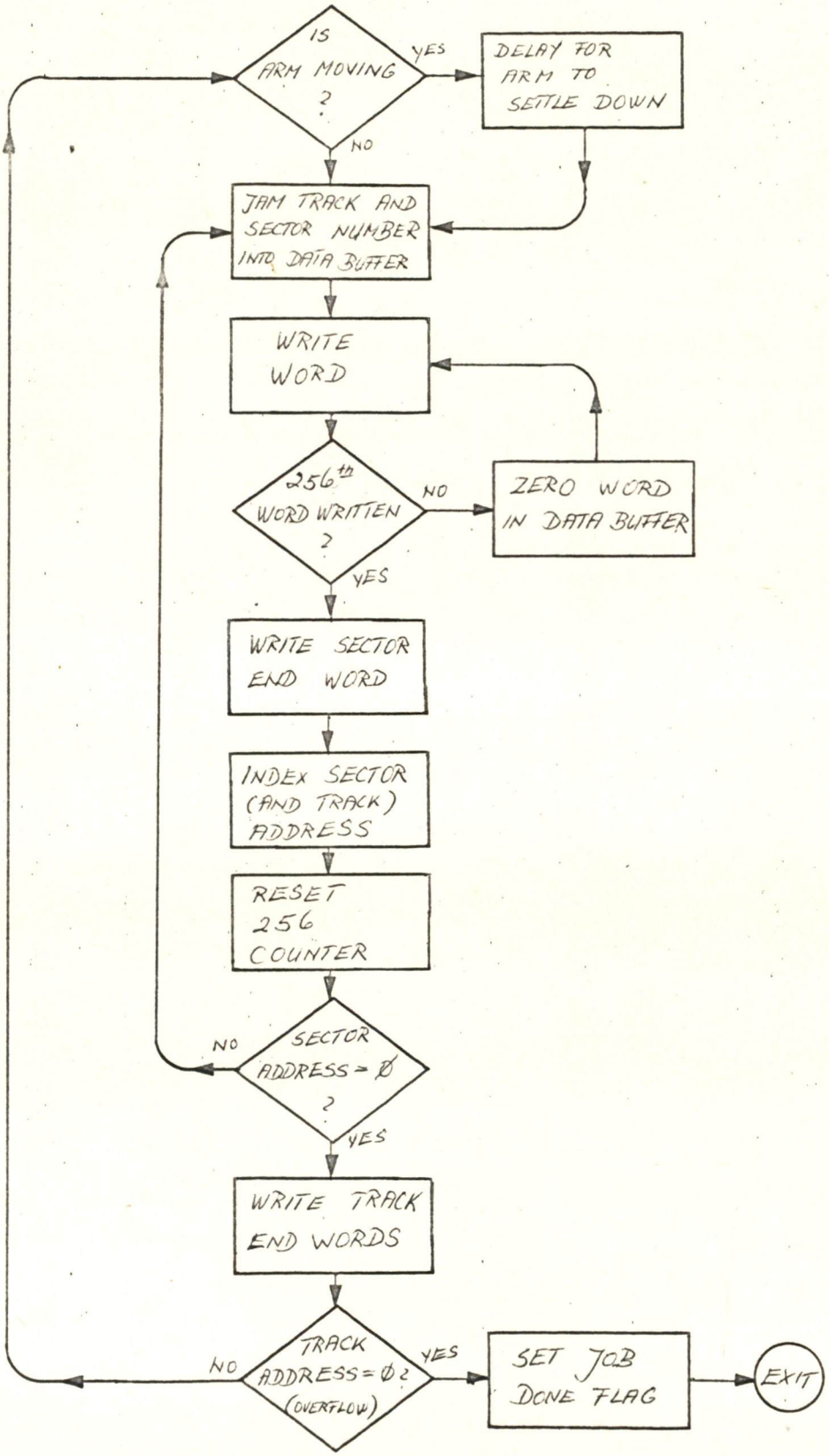
2) DISC READ (DKRD)



3) DISC WRITE (DKWR)



7) DISC WRITE (with over-write Switch)
FOR INITIAL FORMATING OF DISK



INTEROFFICE MEMORANDUM

DATE March 26, 1965

SUBJECT Rental Income Value of Leases on Large, Small, and Special Project Computer Equipment

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

FROM Dick Mills

Concept

Being able to move in the markets we have pin pointed for our products with greater speed than the competition, has been one of the big strengths of our company. In an effort to strengthen this concept and to minimize the effect of some of the rental agreements which are now in force by our competition, I am exploring a rental basis for DEC which will create the minimum drain on working capital and give us a marketing edge at the same time.

The basic premise of this concept is that, the longer the time that a machine is with the customer, higher grows his investment in programming and staff, and higher grows the probability that he will keep the computer equipment beyond the original lease term of twelve (12) months.

Table of Values

If we can create a firm basis for the above concept, our financial requirements will be minimized and our marketing avenue will be enlarged. The following table reduces this concept to mechanical form with numbers inserted to portray the principle, but I would be the first to say that I have no firm basis for backing up these figures:

(1) Months on Lease	(2) Probability of customer continuing to rent equipment in %	(3) Number of months additional rental beyond 12 month original period	(4) Rental Income Value (Months projected from original plus Col. 3)
1	0	0	12
2	0	0	12
3	10	1	13
4	20	2	14
5	40	5	17
6	50	6	18
7	50	6	18

(1)	(2)	(3)	(4)
8	60	7	19
9	70	9	21
10	80	10	22
11	90	11	23
12	100	12	24

Above is only an example - real figures may be quite different.

If I could receive from each of you what you feel would be a reasonable set of numbers for the line for which you are responsible, to fill in columns 2 and 3, this would then form a good basis for serious discussion by product line.

Bank Interest

Preliminary discussions have been had with our bankers concerning their role, in the event we should want to "pull the plug" on renting our equipment, and the bank's reaction was one of great interest in being the financing medium for our leasing program, and also, one of high interest in the above concept, if the bases of extra rental income beyond the twelve-month certain could be substantiated.

Working Capital Effect

Since on a one-thirtieth basis, we get back 40% of the sales value in twelve months, and on a 50% cost basis, 80% of the cost, this puts DEC in the position of having to put in 20% of the cost for each rental unit, on the further basis that the bank would loan only the certain rents, which they have agreed to do (i.e. 100% of 12 months rent).

I would appreciate your comments and figures soon so that we may proceed to phase 2.

INTEROFFICE MEMORANDUM

DATE March 25, 1965

SUBJECT

TO K. Olsen/N. Mazzarese/R. Musson FROM Jonel Sutton

Yesterday, I attended the IEEE Seminar on Direct Digital Control where both the 1800 IBM and Pat Greene paper on the DEC Chalk River job were given. It is apparent by the reaction at the conference that - -

1. DEC has more actual experience in hardware in field than IBM, Westinghouse, and Honeywell combined.

2. This fact was evident to the audience and by their interest in a report of working tested equipment as opposed to theoretical, system planning, overall concept oratory which the other firms' papers contained.

3. It is also evident that the PDP-4 and 7 which are operating are equal to the 1800 which is still in prototype stage, and to the H20 system from Honeywell.

4. The Prodac 50 as you may know was copied from the 5 PDP-5s Westinghouse bought. They have shipped 5 Prodac 50s according to the talk. The other firms have not shipped any.

5. Pat Greene's paper and DEC experience clearly (to my biased view), place DEC ahead in actual experience and technical competency.

If I may, I would recommend that you get a copy of Pat's paper and do some clear thinking about how to utilize this DEC ability to open up an obviously lucrative market.

CC: Win Hindle

INTEROFFICE MEMORANDUM

DATE March 22, 1965

SUBJECT Footnote to Notes on CC Modules

TO Ken Olsen

FROM Ted Johnson

The 3 C Modules are double sided so you have effectively 32 pins per module. They mount 6 connector blocks across the Mounting Panel with 8 modules per block so they have 50% more modules per mounting panel. The connectors are designed for automatic wire wrap but I don't know the manufacturer. They have 125 mil centers on the connector. They are quoting delivery for July and August.

UMM

WU2 PD 2 EX WUX B BROOKLYN NY MAR 22 139P EST
KENNETH H OLSEN DIGITAL EQUIPMENT CORP
MAYNARD MASS

YOUR LETTER RECEIVED WILL BE PLEASED TO DISCUSS WITH
UOXX YOU ANYTIME WEEK MARCH 22 HAVE ALREADY DISCUSSED WITH
VINCE MORRISON
PAUL S CHISHOLM VICE PRESIDENT MERGENTHALER LINOTYPE CO

CLR 211P

RWU2

INTEROFFICE MEMORANDUM

DATE March 18, 1965

SUBJECT Critical PDP-8 Status

TO Nick Mazzarese
Jack Smith
Ed Harwood
Jack Shields
Stan Olsen
Ken Olsen ✓

FROM Jim Burley

Dear Nick:

As of March 18, we have delivery slots left for two more machines in October and two more machines in November. Within the next week, we will be quoting January 1966 delivery on the PDP-8 against a letter of intent and December of 1965 against a firm purchase order.

We are already turning down purchase orders for PDP-8 simply because we cannot deliver, and it appears that we are now production limited. Production in this case includes every process necessary to set the machine in the customer's doorway.

I propose that we start delivering 30 machines per month starting in September. By that time, assuming we can meet our present schedule, we will have gone through two 20-machine months, July and August, and should by than have the manpower and experience necessary to deliver at the rate of 30 machines a month.

The sales campaign underway supporting PDP-8 is a considerable one and will be largely wasted if we can't back it up with delivery. Although other companies like IBM can sell with long delivery, I don't feel that we can be very successful at it.

The sales momentum that we now have with the PDP-8, though now being accepted by most of us as common place, is an extremely valuable commodity. It would be a shame to see this "acceptance" largely diluted by our inability to expand with the demand. If we are then unable to deliver in response to the demand, then we will force our competitors, old and new, into business.

f

dec INTEROFFICE MEMORANDUM

DATE 3-18-65

SUBJECT Servicing Information Requests

TO Ken Olsen
cc: Ted Johnson

FROM Ken Larsen

Following is a summarization of my point of view on the points brought out in Ted Johnson's memo to you of March 9th, 1965. I have attempted to break these down as you asked.

A. New marginal check philosophy on FLIP CHIPS

I discussed this with Burton Scudney during the November Sales Meeting. In the introduction to the catalog that we prepared here in the Palo Alto Office, I "guessed" that the marginal check voltage excursion would be ± 50% on the Flip Flop +10 volt line, and ± 20% on the pulse amplifier -15 volt line. Burt did not think my guess was correct. He could not, however, give me any idea as to what it really would be. It is also obvious to our system module users that the +10 A and B configuration is no longer used. They ask why we are dropping the convention that we previously stressed to be so important.

B. Narrow ground lines on FLIP CHIP modules

This is one of the questions for which I did not like the answer I received. Telling the customer, who has had wide experiences in the past with his own module designs and layout, that the ground line is adequate is not a very good answer. I know that Burt did talk directly to Tom Taussig. I wanted a note from Burt telling me how he approached the problem with Tom. Then I could continue the follow-up in a fashion that would lead Tom to believe that I knew what we were talking about and was able to bring him a convincing explanation from our Engineering Department. I understand that Russ Doane made a study of the effects of the width of the ground line on the printed module and had developed a chart of these effects. I had asked also for this as an aid to use in explaining and calming Tom Taussig's fears in this particular area. This particularly important since Tom watched us overcome a circuit grounding problem on the teletype modules used in the PDP-4. The problem was solved by adding a bus wire between the end of the ground line on the board and the connector pin.

C. W510 Price,
A suggestion for a new diode module,
W100 Price,
Information on W990,
Information on R151 and R205

I believe all of these were taken care of during telephone conversations, and I believe that I marked the answer on the margin of the original carbon copies of the memos in my information request file.

D. The corrections on 4706 and 4707 write-ups

Write-ups for the 4706 and 4707 were revised on February 10th. During my last visit to Maynard I spent some time with Russ Doane pointing out the areas which were in question. The signal now called "active", previously was called "in last unit" and my question relates to its ON and OFF timing relationship. Other, probably minor things, were found such as pin connections that were not labeled, or were mislabeled.

E. Field calibration for 1130 Parity Decoder,
Problems with 4306 and R302 modules

My request for information relating to the solution of the problems with the 4306 and the possibility of a field calibration procedure for the 1130 parity decoder is still unanswered at this time.

F. I discussed this with Stan and with Ted during Stan's week of absence and again with Stan during my last trip to Maynard. If I understand correctly, this is some information that was to come to me from Russ Doane. It may possibly have been misplaced here at the Palo Alto Office. My contention was and still is, that if indeed the original document was created, I would like to have a copy of it.

G. This is expressed very well, and I feel that I could add very little to what has already been said.

H. I discussed Item H in detail with Jack, and I believe the notes on our agreement are in the margin of Jack's memo to me, which is kept in my original information request file. I explained to Jack the problems that arise when computers are shipped. The program tapes and all of the write-ups

are usually not complete, and we try to keep some program tapes and write-ups here in an effort to fill in the gaps as they occur. It is useful also to have a library here so that we can give a tape to a customer, who may have lost or destroyed his last copy of a program. This does not happen often, but it does happen occasionally and being able to replace a tape or to loan a tape to copy on an immediate basis is very much appreciated.

As an example, the PDP-4 for Tom Taussig was delivered with some program tapes and some write-ups. In several cases we had tapes without write-ups and in other cases, we had write-ups without tapes. We were able to give Tom almost everything he needed by giving him tapes that I had here at the office and tapes supplied from the Library at Maynard. The way in which we supplied the program library to Tom was messy and very disorganized. I wanted very much to give him a nice, well-organized package of PDP-4 programs to show him that we are making progress.

I. When Tom Taussig's machine was delivered, we helped him get started in his programming effort by having him call Jack Ridgeway. Frequently, Jack in turn switched him over to someone else who was familiar with that particular program. This, apparently is where the confusion started. Jack Ridgeway's Maynard number has always been on the Bulletin Board in the PDP-4 Room at Berkeley. Tom being used to being turned over to someone else, started calling other people directly. Other customers having similar experience, did likewise, and as a result, Jack Ridgeway was by-passed.

J. This unit was initially priced out for LRL, Livermore during the effort to sell the PDP-6. Occasionally, a request for information on such a device is made. I have not pursued this recently because the project for which I was requesting additional information (on the October 6th memo) has since been cancelled due to lack of funds.

K. Since Ted has assigned Al Ross to assist us in getting information, things in general seem to be moving considerably better. As for example, last Friday I asked Al for 4 items. Before the end of the day, he had sent me a TWX message answering two of them and giving me a status of his progress in dealing with the other two. I regard this as excellent

support. It is very easy to tell the customer that we don't have the answer if you can tell him what you are doing to get the answer for him. Most of our TWX requests are being answered promptly now. I am assuming this will continue, and I expect to see a much more meaningful and easily workable line of communications between Maynard and this Office.

KL/hlh

Ken Larson

INTEROFFICE MEMORANDUM

DATE March 9, 1965

SUBJECT Servicing Ken Larsen's Information Requests

TO Ken Olsen

FROM Ted Johnson

As you requested I am sending you a summary of the information requests which Ken feels have not been properly cared for back here in Maynard.

A number of these requests were originally submitted to Burt Scudney between August and the end of October 1964. They were on the following subjects:

E 1. Possibility of a FLIP CHIP 4303 - like module.

A 2. Problems with the 4306 (and our 302) modules.

B 3. New marginal check philosophy on FLIP CHIPS.

D 4. Narrow ground lines on FLIP CHIP Modules (re: Tom Taussig's comments).

5. The corrections on 4706 and 4707 write-ups.

6. W 510 Price.

7. A suggestion for a new diode module.

C 8. W 100 Price.

9. Information on W 990.

10. Information on R 151 and R 205.

E 11. Field calibration for 1130 parity decoder.

C 12. Paste-on logic diagrams.

It is obviously difficult to review all the communications that surrounded these memoranda. According to my paper work, the requests to Burt Scudney were not specifically directed to me for follow-up. The case of Item #3, I had asked Burt and Dick Best to write up a statement for the Sales Newsletter and confirm this in a memo to Ken Larsen. I know Burt discussed Item #4 on the telephone with Ken and, as I recall, did not feel the objection was technically valid.

It is, however, very clear that the quality of and the delays in obtaining answers were oftentimes unsatisfactory.

F

A number of the questions in the above memos were raised by Stan at the Module Guidance Committee Meeting on January 7th, namely Items 1, 3, 9, 10 and 12. A TWX was sent to Ken Larsen on 1/18/65 asking if the Minutes of this meeting provided enough information. No response was forthcoming and the questions still reside in the packet of questions I have on hand from that office.

Two questions were originally submitted to me:

1. Request for sales pitch against integrated circuits.

2. Suggestions for sending product information to the Sales Offices in advance of the availability of finished literature. (Ken complained that much needed information is treated as unavailable while in process of being prepared by Advertising.

G.

In a memo of 12/17, after a delay on my part, I told Ken that I had submitted a request to both Dick Best and Burt Scudney to develop some helpful competitive sales information for integrated circuits. Ken's question largely stems from his enthusiasm of Dick Best's comparison with Fairchild circuits at the August Sales Meeting. Although Dick said he would include that information in the Sales Newsletter, he felt it was already out of date after new information was received on prices at the WESCON Show. No like data has been forthcoming from Engineering for Module Applications on an organized basis, except for some contributions to the Sales Newsletter which largely clarified our terminology or pointed out some basic policies.

In the latter area, I have been continually lobbying for more dynamic activities surrounding the use of FLIP CHIP Modules and down-to-earth translations to the problems of selling FLIP CHIPS to the contemporary module customer.

I believe Ken Larsen's comments on literature availability is a very valid one and ties into suggestions he has made along the lines of the preparation of Module Catalogs, the task in which I believe his efforts and initiative helped to expedite that program and emphasize the needs for basic sales tools in order to successfully sell a new product line.

Other requests were submitted to Jack Ridgeway, Joan Cowles and Nick Mazzarese for follow-up in September. Ken feels that he has had no cooperation with these requests which were:

1. A good PDP-4 package of programs.

2. A request to update his list of available PDP-5 programs.

3. Program Write-ups and Tapes for PDP-1, 4 and 5.

H

Jack Ridgeway has been in contact with Ken and supposedly has discussed these requests. It is Jack's policy that a supply of qualified and available tapes for customers should be maintained by and serviced from Maynard. He has so stated this to Ken.

I can see no reason why his question #2 should not have been answered. I have suggested to Jack that he take care to acknowledge written requests for information so that we can distinguish between policy and legitimate complaints with the system as it operates. I have no comments on the PDP-4 Program Package and will discuss this with Jack Ridgeway myself.

I

I believe some of the confusion surrounding the software issue, particularly PDP-4 at Berkeley results from the lack of clarification in the minds of the customer as to what DEC offers as standard available tapes and write-ups. Certainly, part of the responsibility is the salesman's. I have recommended that we regularly put out what amounts to ordering blanks for software for each of the computers so that the whole process can be simplified and standardized. Jack Ridgeway recently asked Ken Larsen to have Tom Taussig channel all of his requests to him directly since Tom has used my friendship and communications with other people here to get him information and material. I do not believe Ken Larsen's response to this request was satisfactory and that Jack expressed a legitimate complaint and desires to service his customers in an organized way.

When I visited Berkeley several weeks ago, Tom Taussig expressed to me a lack of clarification on whom he would contact and I told him to go through the San Francisco Office or contact Jack Ridgeway directly and merely keep me informed in our normal conversations as to how we are satisfying his requests.

J

Except for a request to Bob Savell on October 6th for information on making a Tape Transport Simulator Box, (I have no information on action taken), this covers the information requests from Ken Larsen.

K

I have instructed Ken Larsen to rely on me for following-up on information not forthcoming from his requests. I suggested that rather than merely receiving copies of his original request he inform me by memo, or by phone, on the problems he is having on getting that information so that I have working background on what has transpired and we avoid the frustrating and demoralizing redundancy of effort that can result when our many input system of information requests is misused. We will work on establishing a better means to review these outstanding requests and avoid being haunted by old problems.

In my Questionnaire at the recent Sales Meeting, I asked what problems people were having with communications. I am attaching a copy of that question and a related question on company support for your review.

The general comment on the Questionnaire is that nobody seemed to feel very strongly that there are serious breakdowns in communications and support.

TJ/mr

INTEROFFICE MEMORANDUM

DATE March 17, 1965

SUBJECT Screens for Solder Resist.

TO K Olsen

FROM D A White

Way back when we started FLIP CHIP modules we planned to use solder resist. Later, you probably remember, we discontinued the idea since the resist tended to blister and flake off in the solder machine. We are still making the masters and doing the photo work on the screens for resist, however.

I've told Norm Perryman to discontinue making these masters. George Lord informs me that eliminating this one step could half the time of making etched board masters and we can always make up the resist screens later if and when they are needed.

DAW:ASJ
CC
K Fitzgerald
N Perryman
R Melanson
E Hunt
G Bouthiller
L Prentice
G Lord
R Graham
C Kendrick
M Sandler

dec INTEROFFICE MEMORANDUM

DATE March 15, 1965

SUBJECT IBM Reed Switches - 1 form A contact

TO Ken Olsen
cc:Henry Crouse

FROM Paul McGaunn

Prices are listed below for the IBM Miniature Dry Reed Switch. The price is the same for PN #765972 short leads and PN #765830 long leads.

25-499	1.00
500-999	0.95
1000-4999	0.87
5000-9999	0.77
10K-24999	0.65
25K-up	negotiable

Delivery - fob Burlington, Vermont
Stock - 1 week

Paul McGaunn

INTEROFFICE MEMORANDUM

DATE March 15, 1965

SUBJECT ENVIRONMENTAL TESTS OF EPOXY TRANSISTORS

TO
K. Olsen ✓
R. Sogge
R. Hughes
J. Cudmore
K. Doering
R. Best

FROM Richard Burton

Three types of epoxy transistors were boiled in water for approximately 96 hours at atmospheric pressure. These units were pretested. They were tested again on the same machines after approximately 2 hours of drying time. The results are as follows:

Type MPS2894 Mfr. Motorola # Tested 37	Type 16J1 Mfr. G.E. # Tested 100	Type 2N3639 Mfr. Fairchild # Tested 100
Failures: BV_{ceo}, I_{cbo}, I_{ebo}, V_{ce}, V_{bc} — 1	Failures: I_{cbo}, V_{be} — 1	Failures:
V_{ce}, V_{be} — 2	I_{cbo}, V_{ce} — 4	Open 1
I_{cbo}, I_{ebo}, V_{ce}, V_{be} — 34	I_{cbo} 95	I_{ces} 3
		Broken lead 1
# Failures: 37	#Failures: 100	#Failures 4

dec INTEROFFICE MEMORANDUM

DATE March 15, 1965

SUBJECT SALE OF AUTOMATIC MODULE TESTERS

TO

Ken Olsen
Nick Mazzarese
Ed Harwood
Win Hindle
Pat Greene

FROM Jim Cudmore

There seem to be some fairly good prospects of making a module tester sale, (see enclosed memo). At the present moment no one person or department has the responsibility of following up potential sales. As a result, there is a lot of confusion and no one seems to know if we really intend to build such a system.

I would think that the Digital Test Section of the Special Projects Group would be best qualified to design and build such a system. They have instrumentation experience, circuit design engineering and etched board capability in their department. Ulrich Skowronek is currently becoming familiar with our tester to learn the system capability and limitations.

Based on the automatic circuit testers, I have seen,(Tektronix, Oplimized Devices) we are in an extremely favorable position.

The flexibility of a test system controlled by a small general purpose computer is unbeatable.

jgc

INTEROFFICE MEMORANDUM

DATE March 11, 1965

SUBJECT Prospect for Module Tester

TO Jim Cudmore
cc: Ed Harwood

FROM John S. Jorgensen
New York Office

I have another very good prospect for a Digital Module Tester, however, the requirements are somewhat different that ours. The customer is EAI, Long Branch, and the persons name is a Mr. Don Anderson. Generally, the specs on the module tester are as follows:

1. A 6 by 50 input matrix would be required.

2. Four power supplies would be required to provide plus and minus power voltages and plus and minus clamp voltages. These would be in the range of 0 to 25 v.

3. Clock pulses with positive and negative excursions with frequency in the range of 100 kc to 5 megacycles for test purposes. Everything else would be basically the same as far as the use of the Dectronics Scope, and I think that they are willing to pay something on the order of $60,000 for a system.

Again, if you have time and you feel we might be interested, I would like you to spend a day with me discussing these requirements at EAI. I am forwarding a copy of this to Ed Harwood and his group also. I might mention that they would probably like to have delivery on this equipment sometime in the fall. What they are looking for right now is a ball-park price ± $10,000 so that they can make an initial presentation to management, however, I would like to get a feeling for our interest on this matter first.

John

John Jorgensen
NYO

JSJ:DL

dec INTEROFFICE MEMORANDUM

DATE March 12, 1965

SUBJECT Modules Warranty Policy

TO Ken Olsen
Stan Olsen

FROM Ted Johnson

I believe we must gear our warranty policy to meet the competitors and the terms and conditions generally required for modules for government agencies. The GSA and NASA terms spell out one year (GSA is 90 days on computers) during which there is fully warranty. I believe we and 3C are the only ones not on GSA, and we are both thinking of being on.

Also, I wonder how seriously people will take a 10 year policy if we are not liberal on full warranty for some period like a year.

TJ/mr

Ken Olsen

INTEROFFICE MEMORANDUM

DATE March 11, 1965

SUBJECT German Sales Office

TO Harlan Anderson FROM Jonathan Fadiman

In a meeting yesterday with Harlan Anderson, Guenter Huewe and Jon Fadiman, it was decided to set up a second sales office in Germany. The reason for this is that it appears that most of our sales from the German office are to be concentrated in Northern Germany and the Netherlands, and, therefore, Munich is not the most central place for our main office. We are committed to establishing an office in the area of Bonn in any case because of the fact that we have already sold a PDP-6 at the University of Bonn and we are almost sure of selling a PDP-6 to the University of Aachen. Guenter Huewe felt that in light of this and the present and future sales in Germany, the best place for our main office would be in the area just south of Cologne. This area is only about 25 kilometers from Bonn, about 100 kilometers from Aachen, very close to two main autobahns and to two main airports, one at Cologne and the other at Dusseldorf.

The Munich office will be retained as a secondary sales office staffed with one or probably two engineers and one secretary. The total sales force of the German office is being expanded as follows:

1. Guenter Huewe: Manager of both German offices, to be situated eventually in the Cologne area.

2. Juergen Kesper: PDP-6 service to be situated in the Cologne area by May 15.

3. Manfred Jaekel: Service and Sales to be in Munich for some time and then possibly shifted to Cologne.

4. Mr. Klaus D. Kyris: Starting work March 15 in Munich.

5. Fifth engineer:experienced engineer with experience in programming and computer work to start work about July 15. This man will be in charge of the Munich office but under the direction of Guenter Huewe.

Present expenses for the German office are running in the neighborhood of $55,000 per year. It is expected that with expansion the expenses for fiscal year July 1, 1965

through June 30, 1966, will be in the neighborhood of $85,000. It is expected that the sales will be somewhat over $1 million. The area of responsibility for the German office will be Germany, the Netherlands, the northern part of Switzerland. Denmark may also be assigned to the German area.

Guenter Huewe will start looking for the new office in the Cologne area as soon after he returns to Germany on March 15 as possible. We would like to have the office available by May 15.

JF:nlz

cc: Guenter Huewe
John Leng
Dick Mills
Stan Olsen
Ken Olsen

INTEROFFICE MEMORANDUM

DATE March 11, 1965

SUBJECT PDP-1

TO K. Olsen FROM J. Smith

In reference to the cost of completing a PDP-1 computer currently in a state of incompletion..

Below is an estimate of costs that will be incurred to complete the machine:

Modules and Power Supplies	$18,000
Reader 3500	2,150
Punch	720
Typewriter	1,910
Sub Total	22,780
Assembly, Labor and Overhead	840
Checkout, Labor and Overhead	1,920
Sub Total	2,760
Total Costs	$25,540
Costs Incurred To Date	$ 5,250

Obsolete Equipment that Could Be Utilized

1. G.C. Stack	$ 4,500

dec INTEROFFICE MEMORANDUM

DATE March 10, 1965

SUBJECT RECRUITING

TO Ken Olsen

FROM Loren Prentice

This is an item which I have put off as long as possible to try to ascertain as accurately as can be done, the necessities for adding additional personnel to the Mechanical Engineering Department. If we are to recruit from Wentworth Institute and any other trade schools, we must interview this month and preferably starting not much after March 15th. We need to recruit four mechanical technicians as follows:

We would like to transfer Roger Williams from drafting and we need to recruit a draftsman to replace him.

We need two mechanical technicians to work with engineering for a short period to become familiar with machinery in the flip chip module section and then be transferred to production and become the maintenance group for Maynard Sandler and Jack Smith in the production of integrated circuits.

We need an additional mechanical technician to support our own engineers in the production of this equipment.

We would like to use two second year or third year mechanical engineering students this summer. These have proved very beneficial in the past two years.

In addition, I would like to recruit a plant engineer. This man would be charged with security, safety regulations, outside contract personnel that have to do with the building trades; carpenters, plumbers, electricians, etc. I would like to hire an older man for this and someone that has had some experience and I realize that we probably will not be able to select this man immediately and while I expect the load that is now current in regard to plant layout to decline after this summers moves have been made, there will still be a full-time job in this if he takes care of all these items. The number of personnel that we plan to have in the next few months require that we pay considerably more attention to safety measures within the plant

to stairway lighting and to all other features effecting the safety of our employees. In the past, this has been handled partially by myself and partially by Bob Lassen's office, by the guards and some degree by the nurse. We were to come up with an evacuation plan for the plant in case of fire and none of the people charged with this have had the time to do so. Our plant layout is in such bad shape that everytime we have to make a move, considerable drawings have to be generated because none of the prints are updated and this would be one item which he could take care of with the drafting department. I don't mean this should be belabored because we will never be completely up to date on this item. I have already mentioned this type of request to Win Hindle.

Loren Prentice

INTEROFFICE MEMORANDUM

DATE March 10, 1965

SUBJECT RCA Random Axis Memory (3488)

TO ✓Kenneth H. Olsen
Richard Best
James McKalip

FROM Henry J. Crouse

Two RCA sales representatives from the EDP Division in Dedham visited with us Thursday. They brought with them technical data on the 3488 System, which Dick has.

They will sell the system as a whole unit to us, but not on a OEM basis, ie., the price is the same to any one of RCA's customers for a whole system.

The cost of the equipment is as follows:

Minimum storage 3488, 340 million characters	$133,900.00
Additional eight magazines, (340 million characters)	$ 65,000.00
Controls available:	
1. Spectra 70	$ 26,300.00
2. 301 and 3301	$ 32,500.00
Single magazine, which includes cards	$ 340.00
One single magnetic card	$ 2.25

Availability of the equipment is six months or less.

RCA claims an application of the equipment with, I believe, a Spectra 70 System at Crysler Corporation for their five year warranty automobile record keeping.

Henry

Henry J. Crouse

INTEROFFICE MEMORANDUM

DATE March 5, 1965

SUBJECT Work in Process Balances for PDP-5, 6, 7, 8, and LINC

TO K. Olsen
H. Anderson
S. Olsen
N. Mazzarese
J. Burley
M. Ruderman

FROM R. Mills

We took a physical count of central processors on the floor on February 20, 1965 and ran through, as you will see in the attached schedule, what our end of the month balances would be in central processor frames in various stages of completion over the forecast period. As you will see on the current projected production schedule, we will have substantial numbers of machines in process for each product line.

We intend to do a grounds-up forecasting job in June of this year to cover the fiscal year ending June 1966, at which time we can adjust these ending quantities to more nearly reflect our sales picture.

DIGITAL EQUIPMENT CORPORATION

Production Schedule

PDP-5	BOM Balance	Production Entered during Month	Shipments	EOM Balance
2/20/65 - in W.I.P.				12
March 1965	12	6	3	15
April	15	0	1	14
May	14	0	2	12
June	12	0	2	10
July	10	0	0	10
August	10	0	0	10
September	10	0	0	10
October	10	0	0	10
November	10	0	0	10
December	10	0	0	10
January 1966	10	0	0	10
February	10	0	0	10
		6	8	

PDP-6				
2/20/65 - in W.I.P.				19
March 1965	19	1	2	18
April	18	1	1	18
May	18	2	2	18
June	18	2	2	18
July	18	2	1	19
August	19	2	1	20
September	20	2	2	20
October	20	2	2	20
November	20	2	2	20
December	20	2	2	20
January 1966	20	2	2	20
February	20	2	2	20
		22	21	

PDP-7				
2/20/65 - in W.I.P.				17
March 1965	17	4	3	18
April	18	6	5	19
May	19	5	6	18
June	18	5	7	16
July	16	5	5 demos	
			8	8
August	8	5	5	8
September	8	5	5	8

PDP-7 (cont.)

October	8	5	5	8
November	8	5	5	8
December	8	5	2	11
January 1966	11	5	2	14
February	14	5	1	18
		60	59	

PDP-8

2/20/65 - in W.I.P.				0
March 1965	0	10	0	10
April	10	10	2	18
May	18	20	4	34
June	34	20	6	48
July	48	20	18	50
August	50	20	16	54
September	54	16	21	49
October	49	16	20	45
November	45	16	20	41
December	41	16	20	37
January 1966	37	16	25	28
February	28	16	25	19
		196	177	

LINC

2/20/65 - in W.I.P.				8
March 1965	8	1	1	8
April	8	1	1	8
May	8	1	1	8
June	8	1	1	8
July	8	1	1	8
August	8	1	1	8
September	8	1	1	8
October	8	1	1	8
November	8	1	1	8
December	8	1	1	8
January 1966	8	1	1	8
February	8	1	1	8
		12	12	

INTEROFFICE MEMORANDUM

DATE March 4, 1965

SUBJECT

TO Stan Olsen
Nick Mazzarese
Ken Olsen
Harlan Anderson

FROM Ted Johnson

You will be interested in the attached questions from the Sales Meeting Questionnaire:

1.) What should our next computer be?

2.) What technical information would help you the most?

TJ/mr

SALES MEETING QUESTIONNAIRE

Question No. 15 Part No.

What should our next computer be?

R. Ockley	32 Bit; 1.5 μsec ; $120K
J. Murphy	32-36 Bit; $150 - 200 K; Hardware Index registers
D. Denniston	32 Bits; PDP-6 type I/O Bus.
R. Stiver	24-32 Bits; $90K - $110K
K. Weir	Smaller PDP-8 with Card Input (Cheap)
D. Barker	32 Bit SDS 930 at 930 Price
R. Lindsay	More Inst. than PDP-7; as much time sharing hardware as possible
H. Painter	24 Bit PDP-7
D. Henderson	Competition for SDS 930 in the simulation and telemetry field
J. O'Connell	32 Bits - between PDP-7 and 6
S. Olsen	36 Bits, $100 K, program compatible with PDP-6
N. Mazzarese	32 Bit, 1μsec, 3 Index Register basic 4K system $99K
T. Johnson	32 Bit; 16K Addressable, 16 word Scratch Pad, Index Registers, HS Channels, auto priority Interrupt
J. Burley	24 Bit PDP-1. $55K-$60K
J. Jones	32 Bit; 1.5 μsec; $140K for 8K memory and fast P.T. I/O
D. Cotton	Variable word length; $100K and up
R. Bocek	Scratchpad
R. Beldon	3 μsec; 32-36 Bit; Multiple Index Register; Data Channel
A. Titcomb	32 Bit; $100K; few cables; strong I/O Interface; Index Register; expandable, fast, easy to learn.
M. Ford	
R. Buiten	Fast 32 Bit; 8-16K Memory; $100 K
G. Rice	Between PDP-7 - 6; No more than $100K; maybe machine compat. with IBM 360
F. Gould	24 - 32 Bit
C. Kotsaftis	
R. Maxcy	Flip Chip PDP-6

SALES MEETING QUESTIONNAIRE Question No. 14 Part No.

What technical information would help you the most?

R. Oakley	Price on Relay Buffers; Sensing: ADC with Multiple 50 M.V. inputs. General process control Industry Standard for PDP-7, 8.
J. Murphy	Logic problems and answers incurred while building our computers to pass on to module users
D. Denniston	Module Applications
R. Stiver	Specifications
K. Weir	Notebooks of the PDP-8 style
D. Barker	Logic Design, 7, 8 operation and I/O Theory of Interface
R. Lindsay	Computer Application notes and Module Application Notes
H. Painter	Programming, straight forward machine language application notes
D. Henderson	PDP-7, 8 Real time application notes PDP-6 Software literature
J. O'Connell	Good Module Catalog Application notes with module lists.
S. Olsen	
N. Mazzarese	Programming Application Notes
T. Johnson	Programming Concepts and circuit details and technology
J. Burley	Circuit and Software
J. Jones	Good 340 Brochure
D. Cotton	
R. Bocek	Course Workbooks on PDP's
R. Beldon	Computer Interface Information
A. Titcomb	Programming
M. Ford	Clearly defined Interface information for PDP-7, 8
R. Buiten	Everything
G. Rice	Type of logic we use and why
F. Gould	Computer specs. Programming
C. Kotsaftis	Programming for small computers
R. Maxcy	An opportunity to design with modules

INTEROFFICE MEMORANDUM

DATE March 3, 1965

SUBJECT

TO Nick Mazzarese
Ken Olsen
Win Hindle
Stan Olsen
Harlan Anderson

FROM Ted Johnson

It looks like Sol Zasloff has been given a sizeable mandate to build New York facilities. Note Dave Denniston's SDS comments.

Ted

TJ/mr

MAR 1 1965

dec INTEROFFICE MEMORANDUM

DATE 2.25.65

SUBJECT INFORMATION FOR SALES NEWSLETTER

TO Ted Johnson

FROM Dave Denniston
New York Office

IBM 1130

I hope someone can clear up the question areas on the 1130 fairly quickly. I was recently talking with one of our customers who feels that the 1130 is clearly the machine to get if you are going to rent, but the -8 is the machine to buy. He does have the manual on the 1130 and he claims it has a 6 hierarchy channel priority interrupt and that it does have memory stealing which may be (probably) gotten into if the disc is not used. Also their line printer works through a rather crude data channel according to this particular customer. Also it takes a good deal of programming time setting up a line of print with one cycle for each character in the character set on the line printer. According to the manual that he had, they could not be absolutely positive, but it looked as if input code from the keyboard of the Selectric is Hollerith, but the output to the typewriter is not, which means a rather messy conversion table.

SDS

I was recently talking with Robin White who works in SDS's New York Office. (Iknew him personally before he went to SDS). 92 delivery is scheduled for the end of February--the first machine. He claims they now have 3 working 92's.

Their New York Office is growing in leaps and bounds. They presently have 6 salesmen and a couple of systems analysts and are pushing for prestige sales. They are moving into, as Robin described it, a "plush" suite in Manhattan for sales and maintaining field service in Kew Gardens. They plan to have the full treatment with carpets, a large 930 system, etc.

DBD:BMP

dec INTEROFFICE MEMORANDUM

DATE March 2, 1965

SUBJECT Evaluation of Small Computer Marketing Possibilities as requested

TO Ken Olsen

FROM Jim Burley

Would it be attractive for DEC to:

I. Offer a very low-cost copy of an existing popular drum or disc machine such as LGP-21 or G-15?

II. Build our own design in a very low cost ($8k) disc machine?

III. Strip the PDP-8 of non-essentials to reduce the price as much as possible?

IV. What else could we do?

I. The biggest argument for copying an existing drum or disc machine is we would have "all that software" at our disposal (our customers'). Also, there already has been created an acceptance for these designs. As it turns out, however, it seems we would be choosing a diminishing rather than growing market.

Note the following:

1. Last year, LGP sold only 100 machines and virtually all of these went to the Civil Engineering Market.

2. They made significant attempts at getting into other markets including their hiring four consulting firms (furnishing two with computers) to discover markets other than C. E. All four firms failed.

3. Their market is, in general, both harder to sell, and once sold, it requires more support. There were 25 field-based programmers supporting LGP installations last year.

4. To sell this market, we would almost have to assign special salesmen. The type of selling is different; we would be calling on different firms; these are in different physical locations from our present market, etc. Besides our not knowing the market, the market <u>does not know us</u>.

5. General purpose compilers just don't appear satisfactory with these machines, being serial and very slow. They mostly use interpretive systems. The RPC 4000 reportedly has one of the best compilers, an ALGOL type, and even it doesn't meet with much acceptance.

6. The replacement market will be captured by more, not less, powerful machines. Monrobot, Clary, PDS have tried to get into the C. E. field with lower priced gear, but without success.

7. More and more used drum, disc, and delay-line type machines are being made available for sales and rent. These low-cost machines will be very attractive to the small firms that would provide the bulk of the market.

II. The marketability of a very low cost ($8k) disc memory computer doesn't look too promising. There are machines on the market now which approach this figure but which havn't sold well. A new software package would have to be developed.

Note the following:

1. Machines near to this figure in price (factor of 2 or less) are the DSI-1000, LGP-21, LGP-30, HW-15K, DE-60.

2. The inherent advantages of the core machine are becoming more known among the non-technically oriented segment of the market, making it more and more difficult to sell a non-core machine.

3. Creating legitimate compilers for slow serial machines is difficult and in large yields unsatisfactory results.

4. Our sales and field-service force would have to learn a new type computer, quite different in personality to our core machines. Considerable retraining would be involved.

5. To make this program successful, we would have to sell probably 200-300 machines (finance the software program, engineering, etc.). To sell this many would be a considerable, if not impossible, task.

6. Our selling point would be based almost entirely on price--a new position for DEC.

7. Since it would be the least expensive, legitimate, stored-program machine on the market, it very well might find large acceptance in schools and universities as a training machine, in spite of the disadvantages of it's memory. (The Mathatron at $3500 doesn't offer much other than arithmetic power.)

III. The idea of reducing the price of the PDP-8 is a bold and interesting one. With the acceptance it has already met, (89 machines to date without even a prototype working) it is destined to be one of the most successful of the small GP machines. Our competition is already a bit demoralized about the small machine market and a bold move now would possibly really entrench us in a monopolized market level.

If we could justify getting the price to say $12k by reducing the non-essentials to a minimum and eliminating field service (handle solely like an instrument) then not only would we solidify our present position (always in jeopardy) but we would also create a new computer buying group in the market.

This group would consist of companies and users now buying hard-wired systems from Hewlett-Packard and others. The hard-wired system is our next challenge. The success we've already had in the high-energy physics field should tempt us further.

A memo follows and comments on reducing PDP-8.

One important suggestion: Any outgrowth of the PDP-8 must be called PDP-8A. (It would have been a good move to have named the PDP-8 the PDP-5A.) Marketing wise, this is most important. (I'd be happy to discuss this further if need be.)

IV. An interesting possibility for us would be to copy the IBM-1130, but at a lower price, of course, viz-a-viz Spectra and the 360 series.

IBM obviously (I hope) must create enough demand for the 1130 to sell a lot of them. They simply can't afford to sell 100 of anything that cheap. The backwash of such a campaign might provide us enough market to make it profitable. We would try to take advantage of the software although we would have to be cautious in this area.

For whatever reason IBM entered the "cheapy" market (excluding a diversionary tactic) it makes me feel they have confidence in the marketability of such a package.

If we could outperform it at 1/2 to 2/3 the price, then we might have something really saleable.

KHO

digital EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

SALES CALL REPORT NO. 9120

DATE March 1, 1965

FIRM Robert Laskow and Company, Inc.
STREET 1455 North State Parkway
CITY Chicago 4, Illinois

SALESMAN Harlan Anderson
OFFICE AREA Administration - Maynard
AREA CODE PHONE NO.
PHONE (OURS ~~THEIRS~~) ☐ LETTER ☐ VISIT ☒

PERSONS CONTACTED: Robert Laskow
EXTENSION:

EST. ANNUAL POT.	CK.		CK.	PRODUCT	CK.	TYPE
		NEW		MODULES		
UNDER $20K		OLD		A/D		
$20 - 50K		HIGH		COMPUTORS		
$50 - 150K		MED.		SPECIAL SYSTEMS		
$150K UP		LOW		OTHER		

REMARKS

Tom Quinn and I visited Mr. Laskow on Tuesday, February 23rd to further acquaint ourselves with his operation and proposal described in his letter to Ken Olsen dated January 26, 1965. His proposal briefly is that we sell him PDP-8 computers which he would use for production control systems that he would lease to his clients. He proposed that we loan him $25,000 for three years to be used as working capital.

Mr. Laskow is an energetic and an enthusiastic person who has just recently gone into business for himself. He is an Attorney and was Head of the Underwriting Department of Rothschild. His present operations began about 18 months ago. It appears that he has started with very minimal capital and is essentially operating like a tiny holding company. He has major investment interests in five companies. I would guess that each of these companies has a key entrepreneur who owns the remaining part of each company. These companies are described below:

1. Information Processing of Racine, Wisconsin. This is apparently 18 months old and rents its own punch card equipment and rents time on an hourly basis on IBM 1401 computers when required. It is the oldest of the operations and apparently concentrates on doing data processing jobs of large companies for the departments that do not control the computer within the company (Accounting Department). This means that they frequently find themselves doing jobs for Production Department and providing one day response time. This operation is using the punch card equipment 24 hours a day.

2. Data Processing Institute, Racine, Wisconsin. This is a school which is intended to train programmers, system analysts and key punch operators. It has been in business for about 14 months. It trains about 40 to 60 people every two months and they soon plan to add teletype training.

3. Distributor Data Processors, Chicago, Illinois. This operation is run by a man named George Fehlmann who has other interests besides this. Their function is to provide invoicing services similar to what Adams Associates are planning to provide only on a much smaller scale. They will be using on line teletypes connected to paper tape punches at a central location and the actual updating will not be done on line but will be done by processing a paper tape at the central location. This is quite a new operation and they plan to put their first customer in operation in two months.

ACTION TO BE TAKEN

Follow up action - Initiate reference checks and send a letter to him within three weeks.

FOLLOW-UP DATE BY

SPECIAL COPIES TO

SALESMAN'S COPY

4. Scientific Computer Laboratories, 220 North LaSalle Street, Chicago, Illinois. This company provides mathematical consulting, programming, and etc. for engineering-oriented clients. They have done work in strain analysis, and etc.

5. Production Control Systems, Inc.. This is the operation in which he would like to use a PDP-8 and the key man in charge of it has a production control background. They are interested in doing such things as providing five minute turn around on the earnings of piece-work employees so that it can be used as an incentive , etc. This will be located in Chicago and the plans are just now underway and the key man has been engaged, (I believe).

The combined employment of all of the above operations is 15 full time people. Twelve of these have extensive customer contacts. There are six principle employees who are, I would assume, Laskow and one person for each of the five companies above. Mr. Laskow provided us with two banking references. The first of these is Mr. George Cormac of the First National Bank of Racine, Wisconsin, and the second one is Mr.Peter Horne of Continental Illinois National Bank and Trust Company of Chicago. In addition, Mr. Laskow knows Charles Waite of AR&D.

I told Mr. Laskow that we would like to receive a financial forecast for this operation and he promised to mail one to us. Regarding the loan, he is very interested in not giving away any of the equity of these companies at the present time. He is quite flexible in the way in which the money might be provided. He figures that it will cost them $2,000 for start up cost for each installation that they place in a customer's plant. Therefore, he is willing to draw down this loan as they take delivery on each individual computer. Another possibility that he suggested would be the sharing of an office arrangement. I believe he plans to be in downtown Chicago so this probably would not be feasible at the moment. He buys programming consulting time to get each of these operations under way from Programmers who are associated with Illinois Institute of Technology, University of Wisconsin, or the University of Chicago.

Incidentally, the money he wants to borrow is for working capital purposes and is not to be used to finance the purchase of computers which he claims to have arranged for loan from commercial banks. My overall suggestion on Mr. Laskow is that we talk to Charlie Waite about him, check the bank references and review the financial forecast and if all these look reasonably good, we enter into some type of informal agreement with him where we do loan him the $25,000 for three years on the condition that he buys some quantity of PDP-8's such as ten. Incidentally, this is indeed the suggestion that was contained in his original letter which should be examined to obtain more detail of his proposition.

His correct telephone number is 944-3150 in Chicago. This is a one room office on the top floor of a very nice apartment building on the near nath side of Chicago. An alternate phone number is at Information Processing in Racine, Wisconsin which is area code 414, 633-8274.

Andy

HEA:ncs

INTEROFFICE MEMORANDUM

DATE March 1, 1965

SUBJECT Data Disc Delivery, March 12, Palo Alto, California

TO K. H. Olsen

FROM G. Bell

cc: R. L. Best
H. E. Anderson
N. Mazzarese
J. McKalip
H. Crouse

Today I ordered a Data Disc mechanical assembly for trial on our small computers. DD will sell us:

1. A disc capable of 4 m bits using 1 moving head for $5500 (2 weeks delivery).
2. 1 + Electronics for address seeking, and variable disc to fixed disc transfer electronics, etc. for $5500 + $3400 (70 day delivery). Their president, Armand Miller, does not like this because.
   a. The read amps are not so good, and they are designing better.
   b. The system is clocked, using the fixed disc. This seems to be bad, because of mechanical alignment, and also a self-clocked system would give much higher density (2000 bpi vs. 5000 bpi).
3. A fixed head system yielding 8 m bits, under development for 4 months delivery. - If this works, our PDP-6 drum could be simplified and replaced.

They are also giving us schematics of what circuitry they have, and we can buy cards if we want. I would like us to buy only 1 above and do complete development of Read/Write electronics, etc.

Using a very simple Self-clocked system the format would be:

1. Space neither 1 or 0 output, but 1 polarity flux.
2. Clock Bits to start timing oscillator.
3. Clock Sync Bit (a 1) (usually 10101 pattern)
4. Address.
5. Address Sync Bit.
6. Data, Parity.
7. Space.

Both 1 and 7 above are identical, and are determined by the speed variation of the motor. The computer should have the ability (perhaps an option) to write a complete data track. Let's discuss this now.

GB/mro

INTEROFFICE MEMORANDUM

DATE March 1, 1965

SUBJECT

TO K. Olsen

FROM D. Kuyamjian

The Type 500 Royal McBee punch in our Tape Duplicate/ Verify system is available as a self-contained desk-top unit, the Type 520. Maximum punching speeds are 50 cps synchronously, 30 cps asynchronously. Delivery is from stock, pricing:

1-9	$650.00
10-49	$585.00
50+	$526.50

Royal McBee is introducing their new 700 Series with prototypes available in a month, production unit by June. This new series will operate up to 75 cps, synchronous operation, and will run approximately $150.00 more than the Model 520.

Friden, Incorporated is also introducing a 75 cps 8 - level punch, the SP-4, which is designed to compete with Teletype's BRPE line. Friden claims their machine has a simplified design (no clutch assembly for one) and greater reliability. I will send you pricing information as soon as I receive it.

FRIDEN TAPE PUNCH
Model SP-4

INTRODUCTION

The Friden Model SP-4 Tape Punch is designed for recording information in punched paper tape at speeds between 30 and 75 codes per second. The punch mechanism is shock mounted in a vertical panel which can be provided in various widths, and a drive motor is mounted to the rear of the panel. A cover for the front of the punch mechanism is mounted on the panel, but no cabinet is ordinarily provided to support and enclose the panel and motor.

GENERAL DESIGN

The SP-4 Tape Punch involves a continuously running cam shaft which is not driven through a clutch for start - stop synchronizing operation at speeds above 30 codes per second. Accordingly, input control pulses must either be synchronized with the cam shaft rotation or an electronic register must be provided for holding input control pulses over a portion of the rotation of the cam shaft where these pulses cannot effectively control the punching operation. Each revolution of the cam shaft provides for the punching of four complete codes sequentially so that the cam shaft speed is one quarter the maximum code punching rate desired.

Up to eight transversely-spaced information or code holes can be punched in a tape plus a sprocket or feed hole. The punching of each of these nine holes is controlled by nine electromagnets, each magnet operating to cause punching of its corresponding hole when energized. Feeding of the tape to provide longitudinal code hole spacing is also under control of an electromagnet so that no tape feeding occurs unless this magnet is energized. Accordingly, if none of these ten electromagnets is energized, the cam shaft rotates without punching holes and without feeding tape.

Control pulses are supplied simultaneously through gating control contacts operated by cam shaft position to the electromagnet controlling sprocket hole punching, the electromagnet controlling tape feeding, plus the proper ones of the eight code hole electromagnets required to punch the desired code. In the sequence of mechanical operations following the energization of these electromagnets, the tape feed operation occurs before the punching of holes. This permits a deleting operation of the last code punched in a tape merely by supressing the pulse to the feed control electromagnet and supplying pulses to all the code hole punching electromagnets.

GENERAL SPECIFICATIONS

Tape Used - Normally provided for one inch wide tape, but special arrangements can be provided for using narrower tape.

GENERAL SPECIFICATIONS - cont'd.

Hole Size - Code holes are .072 inch and feed holes are .040 inch in diameter.

Hole Spacing - Holes are spaced one-tenth inch apart both longitudinally and horizontally. The feed hole is located .304 inch from the guide edge of the tape and transversely in line with the code holes.

Operating Speed - Recommended for operating in speed range between 30 and 75 codes per second with cam shaft speeds between 450 and 1125 revolutions per minute. Cam shaft is directly driver (without clutch) by a cog belt from the drive motor. Various cam shaft speeds can be provided within the above range, and it is recommended that a cam shaft speed be selected which is only slightly above that required for the maximum code punching rate. Either an induction or a synchronous motor can be provided, and the motor power requirements are about one-twelfth horsepower.

Control Electromagnets - All ten electromagnets are identical in design. Large size coils are provided to permit efficient design at various control voltages, and the armatures are light weight and operate without mechanical loading during selection periods. Various standard coils are available having nominal direct current resistances of 50, 120, 800, or 1500 ohms. A nominal pulse intensity of 100 milliamps is required for a nominal duration of 5 milliseconds.

Tape Check Contacts - A class C (transfer) contact mechanism is provided on the punch assembly and is operated in an abnormal position when there is no tape in the punch or when the tape hold down arm is not in proper position to hold the tape in feeding position against the sprocket wheel.

Cam Shaft Contacts - Two class A (make) contact assemblies are mounted on the punch mechanism for independent operation by cams adjustably mounted on the cam shaft. The cams are each designed to close the associated set of contacts once during each punching cycle or four times per revolution of the cam shaft.

Functional [illegible] - One class A (make) contact assembly is provided for operation by the tape feed actuating arm, and a similar contact assembly is provided for operation by each of the eight code hole punching levers and the feed hole punching lever. These latter nine contact assemblies are positively operated by their respective punching operations and can be used as parity checking or code verifying controls.

External Connections - An AMP Series M, 24 - position connector is mounted on the punch mechanism at the rear of the mounting panel. Both the male and female parts of the connector are supplied with the punch assembly.

GENERAL SPECIFICATIONS - cont'd.

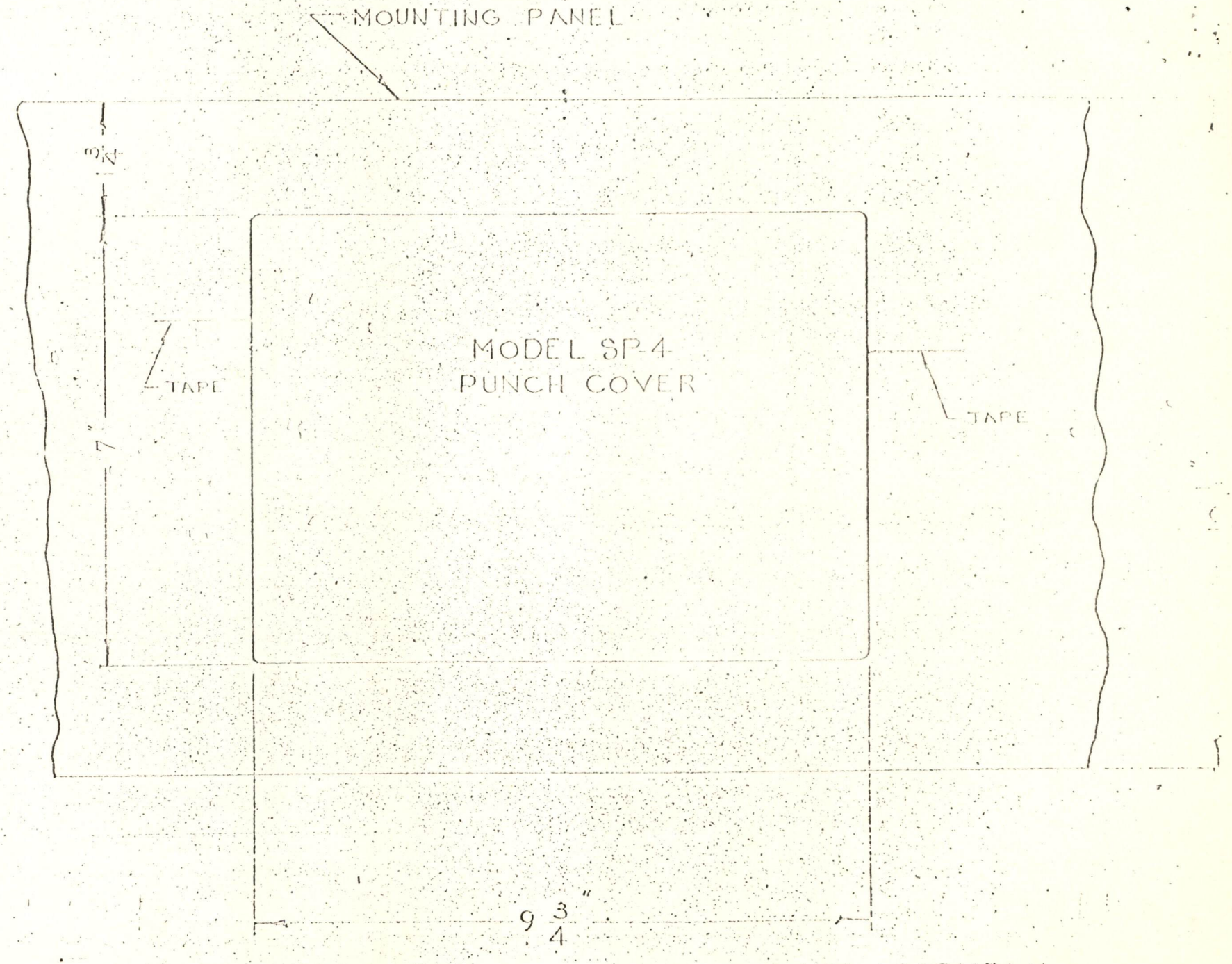
Chad Handling - A vertical chute is provided for conducting chad punched from the tape downwardly through the punch mechanism but no container is provided within the punch assembly for collecting the chad.

Punch Outer Cover - The front of the punch mechanism is normally enclosed by a two piece cover assembly mounted to the panel. The top portion of this cover assembly is mounted to swing out and down to provide access to the punching mechanism for loading tape and for manually feeding tape through the punch. A knob is provided on the sprocket wheel shaft for feeding tape manually in either direction, and a release lever is provided to permit manual rotation of the knob.

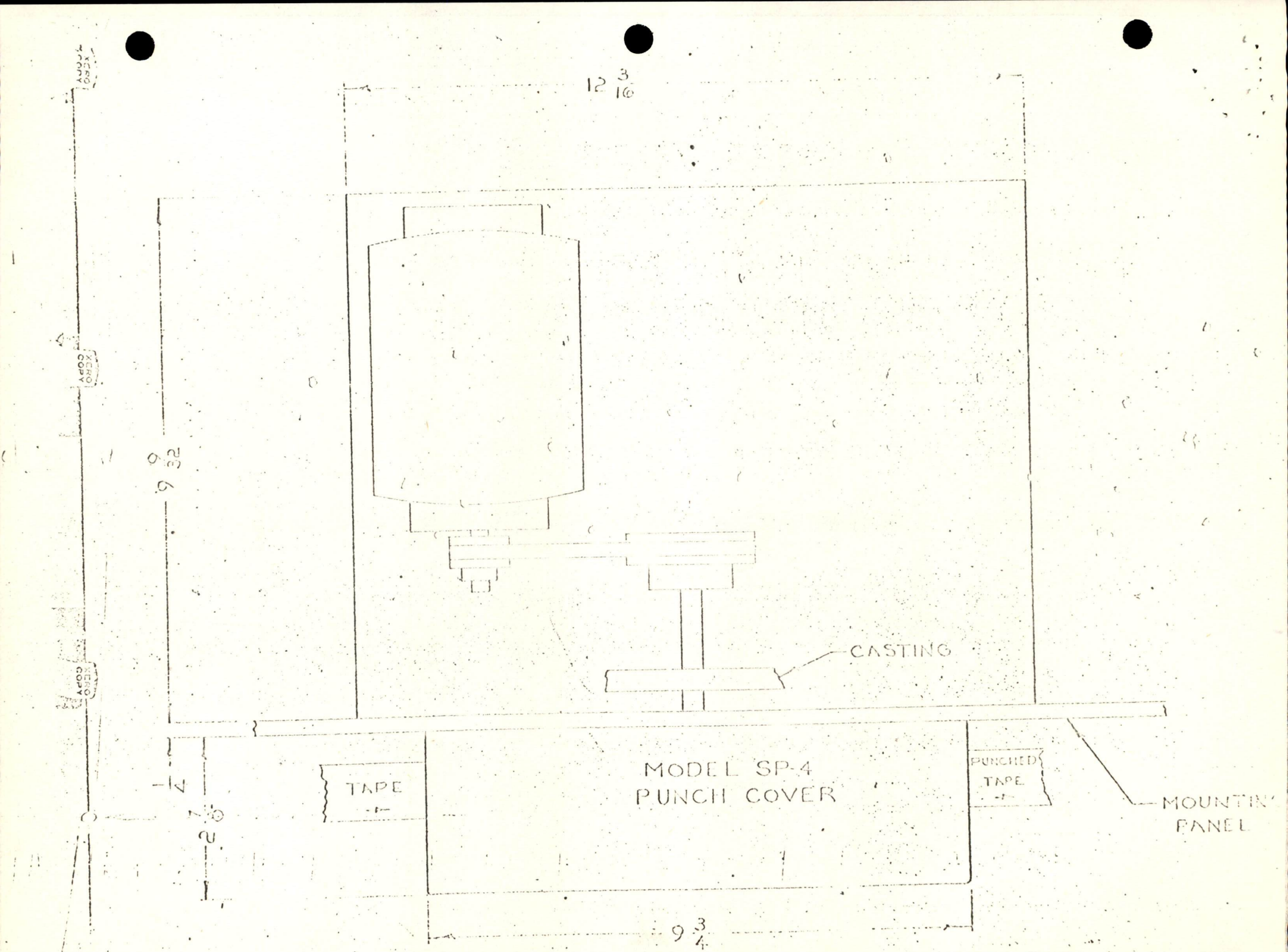
EOB/mq

E. O. Blodgett

December 28, 1964



FRONT VIEW OF MODEL SP-4 TAPE PUNCH AND PANEL ASSEMBLY



FOUR VIEW OF MODEL SP-4 TAPE PUNCH AND PANEL ASSEMBLY

INTEROFFICE MEMORANDUM

DATE February 24, 1965

SUBJECT Module Repair, Warranty and Return Policies

TO Stan Olsen FROM Frank Kalwell

CC: Ken Olsen
Dick Best
Ted Johnson
Jim Cudmore
Tom Whalen
Ray Michel

MODULE REPAIR:

I feel it is possibly the time to establish a repairing cost on modules that are returned for repair after the warranty has expired. During 1964, a total of 876 Lab. and System Modules were returned from customers. Jim Cudmore indicates that it cost DEC slightly over $10 to repair a module in the module repair department.

Considering the paper work required to process such modules plus the transportation cost of returning the units, the total is approximately $10, with an estimated total of $20 per module. Based on these costs, an estimate of total costs for repairing customer modules for 1964 would be $17,520.

Customers who call are amazed that this work is accomplished on a no-charge basis. Attached is a memo from Jim Cudmore which indicates the cost of repairing current drivers. I'm certain most customers would be receptive to paying a small amount to get a module repaired.

MODULE WARRANTY:

One area in our "Terms and Conditions" is the warranty clause which states that "Digital warrants all modules and accessories free from manufacturing, materials, and design defects for a period of six months after delivery. Any defective units will be either repaired, replaced, or the price thereof credited to the purchaser, at Digital's option."

The six month warranty could possibly be extended another six months. Presently our competitor, namely 3 C's, have a one year warranty and Packard Bell has a five year warranty. Presently our Pittsburgh office is negotiating a large 25K Lab. Module order with a customer and the warranty will be the determining factor on who gets the order. I'd like to see our warranty extended to one year

MODULE WARRANTY (cont.):

on modules and accessories, and modules returned after one year to be repaired would be charged a flat fee for handling.

RETURN POLICY:

From time to time, customers return units for credit after one year from purchase date. The majority of the units have never been used but require retesting and checking which is extremely costly. I would like comments on possibly including in our next revision of "Terms and Conditions", a merchandise return policy which would be as follows.

If merchandise is returned to us, please ship prepaid. Include full information regarding date of order, order number, invoice number and reason for return. Items manufactured specifically for you (if work has begun) cannot be cancelled without authorization from home office. A rehandling charge of 10% will be charged for all returned units.

Possibly the Module Guidance Committee could discuss these topics further.

INTEROFFICE MEMORANDUM

DATE December 4, 1964

SUBJECT REPAIR OF CURRENT DRIVERS

TO Frank Kalwell FROM Jim Cudmore

1) The time has come to establish a repair charge for current drivers. The cost of fixing a 52, 53, 62 or 63 I would estimate at $30. The cost of fixing a 58 or 68 is closer to $50. I don't think Digital should continue to absorb these costs.

2) Arthur Parks has seven "modified" 53 and 63 current drivers. These units were modified for Ferroxcube and RCA by Special Systems to be similar to 58's and 68's. These units are a mess. They would probably cost about $100 each to repair.

3) Early 58's, 68's and the seven drivers mentioned above require a transistor which is no longer available. These transistors can be had for a premium price of $50 - $100. There are six of these transistors in each 58 and 68.

COMPANY CONFIDENTIAL

+ 15

KHO

file

PRODUCT ASSURANCE ORGANIZATION PLAN

Submitted by:
R. Hughes
C. Gadzinski

February 19, 1965

1

INDEX

PURPOSE

The purpose of this organization plan is to describe the work and the organization of work of a proposed Product Assurance function. Staffing and transitional plans are provided as well as operating details.

INTRODUCTION

An organization plan concerns people and their effective use. Part of the organization plan is concerned with logical listing and sub grouping of work. An organization chart is a convenient and generally acceptable way of displaying this grouping. Unfortunately, we must assign people to the organization and this act by its very nature creates problems – it demonstrates a pecking order. Hence, no organization plan is complete which fails to take into consideration the feelings and sensibilities of the people involved.

In the plan proposed, we have outlined an organization structure and have indicated those people who we feel are qualified to discharge the responsibilities of the positions designated. We have also proposed an outline for the introduction of this plan. Finally, we have listed the operating principles by which we will manage the organization. We have listed the principles only, rather than listing the results expected because in order to plan for results one must be intimate with the details of operation. It was our judgement that in order to do this we would have been forced to reveal our hand on a tentative plan – which would have created problems. However, you may be fully assured that within three weeks after the initiation of this program a detail plan will be prepared listing accomplishment milestones for your review and control.

ORGANIZATION STRUCTURE

An organization structure is described in Attachment I. The concept behind this structure is to identify and control staff and line activities. Line activities are listed as Test and Inspection. Their mission is to perform all tests and inspections and to certify that the product is essentially free of defects and that it is suitable for delivery to the customer. Staff activities are listed as Test, Project Engineering, Test Equipment Design, and Administration and Audit. The responsibilities of these activities are to provide technical direction and support to the line functions. In establishing these two functions we are attempting to separate the thinking from the doing. Since experience indicates that trying to combine the two produces neither good thinking nor efficient doing. This subdivision of labor will also permit the more efficient utilization of manpower. This will be accomplished by having the Test Project Engineering function prepare detailed test procedures which can be executed by semi-skilled personnel. Now, the mix between engineering capacity and technician capability can be controlled through the level of detail expected of the procedure. As an example, consider an operation which classifies its testers as A through F; A, indicating a high degree of competence, and F, indicating a low degree of comptence. A, being capable of a high diversity of work. F, indicating a low diversity of work. This kind of classification permits the Product Assurance Manager to specify the skill level mix by which he wants to manage his operation. And, in turn this specifies the level of detail which will be required of his procedure writing function. Obviously, completely automated testing routines are also considered in this concept.

This organization structure further permits the concentration of test planning effort and thus assures that a total test planning job is done. It also permits for the direction of generations of test equipment. By total test planning we mean the relating of one inspection and test operation to the next thereby eliminating a costly duplication of effort. Vendor Certification, off line test, and module test are examples of areas where this integration will be facilitated. By generations of test equipment we mean

going from bread board test equipment, to semi-automated test equipment. Obviously, this effort would be in consonance with the efforts at product development and certainly product volume. However, the fact that an organization is established with this as its singular responsibility assures that this action will take place and that the efficiencies that it portends will occur.

TRANSITIONAL PROBLEMS

Two alternatives are apparent for the introduction of this change. One, is to gradually absorb the organizational components one at a time. The other, is to absorb all of the organizations at once. It is our considered judgement that the latter course of action be followed. This judgement is based upon the following premises:

1. Once the first organization change had occurred, the remaining functions would become apprehensive and this apprehension could only be negative in character.

2. By taking over the entire activity at once, permits for a greater flexibility in terms of manpower utilization.

3. Since the change will not seriously disrupt the existing organizational patterns in terms of technical direction and supervision of work, there should be a minimum of interference with the flow of present activity.

As far as announcing the change the following procedure is recommended:

1. All of the affected people should be called together and told what will be the organization structure and why. At this time only questions concerning the organization form should be entertained. There should be no discussion of why or of alternatives.

2. Immediately after this meeting the affected individuals should be talked to separately and individually and before they have an opportunity to get back to their respective organization – (let's not give them an opportunity to subvert the plan with their subordinates before we have had an opportunity to sell them completely on it.)

3. During the interview which should occur with Ken Olsen, Bob Hughes, and Chet Gadzinski present, the affected individual should be given an opportunity for a frank discussion of his feelings toward the change and to the people involved. Once again, the initiative should not be passed out of Ken Olsen's hands. The person must be made to understand that this change is best for the general welfare of the company and that this position has been deemed most appropriate for his talents. It must be implied but not spoken that other than this there are no other opportunities in the company. We recognize that this procedure sounds a bit high handed; but, in view of the deep emotions which will be unleashed at this time the only procedure which stands any chance of success is one of dispassion and objectivity.

4. Following the interview each of the affected organizations should be addressed by Bob Hughes and the affected individual. Once again their should be immediate interviews with affected key subordinates and the methods outlined in 3. above should be applied.

5. Finally on the day of announcement a newsletter and bulletin board notice should be sent out to all supervisors and employees. Such a letter is provided as Attachment II.

6. Should anyone wish to terminate rather than accept the new situation, he should be given his severance pay that day and directed to leave the premises. (Of course this should be done only as a last resort – but, again we must minimize all opportunities for negative or destructive criticism.)

7. For those who are strongly opposed to the organization plan, but who we feel are worth keeping we can offer two inducements:

    1. An immediate salary increase (the amount depending upon the salary level and time period since last salary review).

2. Transfer opportunities should be offered however conditionally. These conditions to be:

   a. There must be a real opportunity for transfer.
   b. The person must give the job a try for at least a month.
   c. There shall be no evidence of half-hearted effort or destructive criticism of the organization or leadership involved during this month's period.

OPERATING PROCEDURES

A work simplification and work measurement program will be initiated in each of the areas of activity of the Product Assurance function.

This work will include:

1. Evaluating each area as to volume of work that it is to perform.
   a. In the module area:
      1. How many modules are being produced.
      2. What types of modules are being produced.
      3. What is the expected volume on each type of module.
      4. What is the expected conversion rate to FLIP CHIP modules. (C. Gadzinski has data available on this)
   b. In the peripheral equipment test area:
      1. What pieces of peripheral equipment are on order and when are they expected to be received.
      2. What are the production requirements.
      3. What pieces of peripheral equipment have purchase specs covering them.
      4. What vendors are supplying data with each order and how reliable is the data.
      5. How soon will we be able to develop a Vendor Certification program.

      (Gadzinski has data on 1, 3, 4, and 5.)

c. In the area of Computer Checkout:

1. What are the number and type of computers on order and when are they to be delivered.
2. Do detailed schedules and plans exist for checking out each computer type.

2. Evaluating existing test plans and test programs to accomplishing this work.

3. Preparing simplified test programs and test procedures to accomplish this work. This will be done by breaking each task down into a logical sequence. Determining what would be required to accomplish this work. Evaluating the alternatives thus uncovered and initiating a course of action, keeping in mind the principles described earlier with respect to skill levels and skill level mix required to accomplish this task.

4. Finally time standards will be established for each testing function. At first these may be rather gross standards. They will be prepared keeping in mind the fact that faults will occur and will need to be sought and corrected. However, systematically recording the faults and pursuing effective corrective action should eliminate a certain portion. Also, establishing a maximum limit for trouble shooting should provide a control on malingering or point up needs for additional training. If the tester could not diagnose the cause of failures within a specified period of time, more experienced testers can be called in to assist.

We have not mentioned the activities of the Administrative and Audit function of our organization. This function is to provide the unifying procedures for the entire activity and through their audit services assure that they are being followed. The audit function will also be directed to measure the degree of conformance which

the tester applies in following the detailed procedure provided him by Test, Project Engineering. We have a start on this activity in the present Quality Control Manual that we employ. In addition, this group will be charged with the responsibility for developing budgets and schedules for the Product Assurance Organization and assuring conformance.

SUMMARY

In the foregoing pages we have outlined an organizational plan, and described how to bring it about. In this latter process we outlined an approach which takes into account the feelings and sensibilities of the affected people and permits for an opportunity to control them. In addition, we have outlined some operating procedures which will assure the organization's success.

We are prepared to begin this enterprise immediately and welcome the opportunity to do so. We fully recognize the challenges and responsibilities this entails and appreciate the confidence you place in us. It shall be our endeavor to do our utmost to prove worthy of this confidence.

ATTACHMENT 1.

PRODUCT ASSURANCE
R. HUGHES MANAGER

TEST, PROJECT ENGINEERING
E. HARWOOD MGR

1. TEST PLAN'G
2. TEST METHODS
3. TEST PROC'DS.
4. TROUBLE SHOOT'G
5. FAILURE ANALYSIS
6. DATA ACQUISITION PLAN'G & ANALYSIS
7. RELIABILITY ENG'G.

TEST EQUIP. DESIGN
W. LONG MGR.

1. DESIGN TEST EQUIP
2. DESIGN SPEC INSP EQUIP
3. BUILD OR BUY TEST & INSP EQUIP
4. MAINTAIN ALL INSP & TEST EQUIP
5. CALIBRATE ALL INSP & TEST EQUIP
6. MAINTAIN INVENTORY OF ALL INSP & TEST EQUIP.

TEST
R BECKMAN MGR

1. PERFORM ALL TESTS

INSPECTION
K. DOERING MGR.

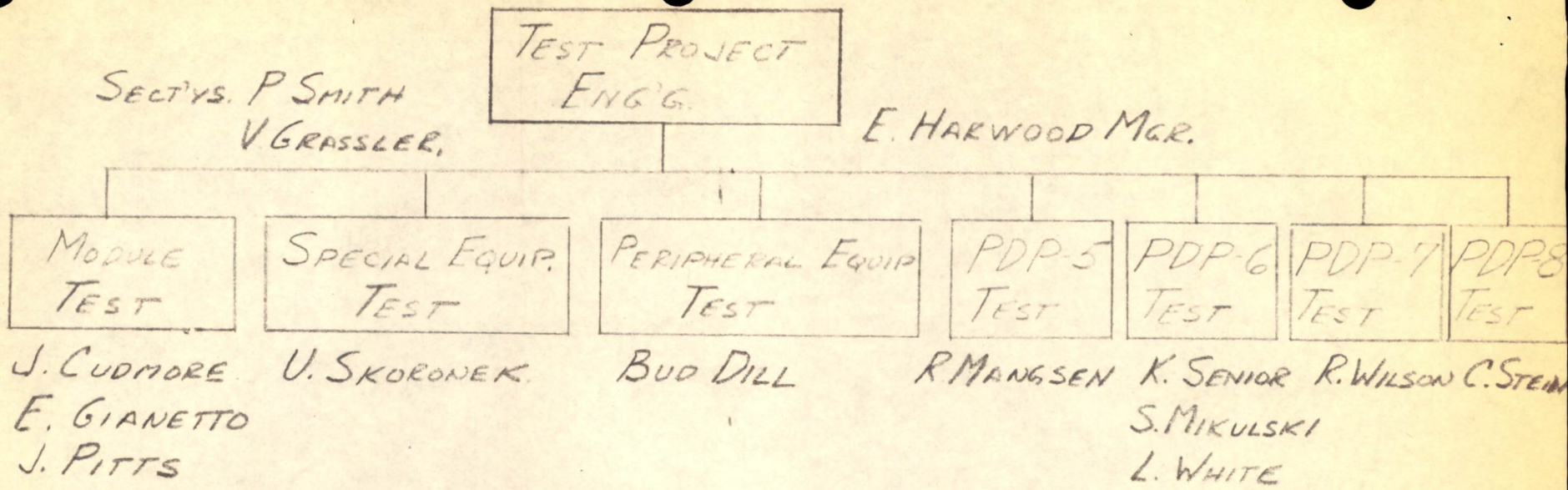
1. PERFORM ALL REC'G. & IN-PROCESS INSP & TEST

ADMIN & AUDIT
R. PATE MGR

1. WRITE INTERNAL Q.C. PROCEDURES & POLICIES
2. PREPARE & MAINTAIN BUDGETS & SCHEDS
3. AUDIT CONFORMANCE TO ESTABLISHED POLICIES & PROC.
4. TRAIN'G
5. RECORD KEEPING.

PERSONNEL REQ.

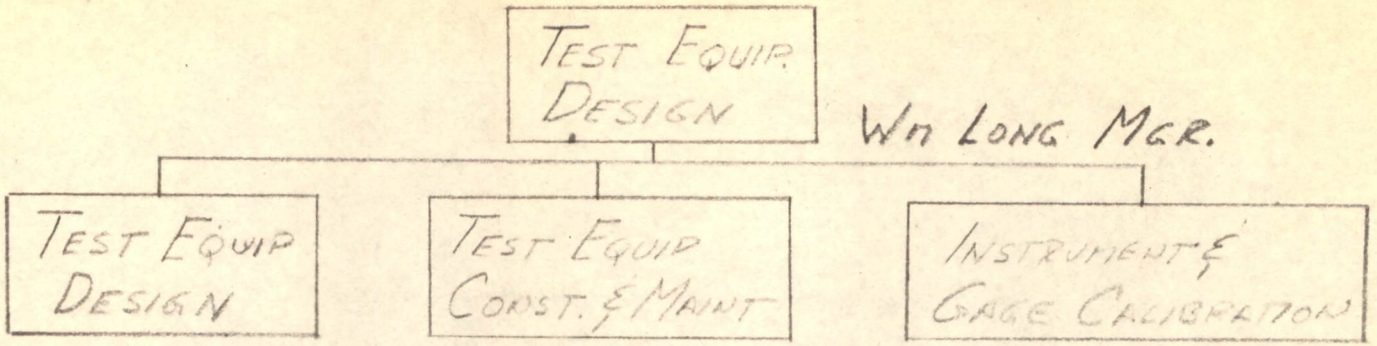
6. MGRS.	1. DRAFTSMAN.
5. SECRETARIES.	5 LEADMAN.
3 SUPERVISORS.	72 INSPECTOR/TESTORS.
18 ENG/TECHS.	112 PEOPLE TOTAL.
2. WIREMEN.	



PERSONNEL

1. MGR.
2 SECT'YS.
11. ENG'S/TECH

14. TOTAL.

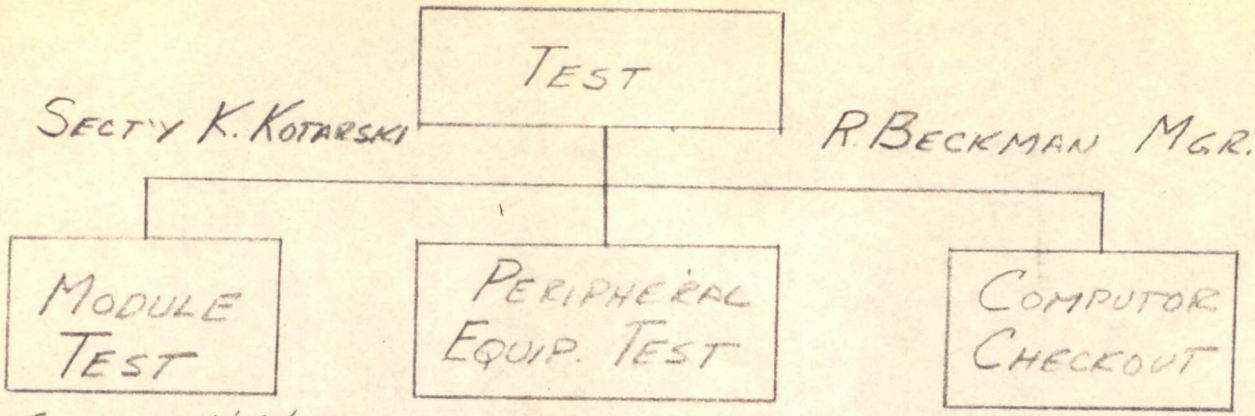


T. LEONARD
D. PINKNEY
1 ADD'L MAN
1. DRAFTSMAN.

2 MEN

MECH. D. CLARK
ELECT. WM. TITLEBAUM
M LIBEN
J. TRUBIANO

1. MGR. (ENG'G.
3. ENGINEERS
2. WIREMEN.
4 TECH
1. DRAFTSMAN.
11. TOTAL

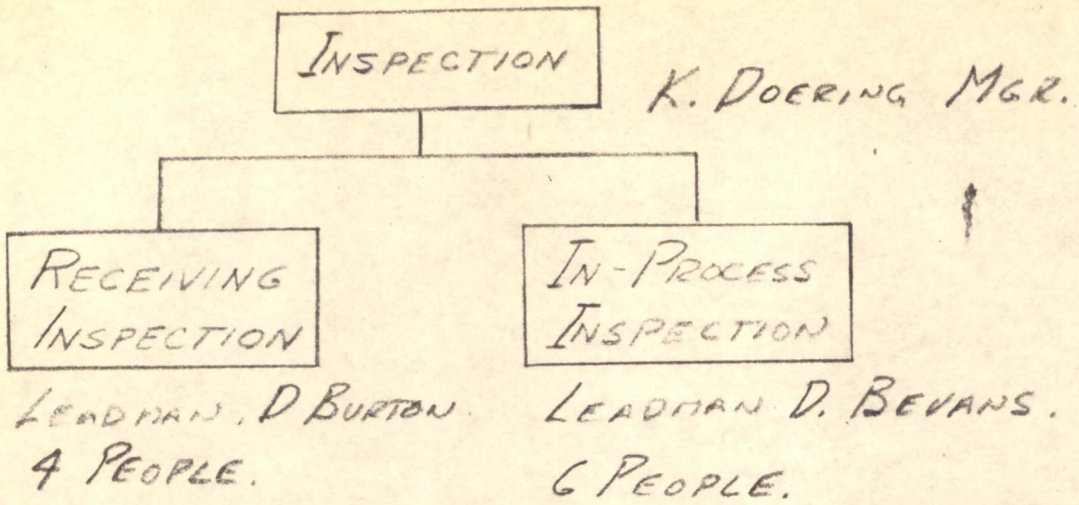


SUPER. H. NORTON
21. PEOPLE
1 LEADMAN

SUPER. J. GODBOUT
14 PEOPLE.

SUPER: R. MANGSEN
LEADMAN W VAILLANCOURT
LEADMAN J. WILLIAMS
32 PEOPLE.

1 MGR..
1 SECTY
3 SUPERVISORS.
3 LEADMAN
62 PEOPLE.
70 TOTAL.



1 FOREMAN
2. LEADMAN.
10 PEOPLE.

ATTACHMENT II

To All Digital Equipment Employees.

As our company has grown we have continually tried to respond to the new conditions this growth created. For many months we have been concerned with the better integration of our test and quality control activities. We have retained the service of Reliability Dynamics Institute, Consultants in Reliability and Quality Control to assist us in developing a plan in this area of endeavor.

The facts uncovered undeniably suggest that a single organizational component concerned with the total quality control job is in order.

We are fortunate to have an experienced and willing member of our staff who we have confidence in to discharge this responsibility.

Henceforth, a Product Assurance organization is established with Robert Hughes as Manager. This organization is responsible for all test and inspection activities as well as reliability and quality control.

We recognize that the quality for which we have become noted is more than organization – it is the willful and imaginative concern of all of our people. I trust that you will continue to exercise this concern and lend Mr. Hughes and his organization your full cooperation.

Kenneth H. Olsen

COMPANY CONFIDENTIAL

MARKETING REPORT PDP-6

Submitted by:
C. Gadzinski
S. Radler
Consultants R.D.I.

February 17, 1965

INDEX

PURPOSE

The purpose of this report is to summarize findings, conclusions, and alternatives which have been uncovered in our survey of the PDP-6 Marketing Effort.

INTRODUCTION

A Marketing Plan begins with a recognition of a need and proceeds through developing products or services which will fulfill the need. It isn't enough to develop products,one must also develop means for getting the products to market. Certainly timing the products entry into the market becomes an equally important task. Looking at it another way, one must know what business he is in (what need is he trying to serve), know how much business is available (total market potential), know how much of the available business he would want, decide how much business he could get (rightful share of the market), and finally develop the means to get it. This latter means not only advertising and sales promotion but also the ability to follow through with field sales effort. It is these principles which we will keep in mind as we evaluate the PDP-6 Marketing Plan.

SUMMARY

Two conclusions are apparent as one reviews the data:

1. That although no total marketing effort was made with the PDP-6, sales have been generated. Our inquiries remain high and efforts are underway to maintain a high rate of inquiries. If we can assume an expanding market for this computer and further assume that we can continue to convert at the demonstrated rate, there should be no problem in meeting our modest sales goals.

2. We have not really zeroed in on a segment of the market in which we can best utilize our strengths. No organized or penetrating effort has been established which would provide the data to enable us to do so. Hence, a market survey is in order.

STATUS REPORT

Market Need

A product plan defining the market need which the PDP-6 is to fulfill is not in evidence. Hence, a market has not been defined, nor a rightful share established, nor programs developed whereby this share could be realized. This fact is central in any further evaluation.

Promotions and Sales Effort

The PDP-6 was introduced approximately one year ago. Since that time 5 new product releases, 3 new literature releases, order and delivery releases were sent to the press. Features were placed in "Datamation","Business Week" and other suitable magazines. One direct mail piece was sent to the existing DEC mailing list.

The result of these promotional efforts brought in 2100 inquiries and 150 direct correspondence. From these inquiries, 8 computers were sold totalling approximately 3.5 million dollars in sales*.

To date no space advertising has been placed because up to recently promotion direction was unresolved. Jack Atwood says that we are now prepared to 1) sell equipment capability, and 2) educate a select market on the advantages of Scientific Data Processing (Biomedical, Oceanographic, Physical Sciences, and etc.). Because the well defined computer market is highly competitive, it is the opinion of most of DEC's personnel that sales promotions should be directed at a given segment of the total market.

---

*However, in this same period of time over 900 million dollars worth of comparable computers were sold. (See "Computers and Automation" January 1965 - Monthly Computer Census) DEC's share of the total market is then measured at 0.4%.

For this reason advertising space will be placed in such media as "Industrial Research", "International Science and Technology", "Datamation", "ACM", "Computers and Automation", "Scientific American", "Nucleonics" (one shot) and the "Education Series of Time".

Obviously these promotions will attract attention from the scientific community as well as a small portion from the technical businessman with requirements for shared time computing facilities.

The PDP-6, it is felt, is well suited to the latter because its capabilities can be increased year by year. Also, a small university can, with adequate software, place a PDP-6 in their computer center to operate as an on-line system.

Concentration in the specific media mentioned is designed to create a market for the PDP-6 rather than compete with the CDC, IBM, GE, Univac and SDS lines in the wider and more competitive business market.

DEC plans to concentrate the placement of the PDP-6 in the Scientific and Control market as part of a total engineered system and disregard the Business Machine Market - at least until the experiences with Adams (the only business application sold) is evaluated. They plan to concentrate on organizations having IBM's 1401 (Business) and 704, 709, 1601, 1620, Bendix G-15, 30, and PDP-1. Further interest will be in Simulation Communications, PC, OL-RT, CC-TS, PD and Scientific areas when Fortran is developed. However, the decision to concentrate in the Scientific Computational area is evolving after the fact. At this time, we have not estimated how large this market is, how it is distributed or evaluated, how we could cover with our present sales force.

Sales

The PDP-6 Sales organization is composed of six full time sales engineers. Comment from Gerry Moore is that all 8 units were converted from inquiries; but, that all units were sold through sales management efforts rather than through sales staff. Indications are that six salesmen are devoting 60-90% of their time on PDP-6. It is further understood that the rest of the field force is devoting time to PDP-6 sales but has not been rewarded in sales to date. Significantly, the sales force is relatively new - it has come into being only within the last two years. The rocky mountain area of the country is not being covered. No intensive training programs for the existing sales force has been undertaken pertaining to the PDP-6. Indications are that field salesmen have not developed territories and routes but rather spend most of their time responding to inquiries on all product lines. There is also some evidence to indicate that they cannot keep up with the inquiries they are receiving. This would indicate that we either need more salesmen or that we should be more discriminating in our pursuit of leads.

The strengths of the sales force appear to be their technical ability. This is evident in the type of sales and customer that they have closed on. Usually, this has been the technical man on the job with the problem and authority to expend funds who was impressed with the "salesman's" ability to "solve" his problem.

This same characteristic is evident in the PDP-6 sales to date. If we disregard Adams Associates, the greater part of the remainder of our sales have been closed with strong technical people who have had a major influence in the outcome of the decision to buy. It is also significant that it is these same people who do not require a great deal of software or programming support - an area in which we are weak.

In a direct encounter with IBM at R.P.I., we found that the prestige factor weighed most heavily with the administrative people who finally influenced the decision in IBM's favor. In the present encounter with IBM at Washington State we can see to what lengths they will go in order to make a sale.

In sum with a relatively inexperienced sales force, who has had little opportunity to develop contacts, who has not been trained in their product, and who has no experience in executive selling, it is dubious whether we can develop any more sales in areas other than that which we have been servicing - the scientific community.

MARKETING

No organized or penetrating effort has been established which would provide data as to the size and distribution of the PDP-6 market area.

The June issue of "Computers and Automation" lists over 700 areas of application of computers. We have not evaluated which of these can be satisfied by the PDP-6. This same issue of "Computers and Automation" lists a Roster of School, College, and University Computer Centers. Although we wrote to each of these there is no evidence of a follow up campaign.

We have not directed efforts at the OEM market such as Foxboro, nor have we chosen to provide unsolicited proposals in areas where perhaps the client has not recognized that our computer can solve some of his major problems; viz, typesetting. Likewise, we have not exercised an option to show some potential clients how they could get funded from N.S.F. and H.E.W. to establish facilities utilizing our equipment.

Some of the Problems

1. DEC has lost sales in competitive battles because:
    a. We were not considered to be a serious contender.
    b. We tried to sell a unit which was too large for customer - price equipment.
    c. Not large enough and insufficient software.
    d. Did not have feasibility - fact to support business application arguments.

2. The PDP-6 does not meet Cobol specifications necessary for certain military applications.

3. Sort generators are required.

4. Fortran is required.

5. Majority of salesmen technically inadequate to sell computer.

6. Service organization is small.

7. Additional talent is required to make the PDP-6 team self reliant.

What is the Market Place for the PDP-6

The Government – To date the government owns 1767 computers.

802 units	priced between	0-250K
430 "	" "	251-450K
185 "	" "	451-750K

including peripheral gear.

The government will continue to purchase more units because small computers are basically used to support larger systems. The utilization of computers is far beyond a 40 hour week; in fact, average hours are 313 hours per month (not including time for preventive remedial service. And, the larger the computer the more it is used – up to 419 hours (3rd shift and weekends) for the largest units. Units in the $250K-$750K bracket are used at present in 3 shifts.

In 1964 an increase in computers purchased was 38.5%. In 1965 anticipated purchases will increase to 45.9 %.

Here is how they break down by Agency:

	Defense	NASA	AEC	Treasury	All Other
Fiscal Year 1963:					
Number of computers	815	153	142	41	175
Number purchased	132	38	63	10	39
Percent purchased	16	25	44	24	22
Fiscal Year 1964:					
Number of computers	1,148	209	170	44	196
Number purchased	413	76	105	19	68
Percent purchased	36	36	62	43	35
Fiscal Year 1965:					
Number of computers	1,274	224	180	50	218
Number purchased	474	158	125	48	88
Percent purchased	37	71	70	96	40

Although time is not available to detail the facts, the 1964 Inventory of Automatic Data Processing (ADP) Equipment in the Federal Government - of which RDI has advised the Sales Department - indicates each agency contemplating purchasing units for 1965 - by location etc.

Obviously, data such as this can be used to set the sales organization action to go out and methodically sell, pickup RFQ's and prepare suitable proposals.

The Rest of the Market

RDI maintains a list of 4000 computer installations - with addresses, names, etc. or Pat McGovern of "Computers and Automation" is willing to run a Survey to attract leads and other meaningful information. The "Computer and Automation" list is broken down by Model, Installation Date, Peripheral Equipment Purchased, Applications and Industry.

These lists can be used to full advantage to:

1. Alternate leads - for specific computer requirements (dollar potential).
2. Evaluate all PDP installations - (Customer attitudes) find out if they would buy DEC again.
3. Find out how often (%) DEC is considered by type of computer required.
4. Measure advertising and public relations.
5. Measure Sales Force effectiveness (follow up) and customer attitudes. Did they hit all "yes men", management, tab room supervisors, computer managers, systems and procedure men, controller and etc. The Computer Committee (if any).
6. Find out if salesmen are following up.

Surveys can be done by depth interview, blind letter, letter from DEC to customer, lost prospects, general computer facilities in industry and government.

SUMMARY AND RECOMMENDATIONS

In summary it is apparent that no meaningful data is available whereby sales effort can be directed. We are in the unfortunate situation of having a computer in search of a market rather than having a market in search of a computer. We can either go ahead as we have and shot gun our sales effort or we can develop data whereby we can direct our activities. It is RDI's considered judgement that an effort to develop data should be undertaken.

TYPICAL SURVEY FORMAT

The Computer Census could be mailed to perhaps 4000 Computer Installations. Contact: Computer Center Director.

To a Census of Computer Users in Price Bracket

(1) 0-250K

(2) 251-450K

(3) 451-750K

Magazine Survey: The purpose of this survey (sent by "Computers and Automation") is to measure awareness and consideration of DEC as a supplier of three computer price ranges. Further, leads will be uncovered by applications.

Survey

1. Please check those job titles responsible for computer purchases in your company:

President	☐	Tab Room Supervisor	☐	Chief Engineer	☐
Controller	☐	Sales Manager	☐	Engineers	☐
General Manager	☐	Production Manager	☐	Other Specify	☐
Head Computer Center	☐	Research Director	☐		☐

2. Do you use a formal Computer Selection Committee: Yes ☐ No ☐

3. Do you contemplate purchasing a computer: Next 3 months ☐ the year ☐ 1966 ☐

4. If yes, have you decided what model: No ☐ Yes ☐ Approximate Cost $_____.

5. If no, what is its application: Business ☐ Scientific ☐ Control ☐

6. For what type of function/s (Applications) _____

_____

Which of the manufacturers have you/or will you consider: (Please List)

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

What are the major considerations for choosing a computer in your organization:

- ☐ Replaces other obsolete systems
- ☐ Simulates existing systems
- ☐ Reduces clerical costs
- ☐ Simple peripheral tie-in
- ☐ Eliminates other computer steps
- ☐ Higher speed
- ☐ Memory size
- ☐ System Flexibility
- ☐ Better Proposing Techniques
- ☐ Cost of Equipment
- ☐ Fast Delivery
- ☐ Service
- ☐
- ☐

What are special characteristics you sell:

_____

_____

_____

Name _____ Title _____

Company _____

Address _____

City _____ Zip Code _____ State _____

Depth interviews will be conducted as follows:

1. A phone call or letter will indicate that phone call or visit will be made. (Visit radius of 100 miles, phone otherwise) date will be set indicating type of question to be made.

2. At date of interview call will be made and questions asked.

To Eight PDP-6 Customers

The Depth Interview will be conducted for Existing Customers to ascertain their reasons for choosing DEC, and their attitudes relevant to our equipment, sales staff and service.

Customer

1. Which of the following computer manufacturers were seriously considered by your organization intially:

☐ _____ ☐ _____

☐ _____ ☐ _____

☐ _____ ☐ _____

☐ _____ ☐ _____

2. Which were quickly discussed if any:

☐ Name _____ Reason _____

☐ Name _____ Reason _____

☐ Name _____ Reason _____

3. You received proposals and quotations from _____,

_____, _____,

_____, _____,

_____, _____,

4. What features turned the tide for DEC:

☐ Cost ☐ Service ☐ Engineering Assistance

☐ Speed ☐ Software ☐ Familiarization.

Other _____, _____, _____,

_____

5. Please rate DEC for:

		Poor	Fair	Good	Excellent
a.	Salesmen Knowledge				
b.	Technical Support Group Knowledge Application Aid				
c.	Demonstration				
d.	Proposal				
e.	Follow Up				
f.	Manuals				
g.	Presentation to Selected Committee				
h.	Presentation to Review Committee				

Other Comments

6. Based upon your experience with the DEC equipment and personnel, would you buy DEC again? _____

For what specific application _____.

To All Serious PDP-6 Prospects which we Lost

(Prospects = Funded, and Purchased Competitive Unit)

Depth Interview – Lost Customer

Your Computer Application is _____, _____, _____.

1. When you initially began evaluating computers which of the following did you contact (Place a number for (1) serious or (2) marginal):

☐	_____	☐	_____	☐	_____
☐	_____	☐	_____	☐	_____
☐	_____	☐	_____	☐	_____
☐	_____	☐	_____	☐	_____

2. In the process of dealing with any of the above organizations,

a) Did any disappoint you as far as:

	Proposal	Presentation	Equipment	Personnel	Other
☐					
☐					
☐					
☐					

b) Conversely did any supplier considered marginal surprise you:

	Proposal	Presentation	Equipment	Personnel	Other
☐					
☐					
☐					

3. What were the major considerations for your decision: (Specify)

☐	Price	☐	Service	☐	Interface
☐	Capacity	☐	Software	☐	Peripheral Gear
☐	Speed	☐	Reliability	☐	Engineering

Other _____.

4. Are there any misgivings relative to unit purchased?

5. Are you planning to purchase any other computers? Yes ☐ No ☐

If yes, Type _____, $ _____.

Which of the previous suppliers would you again contact:

☐ _____ ☐ _____ ☐ _____

☐ _____ ☐ _____ ☐ _____

☐ _____ ☐ _____ ☐ _____

Others _____

Let's talk about DEC - Please Rate		Poor	Fair	Good	Excellent
1.	Attitude of Sales Force				
2.	Number of Visits Made				
3.	Helpful Technically				
4.	Technical Support Organization				
5.	Demonstrations				
6.	Presentation				
7.	Proposal				
8.	Follow up.				
9.	Technical Proficiency				
10.	Softwares				
11.	Delivery				

Name _____

Customer _____

Title _____

INTEROFFICE MEMORANDUM

DATE February 11, 1965

SUBJECT MAXIMUM SECURITY STORAGE FACILITIES

TO

✓K. Olsen
H. Anderson
S. Olsen
J. Atwood
G. Bell
D. Best
H. Crouse
A. Hall
W. Hindle
B. Hughes
B. Lassen
R. Melanson
D. Mills
L. Prentice
M. Sandler

FROM B. Farnham

We have recently entered into a yearly contract with Ultra Security Records Vault, Incorporated for storage of company records which, for the most part, are on micro film.

Ultra Security is an ex-navy gun emplacement sight that is buried in the side of a hill located south of Boston. It offers maximum security, humidified air and specializes in the storage of microfilm.

The type of records stored in a facility of this type are those vital for reconstruction of the company, it is not a dead storage area.

Our present arrangements include the storage of vital accounting, drafting and programming records.

If any of the above addressees feel that their departments have vital records that should be under maximum security, out of the Maynard, plant, and not already included in the storage of accounting, drafting and programming records, I will be glad to make the necessary arrangements.

INTEROFFICE MEMORANDUM

COMPANY CONFIDENTIAL

DATE February 10, 1965

SUBJECT Suggestions for Improving Engineering Effectiveness at Digital Equipment Corp.

TO K. Olsen
H. Anderson
R. L. Best
W. Hindle (2 copies)

FROM R. E. Savell

During the past four years I have invested a considerable portion of my life in Digital Equipment Corporation. This past year and a half has been a time of increasing frustration for me, primarily due to the pressures of too much to do and too little time to do it, the inability to get things done by people over whom I have no direct control, and the general scarcity of personnel. Now I realize that part of these problems are my own fault, but in my observations of others in Engineering, Programming, Computer Checkout, Field Service and Special Systems I can find no one who seems to be able to solve these problems better than I.

I believe the company is paying a real price as a result of these problems in a number of ways:

Inefficiency and dissatisfaction of personnel who must work overtime constantly, much of the time under pressure.

Added engineering costs due to redesign, drafting and wiring changes caused by errors in planning projects, the pressures of overtime, slippage of schedules, and other projects late at the same time.

Lowered quality of design and production of equipment.

Insufficient time for professional development due to the constant overload. Managers not managing because they are putting out fires. We are in the spots we are in on PDP-6 and 7 and late deliveries of other systems primarily because of a lack of management capability, not because of a lack of technical competence.

In fact all the above items boil down to a need for improvement in organization, procedures, and management capability, and the areas most affected are those areas where one would expect to be hurt most by poor management. They are the areas where creative design effort is involved, where many people not under direct control of the project engineer are involved, and where many, many unforeseeable problems always arise.

I feel that improvements can be made that will help solve these problems. I believe that these improvements must be made or we will get into more serious trouble than we are in at the present. I do not believe the company can continue to compete successfully in the computer

and module field, especially the computer field, unless we engineer and produce systems on a more organized basis than we are at present. I also believe that there is enough personnel dissatisfaction so that many people will leave the company during 1965 if we do not improve.

ORGANIZATIONAL CHANGES

I believe a change in company organization to something like that shown below would help to clarify responsibility and to better define the authority that goes with one's responsibility. There are a few areas here that are still a bit fuzzy as to what a group's responsibilities should be or who should run the group. I've indicated these with question marks. No one can be held totally responsible for a project unless he has the necessary authority to accomplish the project. It is, of course, not possible to grant authority over everything to everyone, but with the present organization and its split chains of command which in the case of computers seems to go up through Dick Best, Gordon Bell, Andy, Ken, and the Computer Guidance Committee in parallel, it is extremely difficult to know where to turn to get to a level of authority that can and will help when problems arise requiring the granting or the exercise of more authority than the project engineer possesses. There should be a specific chain of command that clearly defines authority and responsibility and that provides one and only one manager to whom each person reports. Just as one cannot design parts of a computer system independently without defining design responsibility and authority, neither can one produce the designed equipment if the necessary responsibility and authority are not clearly defined.

This organization differs in only a few respects from that which exists at present. Those areas in which it differs are as follows:

1. Computers are such a large part of the company's creative effort in terms of the number of people employed that I believe they should occupy a single major division in the company with a person to head up the division who has Vice Presidential status and authority. Management of the Computer Division should be his only responsibility. All computer connected activities should come under his control, and all group or department managers in the division should report directly to him. The reporting should be formalized and held at regularly scheduled intervals, preferably once a month.

2. Reactivate a Peripheral Equipment Group as well as a Memory and Tape Group. At present there is no group or any person responsible for any items of peripheral equipment other than memory, mag tape, and drum. This results in sloppy handling of engineering problems that arise after the devices are in the field, since there is no specific person to whom Field Service knows it can pass on the problems. There are also a number of other drawbacks.

3. Create a Circuit Design Group. The present dependence on circuit people not under the direct control of the computer project engineers has been cause for innumerable problems especially during the past year. This group would handle all special circuits required for computer systems. Leave circuit design approval and circuit and

hardware design review in the hands of the chief engineer.

4. Create a Computer System Design Group headed by Gordon Bell to design central processors and specify complete systems. Project engineers for complete computer design projects, such as the PDP-8 or PDP-6, would come from this group. These projects would be carried out on a team basis with members recruited from the various other groups if necessary. For the duration of the project these members report only to the project leader and have no other assignments. In some cases it may not be possible or desirable to assign people from every group to a computer project. In that event the design of the various component parts must still be approved by the head of the responsible group.

ATTITUDE CHANGES

There are some attitude changes that must be made in addition to the organizational changes. The first is in recognizing that a manager's primary function is to be what his title indicates, a manager. If in addition he is expected to carry, or for other reasons assumes, a full time load of projects which he himself must carry through, then most probably both activities will suffer. He must carry projects only to the extent that they do not interfere with his managerial duties. If interference arises, then managerial responsibility must have top priority. His primary responsibilities are technical and administrative supervision of those reporting to him, technical review of their work, helping them schedule their projects, keeping abreast of new products and competition and planning new projects that will be future activities of his department.

The future of Digital rests primarily upon the competence of its managers. Can we afford to rely on managers that are "born, not made"? Most of the people in managerial positions have had no management training whatsoever. I believe good management is comprised of a set of skills that can be learned just as engineering can. We should, therefore, train our managers, or at least counsel them as to where this training may be obtained and what courses are worthwhile.

Planning and scheduling of projects must be improved, as will be explained later on, so that sufficient personnel will be available to adequately carry out scheduled projects. This condition has not existed to any great degree in the four years I have worked at Digital. Sufficient personnel will result in less hours of overtime with its resultant ill effects. Now overtime per se is not bad, but when it must be used constantly and when projects are always behind schedule, the result is extreme pressure at the same time. This pressure results in products that are not tested as fully as they should be to live up to the high standards we have had in the past. Poor reliability and/or excessive amounts of re-work are the prices paid for operating this way. Overtime should be used as a cushion against occasional periods of overload. At present it is a constant necessity since we are always in a period of overload.

DELEGATION AND DEFINITION OF RESPONSIBILITY

The delegation of responsibilities should wherever possible be in writing and should define as clearly as possible the task to be accomplished, set time limits, and clearly assign the responsibilities to specific individuals. It has been my experience that when these responsibilities are not set forth in writing they are conveniently distorted or forgotten or at the least require several rounds of verbal redefinition to clarify misunderstandings. Some paper work of this sort in an organization of the size and com plexity of ours is an absolute necessity. The present loose definitions result in top management never knowing who to praise or blame when a project goes right or wrong. This results in the wrong people sometimes getting credit or blame and sometimes no one getting it.

Responsibilities should be delegated with a minimum of restriction and a maximum of authority. The larger the number of restrictions, the less one can hold the delegatee fully accountable for the proper completion of the project. We must trust the person to whom the responsibility is delegated. If he says he needs six men to do the job in the allotted time he should be given the men if it is at all within reason. Too often I feel we brow beat people into working to a schedule that is impossible to achieve with the personnel allotted. This can result in nothing but frustration for the personnel involved and dissatisfaction with their output on the part of top management.

Responsibilities once defined and delegated must be lived up to, and unless responsibilities are defined results cannot be measured. The manager who fails to measure up should be helped to overcome his mistakes. If they cannot be overcome in a reasonable time he must be replaced.

Once a project has been defined and responsibility delegated, a schedule can be drawn up by the project engineer and submitted to management for review. On a large system composed of many smaller projects, the project schedules should then be combined into a system schedule. It is at this point that our troubles begin. On PDP-6 for instance, in April of this year our project responsibilities were defined in writing and due dates for various parts of each project were specified in writing and agreed upon by the responsible project engineers. The biggest source of error at this point was in judging when people would really be free from their other commitments to live up to the new commitments which they agreed to. This implies that previous projects were scheduled inaccurately.

The accuracy of scheduling projects needs to be improved, and it can be if only accurate cost accounting information, both in actual hours and in dollars spent for labor, and in actual materials used and their cost, can be obtained for each and every project in an easy to use form. The format used should be that used on the project pricing form. This informa-

tion has been requested both verbally and in writing by myself and others both from Accounting and from other people supposedly authorized to work on the problem for almost three years now. Until managers are provided with this information they will continue to underestimate or overestimate, usually under, the cost and time required to complete a project. Only by being provided with feedback can people learn. It has not been provided in anywhere near the required detail or format.

Some feedback on projects is just beginning to be provided by Bob Vernon and Jim Hastings so I cannot as yet evaluate the effectiveness of what they are doing. I feel quite sure that this effort cannot be handled by Jim Hastings in his spare time however. I believe it should be assigned to someone as a primary responsibility. To carry out this work properly for all projects might even require one person full time.

Even with accurate schedules, it is from this point on that the greatest improvement is needed. That improvement is needed in the follow-up procedures used to see that the projects progress according to schedule. From the experience of my past four years, I believe this follow-up must take place from the top down since people for various reasons will generally not let their superiors know in time when they have problems unless they are forced to by some formal follow-up method. What follow-up now exists does indeed take place from the top (Computer Guidance Committee) to the bottom (Project Engineer). These checkups are irregular however, and the Guidance Committee is too far removed from the project to do a good checking job. The follow-up responsibility should lie with the person in the next level of management above the person being checked on. The Guidance Committee should be used only for guidance on specific problems that arise and not for routine checking.

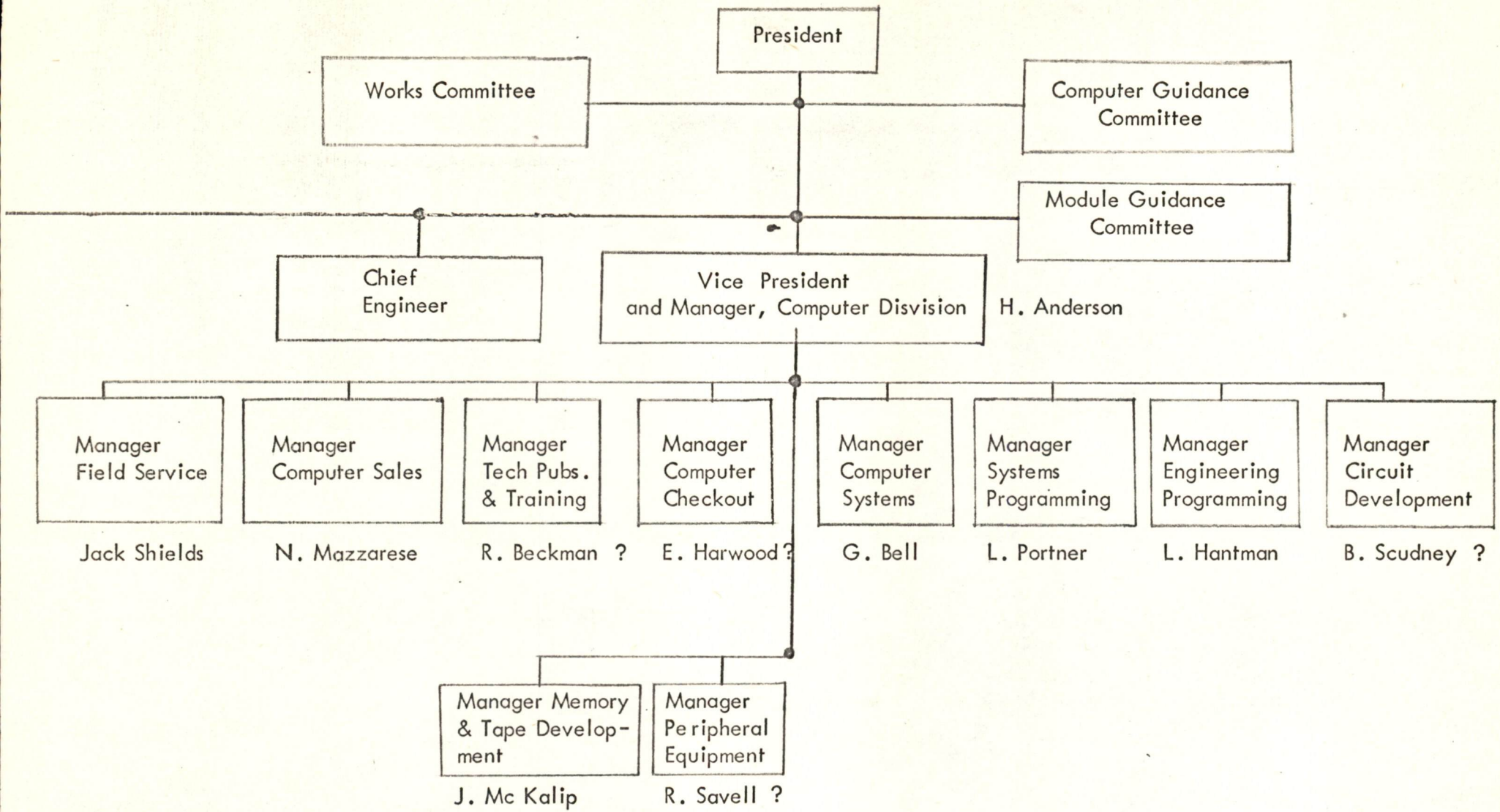
The follow-up should consist of formal reports, accompanied by updated schedules for each and every project, submitted to the next level of management on a regular scheduled basis. Once per month on the same date each month is suggested. The report should state only reasons for lateness and proposed plans to get back on schedule. The most important points to check are not the completion dates of various phases of a project, but starting dates. It is practically a certainty that phases that start late will finish late. In the event of a late start there are only a few choices that can be exercised:

1. Overtime
2. Get more help
3. Extend the date on which the project can realistically expect to be finished

It is in this latter decision making process that managers are most necessary; for if schedules never slipped, a managers job would boil down to one of primarily technical competence. His judgement should be counted on heavily in reaching a solution to the problem.

It is in failing to check these late starts and failing to reach the proper solutions to each late start problem as it arises that we have not done as good a job as we should have. Once a few of these are missed they begin to pyramid. Soon everyone is engulfed in trying to get his head above water and everything becomes late.

The foregoing are the most important areas for improvement. Some others are in the routine definitions of various functions such as duties of a project engineer, systems for processing drawings and drawing ECO's, rules for handling price quotations to customers, design review procedures both for hardware and software, organization of our technical manual writing, and rules regarding amounts that may be spent for any item without a detailed purchase specification.


President
Works Committee
Computer Guidance Committee
Module Guidance Committee
Chief Engineer
Vice President and Manager, Computer Disvision
H. Anderson
Manager Field Service
Jack Shields
Manager Computer Sales
N. Mazzarese
Manager Tech Pubs. & Training
R. Beckman ?
Manager Computer Checkout
E. Harwood?
Manager Computer Systems
G. Bell
Manager Systems Programming
L. Portner
Manager Engineering Programming
L. Hantman
Manager Circuit Development
B. Scudney ?
Manager Memory & Tape Development
J. Mc Kalip
Manager Peripheral Equipment
R. Savell ?

INTEROFFICE MEMORANDUM

DATE February 9, 1965

SUBJECT Weekly Progress Report - Quality Cost Reduction and Scheduling Implementation Program for W/E 2/5/65

TO Win Hindle

cc: Ken Olsen /
Harlan Anderson
Stan Olsen
Dick Best

FROM Chester Gadzinski

The primary effort has been directed to the scheduling and costing of the PDP-6A. Throughout the cooperation of everyone involved was genuine and enthusiastic. Special mention must be made of Bob Dill and Roger Melanson for their cooperation and support in making the project a success.

The vendor certification program as well as the manufacturing scheduling effort had been temporarily sidetracked. However, as discussed in my previous report further progress in these areas must await a management decision as to what course of action to pursue.

By Chester Gadzinski

CG:ncs

INTEROFFICE MEMORANDUM

DATE February 8, 1965

SUBJECT QUALITY STATUS OF THE PDP-6-4

TO Ken Olsen
Bob Hughes
Dick Best
Klaus Doering
Phil Backholm

FROM Don Bevins

This system has become quite a headache for the following reasons:

A. Intermediate inspections still in a state of rejection:

Mech. 1) Micro Tape Control
2) 551*
3) 136-5*
4) Line Printer
5) 340 Display

*these items were bootlegged into Checkout (see engr. news #173 from Oct. 16, 1964).

B. With final solder joint inspection things went too far.
1) One performed on 10-17-64 and accepted.
2) Again performed on 11-10-64 and accepted.
3) Again performed on 2-4-65 not yet accepted.

Each inspection took approximately 10 hours. Since October 1964 we have been called for the same inspections over and over again, (because of numerous modifications).

C. A final mechanical inspection was performed on the system on 1-15-65. The report containing 4 pages of discrepancies was lost by the checkout personnel. Tomorrow the system is supposed to be shipped to the customer. We have been called to do the inspection over again. Small wonder that under these conditions the PDP-6-4 may not leave in time.

DB/kmk

INTEROFFICE MEMORANDUM

DATE February 8, 1965

SUBJECT 24 Bit Memories

TO K H Olsen FROM J McKalip

Costs for three types of 24 bit memories are outlined below. All would be 1.5 μsec cycle and FLIP CHIP. All are costed as memory less address and data buffer registers but including memory timing, power supply, drivers and sense amps.

Type 1 - 4096 x 24 non expandable (old PDP-1 style)
Space: 4 double FLIP CHIP panels
Cost: $5730 (5.85¢/bit)

Type 2 - 4096 x 24 + 4096 x 24 (PDP-7 type)
Space: 5 double FLIP CHIP panels
Cost: 4K, $6710 (6.85¢ / bit)
8K, $10,100 (5.15¢/bit)

Type 3 - 16384 x 24
Space: 6 double FLIP CHIP panels
Cost: $16,640 (4.25¢/bit)

Development cost for any of these would be about $20,000 + memory cost listed above. The exercizer would cost about $18,000. Development time would be about 4 months.

Frankly, I think the best bet is to run a pair of PDP-8 memories in tandem with a common power supply and timing. This costs $6125 (6.25¢/bit) and requires no development. You can still get 1.5 μsec with no problems. Size would be 6 rather inefficiently utilized double FLIP CHIP panels.

JMcK:ASJ
CC
R L Best

INTEROFFICE MEMORANDUM

COMPANY CONFIDENTIAL

DATE February 4, 1965

SUBJECT

TO K. H. Olsen

FROM Ted Strollo

I understand that you have expressed some concern about the general atmosphere amongst the PDP-6 professional and production group. I hope that with this memo I can point out some of the points of difficulty in the group. It is my observation that DEC is in a position where she may lose a number of her very qualified and capable professional people because of the attitudes and policies of PDP-6 management.

In my opinion the history of the problems with the "6" begins with its being released for production too soon. Not witholding that competition encourages manufacturers to keep up with the field, I cannot accept the premature release of the computer for the market. The "6"s have been produced on such a tight delivery schedule, that it has not been possible to work out all of the circuit design and logic bugs known to exist in PDP-6 design. A large amount of the dissatisfaction of the PDP-6 group stems from our realization that we are working on a machine which has some very basic design problems; a machine which in many respects does not live up to specifications.

I believe the next big mistake made with the "6" project was the choice of the PDP-6 production management group. This group knew very little about the "6" as a machine. The group's major objective was the on-time delivery of the machine. While no one can de-emphasize the importance of the delivery date, none can over-emphasize the importance of accurately determining the delivery time. The group should have intimately acquainted themselves with the PDP-6 in order to re-evaluate existing and proposed delivery dates.

Project engineers would normally be in an excellent position to solve the problems I have just mentioned, but our talents were wasted by our assignment on checkout shifts; often at hours when the communication of our ideas about solving the "6" problems would be impossible. In fact the management group has on many occasions superceded the judgement of the project engineers on such matters as scheduling, delivery date changes, etc.

Unfortunately the PDP-6 group has been managed very dogmatically. The words "please" and "thank you" don't exist in the vocabulary of the PDP-6 management group. Destructive criticism thrives; constructive criticism isn't even whispered. No group can survive under pressure without some signs of appreciation.

I do not believe the PDP-6 project is destined to failure. There have been a number of improvements since I began work with the group. Many of the engineering problems have been successfully worked out thanks largely to the effort of people like Bob Savell for whom I have the greatest respect and admiration. On the other hand I cannot imagine a more negative move than the appointment of Bob Beckman to the PDP-6 management task. He has been singularly responsible for the decline of "morale" in the "6" group because of his tendency to over supervise and under appreciate.

I sincerely hope that measures are taken to avoid further loss of professional people at Digital. I have a high opinion of most of DEC and her generally excellent product line and would consider it a loss to computer users for her to cease to compete in the computer industry. In my own case it is too late to reconsider my plans to leave. I have virtually committed myself to B.B.N. which I believe will be a wise move. There is one very important element which I have noticed exists in B.B.N. but fails to exist here at DEC; the opportunity for a man to achieve professional recognition through publishing papers and having contact with other professionals.

TS/mro

INTEROFFICE MEMORANDUM

DATE February 4, 1965

SUBJECT

TO Ken Olsen
Nick Mazzarese

FROM Ted Johnson

Burroughs is telling people about a D-84 Computer (integrated circuit version of the 24 bit D-82).

Price is about $30K - $35K for a 32K machine.

dec INTEROFFICE MEMORANDUM

DATE February 4, 1965

SUBJECT Pricing of Cabinets

TO Ken Olsen

FROM Frank Kalwell

CC: Stan Olsen
Nick Mazzarese
Ted Johnson
Ed Simeone
Loren Prentice
Dick Best
Tom Whalen
Ray Michel

From time to time, our various offices and customers have indicated that our cabinet prices are too high. I've broken down our manufacturing costs vs our selling price on our CAB-1, and have made a recommendation on the prices at which we should sell our complete line of cabinets.

With our cabinets being superior to any on the market today, it is extremely difficult to make an accurate comparison. Most cabinet manufacturers have a different concept of assembling a complete cabinet; EMCOR has a top panel and a bottom plate mounted with casters. I took EMCOR'S premium cabinet frame which is 11 ga material vs 16 ga used on DEC'S cabinets, and priced EMCOR'S unit per the attached page.

The attached EMCOR price list does not include the plenum door for power supply mounting, nor fan housing, fan and filter, or any hardware, as in our CAB-1. The following EMCOR cabinet can be compared against our CAB-1.

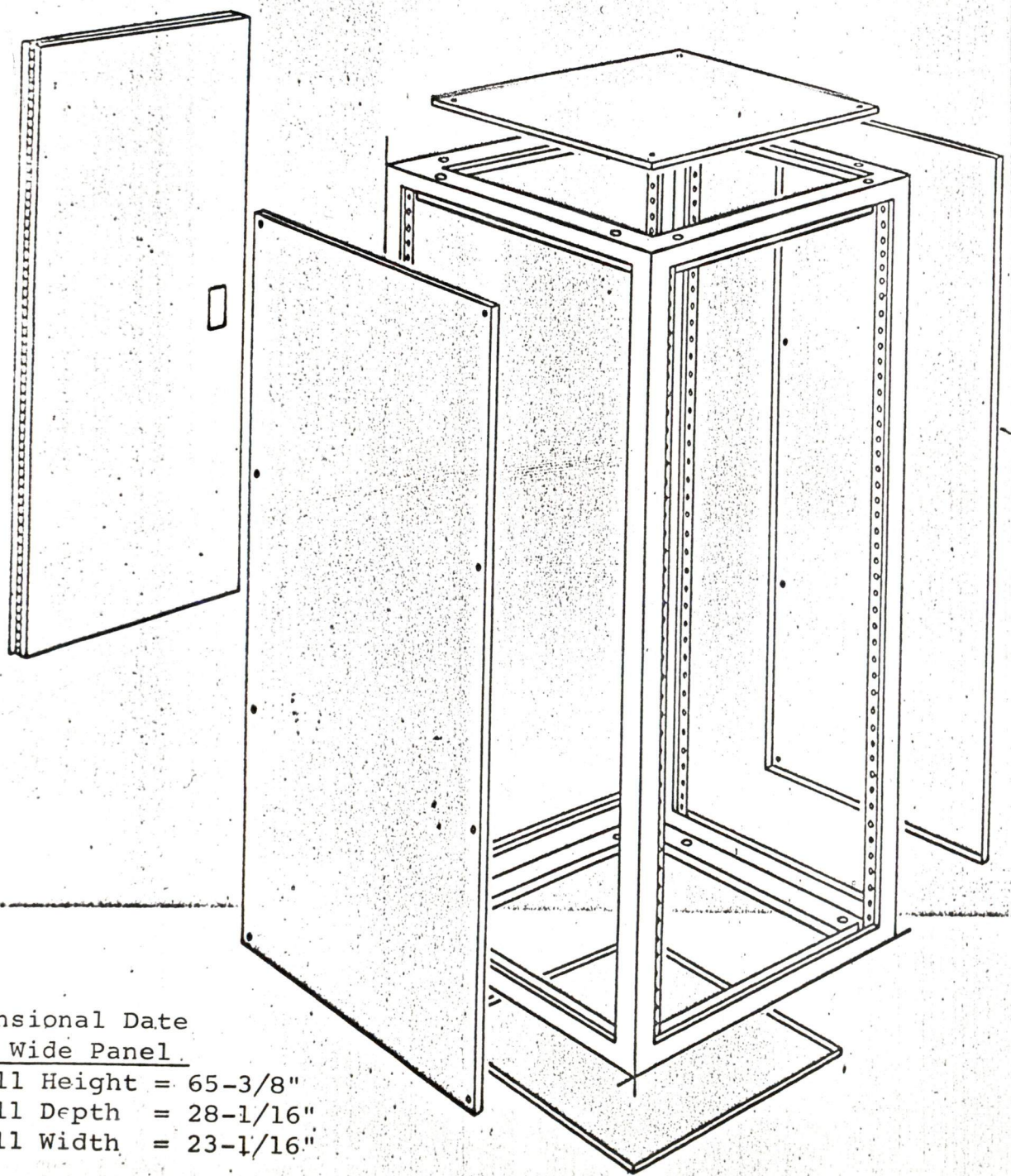
Although the selling price of the EMCOR is less than DEC'S, factors which give us superiority over EMCOR'S are capacity, strength, more versatility and truly a heavy duty frame which will outlive any cabinet, plus a better dressed cabinet.

BORG-WARNER

EMCOR HEAVY-DUTY

PART #	QTY. REQ'D.	DESCRIPTION	UNIT PRICE	TOTAL PRICE
FRH-26-2419	1	Vertical Frame	$234.70	$234.70
DO-61C	2	Front & Rear Doors	48.15	96.30
PN-61-24	2	Side Panel	24.60	49.20
PN-24	1	Top Panel	7.55	7.55
CP-HR-RB-1924	1	Bottom Plate & 4 Casters	42.85	42.85

Total Price.....$430.60



Dimensional Date
19" Wide Panel

Over-all Height = 65-3/8"
Over-all Depth = 28-1/16"
Over-all Width = 23-1/16"

CAB-1
STANDARD CABINET

Number per Unit	Description	Mfg. Cost (Totals)	Present Selling Price (Using X3 Formula)	Recommended Selling Price
8	Magnets	2.09	6.27	6.25
4	Casters	7.96	23.88	24.00
4	Door long	21.28	63.84	64.00
1	Fan housing	5.95	17.85	18.00
1	Latch pin	0.62	1.86	1.85
1	Latch pin spring	0.19	0.57	0.60
1	Plenum door	10.75	32.25	32.25
4	Spacer bottom	0.84	2.52	2.50
4	Hinge pin top	1.28	3.84	3.85
4	Hinge pin bottom	1.40	4.20	4.20
1	Cabinet seal strip set	1.27	3.81	3.80
1	Plenum door seal strip set	1.32	3.96	3.95
1	Cabinet frame	75.57	226.71	225.00
2	Top trim	3.62	10.86	10.85
2	Bottom trim	3.74	11.22	11.20
1	Striker plate	1.75	5.25	5.25
1	Front door stop	1.05	3.15	3.15
4	Door stop rod	2.24	6.72	6.70
1	Rotron fan filter	1.59	4.77	4.75
1	Rotron fan	20.00	60.00	60.00
1	Latch pin striker	0.71	2.13	2.15
2	End panel gaskets	5.28	15.84	15.85
	Total material cost	170.50		
	Labor (Assemble, paint, & inspect)	12.55		
	Overhead	42.29		
	Sub-Total (Complete Cabinet, less end panels)	225.34	(690.00)	
2	End panels	88.24		150.00 pr.
		313.58	(940.00)	

( ) = Indicates prices we are presently selling complete cabinets.

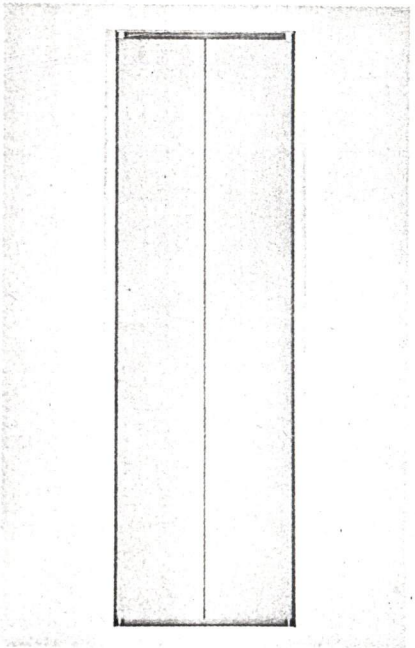
The following list covers our complete line of cabinets. The price comparison sheet lists our manufacturing cost vs selling price plus the recommended selling price. The recommended selling price is based on 2.5 x manufacturing cost. I feel this would be more reasonably priced, and insure our selling additional cabinets with our logic cards.

If additional information is required, please contact me and perhaps we can discuss this further.

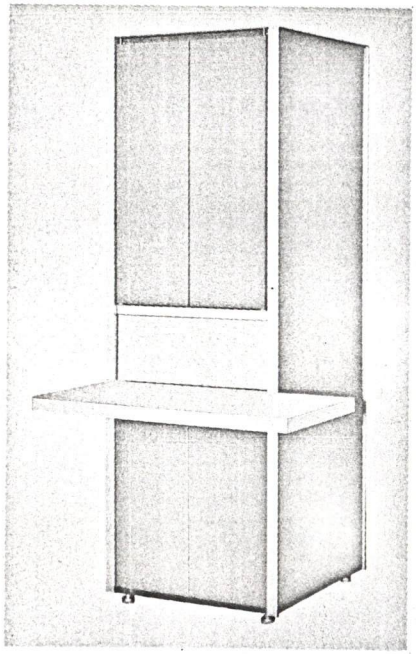
MODULE ACCESSORIES

CABINETS AND END PANELS

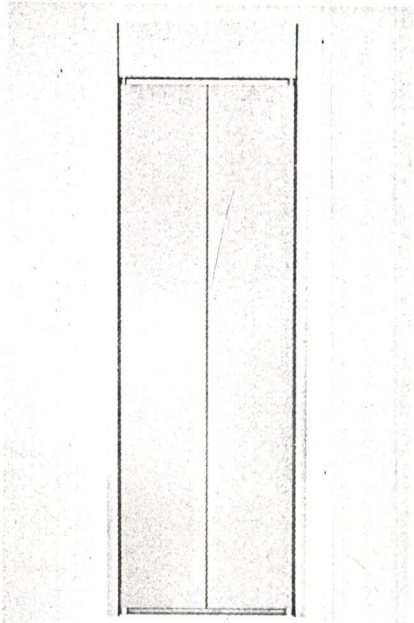
TYPE – CAB-1, CAB-2, CAB-5, CAB-5D, CAB-6



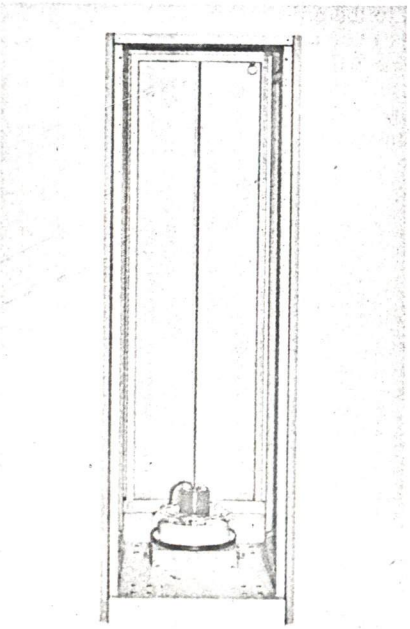
CAB-1



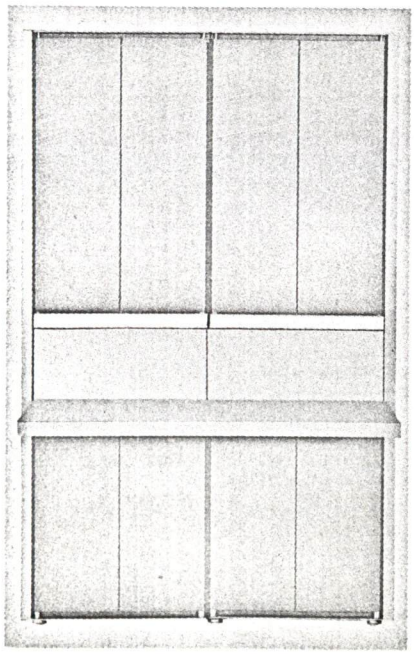
CAB-5



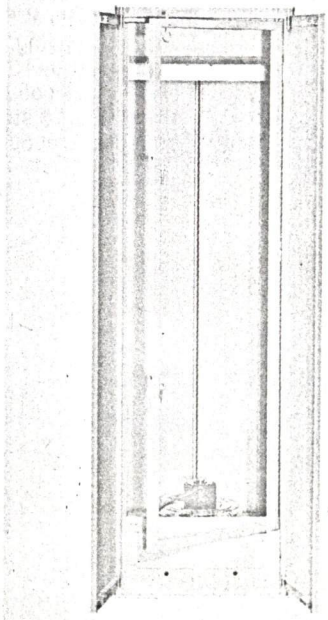
CAB-6



CAB-2



CAB-5D



CAB-6 (Inside view)

		MANUFACTURING COST	VS	PRESENT SELLING PRICE	RECOMMENDED SELLING PRICE
CAB-1	Includes doors, fan housing, fan and fan filter (no table)	$313.58		$940.00	$775.00
	Above (CAB-1) without end panels $313.58 less 88.24/pair end panels (EP1)	225.34		690.00	565.00
CAB-2	Includes doors, fan housing, fan and fan filter (no table)	283.18		822.00	708.00
	Above (CAB-2) without end panels $283.18 less $78.02 end panels (EP2)	205.16		630.00	510.00
CAB-5	(Single table), includes doors, fan housing, fan, fan filter, table frame, table top, and blank control panel. (Includes end panels).	453.94		1378.00	1135.00
CAB-5D	(Double table), same as above (single table) except double table frame and top replaces single table frame and top. Includes two cabinets. Includes end panels.	788.20		2395.00	1970.00
CAB-6	Includes doors, fan housing, fan, fan filter, and blank panel (no table). Includes end panels.	342.78		1044.00	855.00
	Above (CAB-6) without end panels $342.78 less $88.24/pair end panels (EP1)	254.54		793.00	635.00

Cabinet prices include shipping on wooden skids with any adjoining hardward necessary.

CONFIDENTIAL

INTEROFFICE MEMORANDUM

DATE February 4, 1965

SUBJECT Current Responsibilities

TO Ken Olsen

FROM Win Hindle

1. a. Professional Recruiting - 50-60%

   b. Professional Salaries - 5%

   These two responsibilities should remain together. I believe Jim Hastings could do these jobs very capably. For the present, I think this function should remain independent of the Personnel Department. I will continue to watch this activity. Jim should be made a member of the Personnel Committee. He should stay on Patents and be on top of personnel assignments by product line.

2. Data Processing - 10%

   I would like to continue in this area. The new Treasurer should probably be the Chairman of the Committee. I feel quite strongly that Data Processing should remain independent of the Accounting Department, although our accounting system will be a major user of data processing services.

3. Planning - 10%

   Dave Packer is doing quite well here, I think. I would take responsibility for planning special projects, but Dave should continue to push Stan, Andy and Nick on their planning. We should probably hire another man out of school in June to work with Dave.

4. Retirement Plan - 5%

   I could finish this, perhaps working more closely with Bob Lassen who is very sensitive to employee reactions.

5. Dutch uncle - 10%

   As I become committed to special activities, I will be less useful here. Jim Hastings will be helpful on this.

6. Miscellaneous visitors - 5%

dec INTEROFFICE MEMORANDUM

DATE February 4, 1965

SUBJECT

TO K. H. Olsen
CC: R. L. Best

FROM Arthur Hall

Some weeks ago you asked me to make a survey of the means used in turning on Power Controls. Results of a look at all power controls listed in the Schematic book are below.

P.C. Number	Quan. Signed Out Last 6 Months	External Turn-on Method	
811	11	Switch closure across	115VAC
811C	5	External	-15VDC
813	0	Switch closure across	115VAC
820	0	Switch closure across	115VAC
822	10	External	-15VDC
826	19	External	-15VDC
829	10	Switch closure across internally supplied	-15VDC (3 inputs "or"ed)
		or external	-15VDC
830	10	External	-15VDC
834	40	*Switch closure across	115VAC
834B	5	*Switch closure across	230VAC
835	20	*Switch closure across	115VAC
835B	0	*Switch closure across	230VAC
836	22	*External	-15VDC (3 inputs "or"ed)
801, 815, 816, 817, 818, 819, 821, 824, 828, 831		(Listed in the 8XX series of numbers but are not Power Controls)	

*The 836 Power Control was designed and is being used to turn on (by application of a -15VDC signal) the 834 and 835 Power Controls in cases where multiple turn-on inputs are needed or where the system designer wants to avoid running 110VAC lines through the logic or across the floor.

Of the persons whose perference was questioned;

Pat Green preferred 115VAC turn-on for simplicity.

Ed Harwood preferred 115VAC for cost and simplicity and -15VDC for the reasons below.

Bob Hughes, Derrick Chin, Steve Lambert, Dick Tringale, Bob Savell and myself preferred -15VDC because of the greater safety to personnel and circuits (in case of accidental contact) and because of the ease in "or"ing multiple inputs.

I could not reach Dick Best for comment without further delaying this memo but some months ago he voted for -15VDC in turning on PDP-6 equipment.

The question would seem to be whether or not the safety and possibility of "or"ing inputs is worth the 3-5 dollar cost of a frame type 80 ma, 2A contact relay (plus wiring and diodes).

Let me know if you would like me to standardize power controls one way or the other or just leave everything as it is.

AH/mro

INTEROFFICE MEMORANDUM

DATE February 2, 1965

SUBJECT Progress Report - Scheduling and Quality Cost Reduction Implementation Study

TO Win Hindle

FROM Chester Gadzinski

cc: Ken Olsen
Harlan Anderson
Stan Olsen
Dick Best

Vendor Certification

Arthur Hall has completed his work in evaluating the resources required for further implementation of the Vendor Certification effort. Further work in this program must await the decision to go ahead. This program it now appears is inextricably bound to the proposals I have advanced in our informal discussion with respect to a separate test group as well as our engineering document control effort.

Module Test Efficiency

A distribution analysis of sales performance of modules has been completed. As expected there are only a few modules that represent the bulk of our sales. An equivalents analysis converting the old module numbers with the FLIP CHIPS has been completed. Further work in this area is awaiting a decision to go ahead on the manufacturing plan suggested in our conversation.

PDP-6A Programming

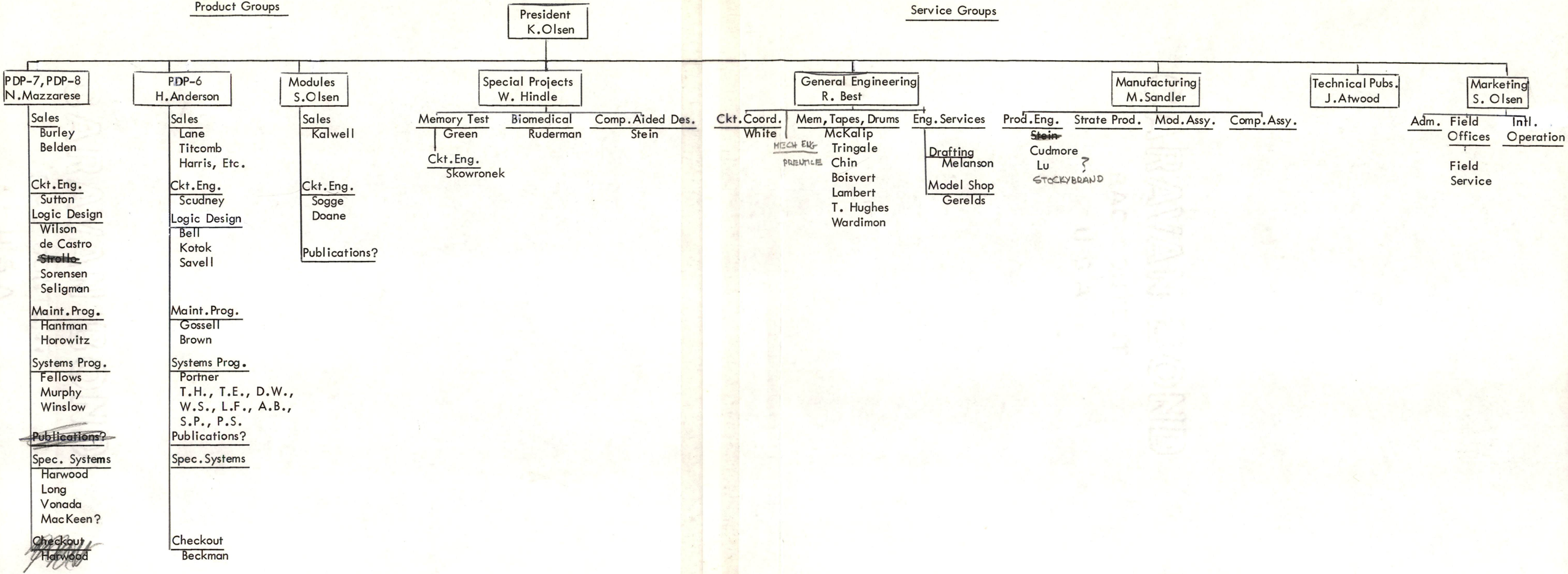
This work is proceeding on schedule. The expected completion date is Wednesday, February 3rd, thus allowing one day for review and two days for production in order to have it ready for February 9th.

Manpower Application

C. Gadzinski	5 days
A. Hall	14.5 hours
J. Cudmore	0 hours.

Chet Gadzinski

CG:ncs


Product Groups
Service Groups
President
K.Olsen
PDP-7, PDP-8
N.Mazzarese
Sales
Burley
Belden
Ckt.Eng.
Sutton
Logic Design
Wilson
de Castro
Strollo
Sorensen
Seligman
Maint.Prog.
Hantman
Horowitz
Systems Prog.
Fellows
Murphy
Winslow
Publications?
Spec. Systems
Harwood
Long
Vonada
MacKeen?
Checkout
Harwood
PDP-6
H.Anderson
Sales
Lane
Titcomb
Harris, Etc.
Ckt.Eng.
Scudney
Logic Design
Bell
Kotok
Savell
Maint.Prog.
Gossell
Brown
Systems Prog.
Portner
T.H., T.E., D.W.,
W.S., L.F., A.B.,
S.P., P.S.
Publications?
Spec.Systems
Checkout
Beckman
Modules
S.Olsen
Sales
Kalwell
Ckt.Eng.
Sogge
Doane
Publications?
Special Projects
W. Hindle
Memory Test
Green
Ckt.Eng.
Skowronek
Biomedical
Ruderman
Comp.Aided Des.
Stein
General Engineering
R. Best
Ckt.Coord.
White
Mem,Tapes,Drums
McKalip
Tringale
Chin
Boisvert
Lambert
T. Hughes
Wardimon
Eng.Services
Drafting
Melanson
Model Shop
Gerelds
Manufacturing
M.Sandler
Prod.Eng.
Stein
Cudmore
Lu
Strate Prod.
Mod.Assy.
Comp.Assy.
Technical Pubs.
J.Atwood
Marketing
S. Olsen
Adm.
Field Offices
Field Service
Intl. Operation

dec INTEROFFICE MEMORANDUM

DATE February 1, 1965

SUBJECT

TO Ken Olsen
Rod Belden
Nick Mazzarese

FROM Mort Ruderman

I have reviewed the specifications for the Physiological Monitor and Data Processing System from Methodist Hospital, Texas Research Center, Houston, Texas. I recommend that we do not bid this request or be encouraged to be prime contractor. I am going to meet next week with the people from Lexington Instruments and relay these thoughts, however, I will recommend that if they feel they could satisfy all the needs of the contract exclusive of any computer needs, we would give them all the support in this area and DEC would be able to fulfill these requirements. I feel that these are good people to be in contact with for they have all the physiological interface equipment that is usually needed for on-line computer needs and that in the future more systems that would be within our total capability will come there way.

Copy for: Mr. Ken Olsen

digital EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

SALES CALL REPORT NO. 327

DATE 1-29-65

FIRM General Precision Inc.
Link Division
STREET 1451 California Ave.
CITY Palo Alto, California

SALESMAN Don Barker
OFFICE AREA San Francisco
AREA CODE PHONE NO. 326-2773
PHONE (OURS THEIRS) ☐ LETTER ☐ VISIT ☐

PERSONS CONTACTED — EXTENSION

Harold Dell - Head of Digital Group
George McCleod - Project Engineer
Ed Lara - Project Engineer

EST. ANNUAL POT.	CK.		CK.	PRODUCT	CK.	TYPE
		NEW		MODULES		
UNDER $20K		OLD		A/D		
$20 - 50K		HIGH		COMPUTORS		
$50 - 150K		MED.		SPECIAL SYSTEMS		
$150K UP		LOW		OTHER		

REMARKS

The Link Division has three departments - the Simulator Group, headed up by Harold Dell; the Analog Group, headed up by Ed Gray; and the Transportation Group.

Harold Dell's Simulator Group has two section, one-of-a-kind Systems and standard products. They are our main target here since they have been using CCC Logic almost exclusively for their one-of-a-kind simulators. George McCleod, who is in this group, has recently finished a design of a small simulator which they consider a standard product. He used the Motorola MECL integrated circuits in his design. I got the impression that they will continue using this approach for their standard products. The reason for this is they have designed their system in functional blocks rather than standard logic blocks. For one-shot systems, however, they do intend to use commercially available circuits.

They told me that CCC was in approximately 2 weeks ago giving them a rundown on the circuits that they are going to announce at the IRE Show in March. They really did not say, but I assume, and I get the feeling that these will be cards with monolithic integrated circuits mounted on them. I really feel that they don't particularely care for the low voltage that the integrated circuits use, the MECL is 0 and .8 volts for their logic levels.

I feel that CCC's position is very vulnerable at this time and that we should use this time lead that we have to the fullest. In order to do this I would like to set up a meeting with the users here at LINK and bring out either Don White or Russ Doane to give them a good 8 hour dose of our circuit design. I have given them some of the information, but I certainly feel that this is a place where we should use the biggest guns that we can.

ACTION TO BE TAKEN

FOLLOW-UP DATE BY

SPECIAL COPIES TO

dec copy dec copy HOME OFFICE COPY dec copy dec copy

digital EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

SALES CALL REPORT NO. 328

DATE 1-29-65

FIRM General Precision Inc.

STREET

CITY

SALESMAN Don Barker

OFFICE AREA

AREA CODE PHONE NO.

PHONE (OURS THEIRS) ☐ LETTER ☐ VISIT ☐

PERSONS CONTACTED	EXTENSION

EST. ANNUAL POT.	CK.		CK.	PRODUCT	CK.	TYPE
		NEW		MODULES		
UNDER $20K		OLD		A/D		
$20 - 50K		HIGH		COMPUTORS		
$50 - 150K		MED.		SPECIAL SYSTEMS		
$150K UP		LOW		OTHER		

REMARKS

In the meantime, I will continue to work on the Analog Group and the Transportation Group so that they can use our circuits in some of their smaller systems for an evaluation.

ACTION TO BE TAKEN

FOLLOW-UP DATE BY

SPECIAL COPIES TO Ken Olsen, Stan Olsen, Harlan Anderson

dec copy dec copy HOME OFFICE COPY dec copy dec copy

INTEROFFICE MEMORANDUM

DATE January 29, 1965

SUBJECT Cutler Hammer Rockette Switches

TO Ken Olsen

FROM Paul McGaunn 282

cc: Henry Crouse

Prices indicated for types listed below.

Delivery for standard white rocker is two weeks from factory (Milwaukee, Wisconsin). Non-standard rocker color increases delivery to four weeks.

	8134K6 (6A @ 125V) (SPST)	8132K3 (6A @ 125V) (DPDT)
List	.88/ea	1.42/ea
1-249	.396/ea	.64/ea
250-749	.352/ea	.57/ea
750-999	.326/ea	.53/ea
1000-2499	.308/ea	.50/ea
2500-4999	.291/ea	.47/ea

	8144K7 (15A @ 125V) (SPST)	8142K4 (15A @ 125V) (DPDT)
List	1.00/ea	1.78/ea
1-249	.45/ea	.80/ea
250-749	.40/ea	.71/ea
750-999	.37/ea	.66/ea
1000-2499	.35/ea	.62/ea
2500-4999	.32/ea	.59/ea

Large quantity orders subject to negotiation.

Paul McGaunn

INTEROFFICE MEMORANDUM

DATE January 28, 1965

SUBJECT Subcontracting

TO K. Olsen
H. Crouse
M. Sandler
J. Smith

FROM D. King

Fabrication costs of standard DEC cabinet to include four welded gussets and zinc chromate primer $80.50 each in quantities of 300.

Long doors to include zinc chromate primer $5.32 each in quantities of 1000.

Plenum doors to include zinc chromate primer $10.75 each in quantities of 300.

End panels to include zinc chromate primer $14.85 each in quantities of 300.

Fan housings complete $5.95 each in quantities of 300.

Fabrication and Sanding of Power Supply Chassis

728 chassis	$2.95 each in quantities of 100
722 chassis	$7.80 each in quantities of 100

Power Supply Assembly - All material supplied by DEC.

728 present vendor's price is $4.95 each - prices quoted by other vendors $19.78 each, $16.00 each, $15.00 each, $19.25 each and $14.75 each.

722 present vendor's price is $14.50 each - prices quoted by other vendors $40.00 each and $35.00 each.

Subcontract Expenditures for the month of January have been Castings $185.00, Machine Shop Work $19,325.00, Plastics $1,979.47, Ceramics $4,451.74, Finishing $2,801.35, Screening/Etching $195.25, Sheet Metal $53,303.19, Wiring $65,661.74, Total $147,902.74.

dec INTEROFFICE MEMORANDUM

DATE January 28, 1965

SUBJECT VERMONT RESEARCH CORPORATION AS A VENDOR

TO Ken Olsen
Henry Crouse
Dick Best
Dick Tringale

FROM Jack Shields

In the past year I have had the displeasure of working with Vermont Research Corporation on a few different projects. These were the BB & N Project and lately the Stanford System. Invariably delivery dates are not met, projects are carried out in a slipshod manner, and, in many cases, we correct problems ourselves because it's easier and faster than trying to get VRC to do it.

As a result, DEC prestige has suffered - due to our customer committments; undue expenses have been incurred - purchase of a second drum by DEC for BB & N; and other projects are late because of the effort needed to rectify existing problems.

I feel that we, as a company, are in a very dangerous position with Vermont Research as a sole source vendor on drums. I recommend a highly extensive investigation of drum suppliers to the OEM market and replacement of Vermont Research as our prime vendor.

INTEROFFICE MEMORANDUM

DATE January 27, 1965

SUBJECT Organization

TO Ken Olsen
Win Hindle

FROM Dave Packer

Our thoughts on organization appear to be focusing on a structure like that described below.

Four component organization types are possible.

1. Product line groups. The line organizations responsible for planning and executing products that bring revenue to the company. Each group consists of a manager and a team of individuals necessary to plan, develop, and (possibly) sell the product.

   Full time personnel with specialized skills (circuit design, technical writing, drafting, programming) are brought into the groups as needed. Group will not be completely self-sufficient. It will use centralized services (such as manufacturing, print shop, reproduction, field offices) by contract; i.e., these services must be arranged for in advance.

2. Product Development Groups. Similar to product line groups, except responsible only for development work.

3. Technical groups. The groups in which specialized capabilities are developed and which are the source of staff for product line groups. Responsible for hiring, training, and placement of personnel as well as their technical development in specialized disciplines.

   These groups are the buffer between product line assignments for individuals. People in the groups can do short term jobs and assist in training. Each group would have a small permanent staff.

4. Centralized Service Groups. Basically, the same as existing departments. Provide services (printing, manufacturing, purchasing) that cannot be effectively integrated into product line or technical groups.

Dave Packer

DWP:ncs

INTEROFFICE MEMORANDUM

DATE January 27, 1965

SUBJECT

TO K. Olsen

FROM D. Kuyamjian

The Licon Switch Model 16-304 is priced as follows:

Quantity	Price
1-9	$2.25
10-19	$2.03
20-49	$1.80
50-99	$1.58
100-199	$1.47
200-499	$1.42
500-999	$1.35
1000-1999	$1.26
2000-4999	$1.17
5000-9999	$1.10

Small quantities are available locally from stock; larger quantities require a two-week lead time.

INTEROFFICE MEMORANDUM

DATE January 25, 1965

SUBJECT Teletype 33 Reliability Investigation

TO K. H. Olsen
H. Anderson
S. Olsen
N. Mazzarese
T. Johnson
J. Shields
P. Gadaire
W. Newell
D. Dubay
J. Smith
B. Dill
J. Hagerty
E. Harwood
R. Mangsen
R. L. Best
G. Bell
R. Savell
D. Adams
E. De Castro
J. Burley
R. Wilson
R. Belden

FROM Arthur Hall

The project assigned me to investigate the means of improving the reliability of Type 33 Teleprinters is, for all practical purposes, complete.

My findings and recommendations are as follows:

1. Teletype claims that the Type 33 may be operated continuously (except for preventative maintenance every 500 hrs) for its estimated service life of 4500 hours. They say that the reliability should be as good as that of the Type 35 (which has a longer operating life). I have found no conclusive evidence to dispute this claim.

2. My estimate of the reasons for the large number of complaints about and troubles with the Type 33 are, in order of importance:

   a. The relative inexperience and lack of training of most of the persons responsible for repair of the Type 33, the difference between the familiar Type 28 and Type 33 and the conviction of most of these people that regardless of their efforts, the Type 33 was not going to work properly.

   b. Improper and inadequate packing for shipping of the Type 33 by both Teletype and DEC.

   c. Marginal design of early units and too many difficult-to-make adjustments in early and current units.

3. Analysis of Type 33 troubles has been difficult not only because of the somewhat emotional atmosphere surrounding the situation but because of the very wide variety of troubles encountered. For instance the part which caused trouble most frequently caused less than 8% of the total complaints; 50% of the complaints involved parts

failing five times or less; less than 5% of the complaints were due to broken parts and of these 1/3 were broken in shipment and 1/3 involved the reader feed wheel (for which Teletype has a fix).

4. Complaints and suggestions about troubles which have formed a relatively high proportion of reports have been passed along to Teletype. They have a modification to eliminate breaking of pins on the reader feed wheel and we hope they will release this mod soon so we may retrofit units in the field. I have written twice and talked to Teletype once about the loose screws attaching the unit to the mounting board and about the poor labelling which offers the shipper an excuse for sloppy handling of the cartons. A comprehensive, detailed analysis of all troubles reported to 12-7-64 will be mailed to Teletype by 1-29-65.

Improvement of Reliability

5. Teletype feels that Teleprinters manufactured after serial #19090 are, because of changes made at that point, more reliable than earlier units. My analysis does not bear this out but then my statistics are incomplete. Modification kits to retrofit Teleprinters made before Serial # 19090 are in house and available for any one at DEC or in the field. As the worth of this modification is not proven and as it requires a lengthy re-building of the unit by an experienced technician I would not suggest the installation of these kits unless a unit is having serious troubles.

6. Training by Teletype or in Dave Dubay's class (given by Field Service on occasion) and as much repair experience as possible are the prerequisites for the development of sufficient skill to properly adjust and repair Type 33 Teleprinters. Attempts by overconfident amateurs have caused more troubles than they solved. A continued reluctance to sacrifice the time and money necessary to give repairmen this training will prolong the troubles we are having with Type 33's.

On 11-11-64 I sent out a memo requesting information from our field offices on the capabilities of these offices to handle Teletype Type 33 troubles. There were 7 replies. Only 1 office had a trained man (he took a 2-day DEC course). Two offices had repaired or adjusted 33's, one of them two times, the other 3 times. Only 1 office knew of available outside assistance and only 1 had definite plans to send a man to school for 33's.

It does not sound to me as if we were prepared to deal with the adjustment and repair of the numbers of PDP-8 attached Teleprinters which we expect to ship in the near future.

A method we might employ to avoid the expense and time of training is to equip our field offices with spare Teleprinters for replacement and to ship faulty units to DEC for repair or replacement. (We would have to make better shipping crates than are presently available.) How to deal with the coming Type 33 maintenance problems should be considered by Customer Relations.

7. Regular maintenance should be performed on a Type 33 Teleprinter every 500 hours of running time. Very few Teleprinters have running time meters and so we have little way of knowing which units are due for or past preventative maintenance. Lack of these meters also makes any analysis of Mean Time Between Failure or total life of Teleprinters impossible.

These meters are available at DEC and the modification is a simple one. These meters should be installed in every Type 33 in house and in the field at the earliest possible opportunity. Jack Shields should see that Field Service personnel carry one of these mod kits with them on any visit to any unmodified PDP-5.

Who ever installs a meter should send a note to Bud Dill (in Peripheral Equipment Checkout) giving the best estimate possible of the time that the Teleprinter has run before the meter was installed (the computer elapsed time meter and a % use estimate from the operating personnel should give a fair answer). No Type 33 must be allowed to leave the Peripheral Equipment Checkout area for any reason without a meter. This may involve a manpower problem which Jack Smith and Bud Dill will have to solve.

8. I have devised a Trouble Reporting Code and reporting forms to use for statistical analysis of Teletype troubles (it is easily adaptable to other equipment if needed, without altering present data). The data is coded by a knowledgable technician, transcribed to cards and various analyses run off by the Tab Department. All Type 33 reports dated from 9-6-63 through 12-7-64 which were available on 12-11-64 are on cards and have been analysed for trends in trouble types, part failures, etc. An interpreted report will be available 1-29-65.

This analysis has been useful and should be continued. When running time meters are installed, the meter indication should be recorded on the Field Service Report and on the tabulating cards. This will enable us to make a determination of MTBF.

Analysis work has been hindered by a lack of knowledge about how many Teleprinters have entered DEC, to which computer they are attached and what the serial numbers of those computers are. Paperwork involving the transfer of Teleprinters from one area or jurisdiction to another should record the serial number (this number is easily seen without any disassembly). The fact of the entry of any Teleprinter into the Peripheral Equipment Checkout area from any source for any reason should be recorded together with the serial number so that we can keep records up to date and catch previously unrecorded units if they pass through.

9. To avoid giving customers used Teleprinters and so that we may have a control lot to watch carefully, the Teleprinters used in Checkout will remain in Checkout. Teleprinters to be shipped with the system will be attached only far enough ahead of final checkout to assure that they are working properly.

10. A careful analysis of the trouble we have with parts should be the basis of a comprehensive stock of parts both for use at DEC and in the field. The cost of the parts themselves is trivial compared to the expense of system downtime.

AH/mro

digital EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

SALES CALL REPORT NO. 11505

DATE 1/25/65

National Cash Register

STREET

CITY Dayton, Ohio

SALESMAN N. Mazzarese

OFFICE AREA Maynard

AREA CODE 513 PHONE NO. 449-2625

PHONE (OURS ~~THEIRS~~) X LETTER [ ] VISIT [ ]

PERSONS CONTACTED	EXTENSION
Frank Kernan	

EST. ANNUAL POT.	CK.		CK.	PRODUCT	CK.	TYPE
		NEW		MODULES		
UNDER $20K		OLD		A/D		
$20 - 50K		HIGH		COMPUTORS	X	8
$50 - 150K		MED.		SPECIAL SYSTEMS		
$150K UP		LOW		OTHER		

REMARKS

Checked back with Frank Kernan today to determine if they had had sufficient time and information to evaluate the PDP-8 product. He informed me that NCR Dayton was undergoing a reorganization which he was reluctant to talk about, but which did affect the plans for including the PDP-8 in their product line. He advised me that within two or three days, the reorganization should be firmed up and he would have whoever was going to be in charge of this project contact me. If I do not hear from him in two weeks, I will give Frank Kernan another call.

ACTION TO BE TAKEN

FOLLOW-UP DATE 2/8/65 BY n. Mazzarese

SPECIAL COPIES TO K. H. Olsen, Bob Oakley

COPY

AMERICAN RESEARCH AND DEVELOPMENT CORPORATION

THE JOHN HANCOCK BUILDING - BOSTON 16 - MASSACHUSETTS

To: ~~WC, DR,~~ Ken Olsen

Taken from: Wall Street Journal
January 13, 1965

attach to NCR
Sales call Report
to R. Oahl & ~~and~~
KHOFMY copy

this is probably the intended application for PDP-8 computers...

National Cash to Provide Computer Link to Banks

By a WALL STREET JOURNAL *Staff Reporter*

DAYTON, Ohio —National Cash Register Co. said it will provide a new service for savings banks that don't have computers of their own by making direct connections from tellers' machines to central data-processing units operated by the company.

The central computer will post and process accounts and update passbooks in a maximum of 20 seconds, reducing the bank's personnel, accounting, and figure rehandling requirements, the concern said. Rates for the service will be based on a complicated sliding scale involving the number of open or active accounts, it added.

Several savings banks have or have ordered computer systems of their own that are linked directly to tellers' posting machines. But National Cash Register said its offer to connect posting machines of several different banks to a service-bureau computer is "the first of its kind."

The company said it has contracted with eight savings banks and one savings and loan association in the New York area, together totaling more than one million accounts, to supply the service. A similar Pittsburgh center to open in mid-year has service contracts with 18 savings and loan associations, the company noted.

Within the next 18 months, such "on-line" processing centers will be set up in Chicago, Los Angeles, San Francisco and Boston, providing service to customers up to 300 miles away.

INTEROFFICE MEMORANDUM

DATE January 20, 1965

SUBJECT Responsibility for the Canadian Operation

TO Kenneth H. Olsen FROM W. R. Hindle, Jr.

The Works Committee, on January 19, heard the arguments on who should be responsible for the Canadian subsidiary. Ted Johnson, Stan and Nick felt strongly that it should operate as another U. S. field sales office because of:

1) Desirability of stressing similarities to U. S. rather than stressing differences.
2) Geographic proximity to Maynard.
3) Similarity between U. S. and Canadian business customers.

Jon Fadiman and Andy believe Canada should be part of the Foreign operation because:

1) All of the foreign legal, financial and duty problems are present in Canada.
2) Denny Doyle prefers to be a foreign operation.

It seems to me that two criteria override all of these considerations. They are:

1) How can Canada get the maximum support from Maynard?
2) Who is in the best position to watch and evaluate the entire Canadian operation?

In my view, the domestic and foreign sales groups offer equivalent support from Maynard. Thus the decision comes down to who at Maynard is in the best position to watch Canada. I think that the control techniques that we are developing for our foreign operations are more appropriate for Canada than the controls that we are developing for domestic sales offices. I fully agree with Stan's point that we need to stress "American" marketing ideas, but these are equally applicable for all foreign operations. Thus, if it is worth having a separate group to handle foreign subsidiaries, and I think it is, then Canada should be controlled by this group.

Win

WRH:ecc

INTEROFFICE MEMORANDUM

DATE January 19, 1965

SUBJECT CANADIAN OPERATION

TO K. H. Olsen
H. E. Anderson

FROM J. L. Atwood

I see two choices with respect to our Canadian operation.

1. By handling it as a U.S. regional office, we stand to upgrade our sales in Canada rather quickly since Ted appears to have better rapport than Jono with the majority of the Home Office sales staff.

2. By handling it as a foreign subsidiary, we stand to upgrade our entire international marketing effort since Jono would be influenced to solve the many problems that are or will be common to all of our operations outside the U.S.

Neither alternative would appear to offer any particular advantage in the current fiscal year. Consequently, the problem should be viewed in terms of our long-range objectives. And it should also be viewed with minimum emphasis on the individuals presently concerned. Ted, Jono, Denny, John Leng - any or all might have completely different assignments six months or a year from now.

My considered opinion is that we have far more to gain by using DECAN to help support and guide the establishment of an effective international marketing operation than by extending our U.S. sales operation into Canada.

J.L.A.

fd

dec INTEROFFICE MEMORANDUM

DATE January 19, 1965

SUBJECT Phase-Over Requirements

TO K. Olsen
R. Best
H. Crouse
R. Hughes
D. Packer
L. Prentice
M. Sandler
T. Stockebrand
D. White
W. Hindle

FROM J. Smith

1. Documented Process Specifications:

This will include temperature, time and atmosphere requirements. What is currently in existence is well done and acceptable.

2. Documented Chip Specifications and Parameters:

A number of specifications and parameters are currently in existence. It is my understanding that they are not complete. Once complete, it is customary to review the documentation with Dick Best and Quality Control for approval.

3. Documented Specifications for the Testing and Inspection of Incoming Material:

We are currently very weak in this area; diodes are the biggest problem.

4. Testers Designed and Built for Checking Completed Chip Parameters:

There are currently testers in existence. It is not clear if Dick Best and Quality Control agree that these testers are adequate and are checking all required parameters.

5. First Lot (100 Chips):

Testing and approval of each chip type by Quality Control.

INTEROFFICE MEMORANDUM

DATE January 19, 1965

SUBJECT Cost Comparison - Discrete versus Flip Chip

TO K. Olsen ←
R. Best
H. Crouse
R. Hughes
D. Packer
L. Prentice
M. Sandler
T. Stockebrand
D. White
W. Hindle

FROM J. Smith

DCD

Machine Insertion - .014
Hand Insertion - .057
Machine Drilling - .0018

2 Resistors - 15K
5 Diodes - 664's
1 Capacitor

Discrete

Material:

Resistors - 2 @ .03 =	.06
Diodes - 5 @ .10 =	.50
Capacitor - 1 @ .04 =	.04
	.60

Labor and Overhead:

7 Machine Insertions @ .014 =	.098
1 Hand Insertion @ .057 =	.057
16 Drilled Holes @ .0018 =	.0288
	.18

Total: .60 + .18 = .78

98% Yield = .80

Henry does not feel there will be a reduction in price on discrete components in the near future.

Current Manufacturing Cost			Estimated Cost, June 1, 1965		
Material:					
Sub Strate	1 @ .02	= .02		.02	(No Change)
Diodes	5 @ .05	= .25	5 @ .02	= .10	(Reduced by .15)
Capacitor	1 @ .05	= .05	1 @ .01	= .01	(Reduced by .04)
Cover	1 @ .0058	= .0058		.0058	(No Change)
Inks	.01	= .01		.01	(No Change)
		.3358		.1458	(Reduced by .19)
Labor:					
Bonds (4000/8 Hours)	12 @ .01	= .12	12 @ .01	= .12	(No Change)
Screening (1/5 Seconds)	3 @ .0025	= .0075	3 @ .007	= .021	(1/2.5 Seconds)
Die Setting (1/12 Seconds)	6 @ .018	= .108	6 @ .0045	= .027	(1/3 Seconds)
Metalizing (1/Minute)	1 @ .09	= .09	1 @ .0075	= .0075	(1/5 Seconds)
Pin Insertion (1/ 3 Seconds)	1 @ .0045	= .0045	1 @ .0045	= .0045	(No Change)
Potting (1/Minute)	1 @ .09	= .09	1 @ .0045	= .0045	(1/30 Seconds)
Drilling	6 @ .0018	= .0108	6 @ .0018	= .0108	(No Change)
Lead Protector (1/10 Seconds)	6 @ .015	= .09	6 @ .0045	= .027	(1/3 Seconds)
Resistor Trimming (1/25 Seconds)	2 @ .0375	= .0750	2 @ .0045	= .0090	(1/3 Seconds)
Testing (10 Seconds)	1 @ .015	= .015	1 @ .015	= .015	(No Change)
Board Insertion (1/1.5 Minutes)	1 @ .06	= .06	1 @ .06	= .06	(No Change)
Soldering Lead	1 @ .03	= .03	1 @ .012	= .012	
		.7008		.3183	

Total Manufacturing Cost

.34 + .70 = 1.04

85% Yield = 1.225

.15 + .3183 = .4683

= .552

Conclusions:

Our present manufacturing cost of $1.22 is due to rather large material costs and very crude manufacturing processes. At present, we have only one automatic machine in operation, the pin inserter for inserting the feet. All other operations are hand operations, which require a great amount of direct labor. Our present labor costs amount to 58% of total manufacturing costs.

This report does not mean to imply that $.55 per chip is the ultimate in cost reduction. There is a possibility of further reductions in material costs. Estimates of labor savings to be realized by automating certain operations were conservative. If the below listed programs can be accomplished within the next four-month period, discrete versus flip chip costs would be $.80 versus $.55 or a very comfortable return on investment.

1. A reduced diode cost from .05 to .02.

2. Get the automatic die setting device operational.

3. Get the resistor trimmer operational.

4. Develop a machine to metalize the slots at a minimum rate of 1 chip per 5 seconds.

5. Develop a machine to add frit to protect our bonding leads at a minimum rate of one application every 3 seconds.

6. Develop a machine to solder leads to the sub strate.

7. Develop a potting machine with a minimum rate of 1/30 seconds.

8. Develop a semi-automatic labeling machine.

9. Realize an 85% or greater yield.

On the chart below are noted the events or combination of events and what the effect is on unit cost per chip:

Machine Development	Diode Cost Reduction	Unit Cost
		1.22
	X	99.6
X		71.0
X	X	.552

In order to reduce costs below our present discrete costs, development of machine is essential. Expected reduced material costs alone would not reduce costs below our present discrete methods. It is interesting to note that, if we develop the machine and material costs do not decrease, we will still realize a $.08 gain.

dec INTEROFFICE MEMORANDUM

DATE January 19, 1965

SUBJECT Man-Power Requirements

TO K. Olsen ←
R. Best
H. Crouse
R. Hughes
D. Packer
L. Prentice
M. Sandler
T. Stockebrand
D. White
W. Hindle

FROM J. Smith

Engineering man-power requirements to complete development of specified equipment is 29-man weeks or approximately seven months. Without the specified machinery, each chip manufactured will cost an additional $.38 (.70 - .32). Our present PDP-8 schedule requires 20,000 chips per month. Without machinery, this requirement alone would be costing us $7,650/month.

Operating Personnel Required:

Without Machinery -

.70/unit X 20,000 = $14,000/month Labor and OH

$$\frac{14,000}{\$5.40} = 2600 \text{ man hours/month}$$

$$\frac{2600}{160} = 17.0 \text{ Girls}$$

With Machinery -

.32/unit = 8 Girls

dec INTEROFFICE MEMORANDUM

DATE January 13, 1965

SUBJECT PROPOSAL FOR A CHAPTER IN THE COMPUTER USERS HANDBOOK

TO Ken Olsen

FROM Barbera Stephenson

The handbook is intended primarily for the computer user rather than designer. The present outline for the book is quite heavily weighted in the direction of slot-in-the-wall-communication with institutional computer centers. Our section, is in Professor Korn's words, "To point out the flexibility, elegance, and man-machine interaction possible with smaller computers directly available to an investigator or hooked into an instrumentation system." Professor Korn has also stressed the need for an unbiased article. However, I think this is certainly an area in which our computers shine and much of the contents of the handbook chapter can parallel that of the Real Time Computing textbook. Of course, the discussion will go into more detail and assume more knowledge on the part of the reader.

The main emphasis will be on I-O and how the computer interacts with the man or machine in the loop. The main features I plan to cover are the following:

Functions of the Small Computer

This section will discuss the two basic functions of a computer.

1. Functioning in its normal capacity--to collect, analyse, and present the data and to control external devices on the basis of the analysed data.

2. To assist the user in preparing, changing, and debugging programs. The other portions of the handbook will cover compilers in great detail, this section will be primarily concerned with editors and how they are used on line.

Organization of the Small Computer

This section will discuss the central processor and memory portions of the computer only to the extent that they are not covered in earlier chapters.

The main emphasis will be on I-O. It will describe connection of a generalized, low speed I-O device to a computer and connection of a generalized high speed device. It will discuss interrupts versus I-O processors, I-O busses versus a radial system, buffered I-O versus unbuffered I-O. It will also discuss the various types of external devices and how they are connected to the computer, including the problems of synchronization, timing and control. Since most real time applications involve connection to voltage or pulse train devices, these will be covered in more detail.

There will also be a discussion of the methods of keeping track of time--real time and interval clocks using external devices or programming techniques.

Applications of Small Computer Systems

There will be one illustration for each type of application. This will include a block diagram and flow chart, a discussion of the system operation, what type of special equipment is utilized, what particular central processor features are utilized, and generally what kind of speeds can be anticipated. The major application areas described will be the following:

Instrumentation

I think the best example here would be the use of the LINC for averaging, time histograms and amplitude histograms. The lab. proof mechanical configuration,plug-in unit for IO and LINC tape are worth particular mention. Other areas, which can be mentioned in less detail, are pulse height analysis, seismographic data analysis, telemetry, and industrial testing.

Control Systems

The principle example here will be a defraction-refraction system with the PDP-8 since this includes all of the necessary components but is relatively simple. Other areas that could be mentioned would include our own resistor trimming on our flip-chips, and the Nabisco Cookie controls.

Simulation

Simulation is primarily used by the aircraft industry

so the United Aircraft system would seem to be a good example. Some discussion of ADA processors, sample and holds, double buffered D to A, timing, and mode synchronization would be in order here also.

Engineering Design

Our own automatic logic design system would be an excellent subject for the main application here. A discussion of sketch pad and some of the various I-O media would also be in order.

Satelite Computers

This will be a small discussion of how a computer can collect real time data and make direct transfers to a larger computer system.

Small Computer as a Programming Aid

This section will discuss on-line debugging referencing other chapters for material on compilers and assemblers.

I have contacted John Jones and Chuck Stein about getting logic diagrams of special equipment, flow charts and block diagrams on the defraction-refraction equipment and on the automatic logic design system. They both said that if I would make out a list of questions for them they would be happy to put down the answers for me.

The major difficulty in the article will be covering such a tremendous amount of material in only 25 handbook pages. Since there are no other handbook chapters devoted to hardware or real time systems, there will need to be a lot of detail. I am planning to stop to visit Korn on my way back to the West Coast to try to get a more complete idea of what is being covered in the rest of the handbook, how much knowledge will be anticipated on the part of the reader and what he would like most to see covered if part of this material needs to be dropped out.

INTEROFFICE MEMORANDUM

DATE January 12, 1965

SUBJECT PROPOSAL FOR DIGITAL LOGIC WORKBOOK

TO Ken Olsen
CC: Stan Olsen
Dick Best

FROM Barbera Stephenson

PURPOSE

The Digital Logic Workbook will be designed to promote the sales of our logic trainer as a laboratory teaching device. The major market area will be technical schools and military training schools. High schools and universities will be a secondary market area.

APPROACH

In order to cover this wide market area, I propose that we have a workbook designed to be used directly with the logic kit in the laboratory. The workbook should contain a sufficient number of experiments on different levels that the instructor can select the experiments best suited to the age and ability of the students and the aims for course. The experiments should also be sufficiently independent that the instructor can arrange them according to the text that he is using in the classroom portion of the course.

With the workbook approach I feel we will do the most to demonstrate the power and versitility of the logic kit. By restricting ourselves to the laboratory portion of the course, which deals with examples rather than principles, we will make a better impression on academic types than we would by trying to combine a discussion of general principles with applications in DEC logic.

The first two experiments will be designed to introduce the student to the equipment. These will consist primarily of reading matter similar to the introductory sections of our present module catalogues. These will also contain some very simple experiments -- "Put -3 volts at the input to the diode gate, measure the output with a voltmeter." etc.

The remainder of the experiments will be completely independent. They will be divided into three basic parts, each of which can be performed in 45 minutes. (This means a maximum of 15 minutes for an adult who is familiar with DEC

logic.) There will be optional parts which can be performed only on an expanded logic kit and design project suggestions for the student who is able to complete the basic work before the lab. hour is done. Most 1 hour courses have actual class times of 42 to 57 minutes. Thus, the high school instructor can assign one portion of an experiment for completion in the class hour while a college instructor can assign a total experiment for completion in a 3 hour lab. session. Since the high school term consists of 36 weeks and a college semester consists of 14 weeks, there should be at least 16 to 18 experiments to select from.

In addition to this, the back of the book will contain some suggestions for more complex student design projects. These could be used as a final part of a course on the college level.

CONTENTS

The following is a tentative list of experiments to be included in the workbook. This list, of course, must be subdivided into the experimental format and make consistent with the amount of equipment in the kit, but the basic areas will be:

Introduction

Basic experiments from the logic handbook, simple flip-flop, AND-OR gate experiments.

Counters

BCD, special, and preset counters using DC carry, pulse carry, and parallel techniques.

Shift Registers and Buffers

Shift Register, ring counter, switch tail ring counter, jam and two step read-in techniques.

Arithmetic Units

Serial and parallel adders with DC and pulse carry techniques, complementing and subtraction, possibly look ahead adders.

Gating Networks

Boolean Algebra, minimization of gating nets, binary-to-octal

decoders, BCD decoders, comparators, and parity generators.

Decimal Arithmetic

Counters in different codes, adders, subtractors, BCD-binary conversion.

Gray Code Usage

Counter, Gray to binary converter, encoder.

Synchronizers

Pulse train, start-stop, and single pulse synchronizers

Analog-to-Digital

D to A conversion, A to D conversion using counter, up-down counter and successive approximation techniques.

Operational Digital Techniques

Binary rate multiplier, adder, subtractor, scaling, integration.

Independent Study

This could include suggestions for such things as multiplier, divider, or small computer using operational digital techniques.

SCHEDULE

To sell the kit for use during the next academic year, we should start an advertising campaign late this Winter and be able to distribute sample workbooks in the early Spring. Our proposal for the advertising campaign is a mass mailing in March to as many schools as possible. The mailing will show a photo of the logic kit, discuss the different types of experiments that can be performed with it, offer a sample copy of the workbook to the instructor, and give him the names of DEC offices where he can see the kit itself. The sample workbooks should reach the instructors before the end of April to allow them to requisition the funds before the term ends.

As part of the market research on the project, we would also like to place the kit and some mimeographed experiment notes in a few select schools. Stan Olsen suggested Wentworth as typical of the technical schools and Ted Johnson suggested the U. S. Naval Postgraduate School at Monterey as typical of the military training courses.

The first part of the workbook project is to sketch out the general logic for the experiments and determine an optimum module complement. Once this is done the test kits can be sent to our experimental schools and a few sample writeups can be generated to go with the test kits.

One of the comments that is certain to come back is that our symbols are not consistent with those used in the general texts. I will study a variety of texts and try to find a set of symbols which are as nearly as possible consistent with our present module symbols, our present computer symbols, symbols most widely used in the text, and symbols accepted as standards. This will be done early in the project so that it can be submitted to the Module Guidance Committee for approval. However, rework and review of the symbols can go on simultaneously with the experiment writeups.

The contents of the workbook can then be divided into experiments of approximately the right size. As the actual writing, drawing, and testing of each experiment is completed, it can be mimeographed and sent to all our experimental users.

When the book is completed, it then needs to be edited to incorporate feedback from our experimental users and changes in the proposed symbology. The final typing can be done and the drawings can be prepared by the art department at the same time as the final editing is being done.

I will plan to return to Maynard to check the drawings and final proofs. This can be combined with going over the material and discussing the progress of the other publications.

Copies of each portion - proposed module complement, symbology, outline, experiments and edited copy will be sent to Maynard as completed.

The complete book will be ready for publication on April 1.

dec INTEROFFICE MEMORANDUM

DATE January 12, 1965

SUBJECT PROPOSAL FOR AN INTRODUCTORY BOOK ON REAL TIME COMPUTING

TO Ken Olsen
CC: Nick Mazzarese
Jim Burley

FROM Barbera Stephenson

PURPOSE

The Real Time Computing textbook is intended to increase the sales of PDP-7 and PDP-8 computers to people who have not previously used a general purpose computer. The major market area will be university and Government research laboratories. The secondary market area will be in industry process control, data logging and simulation.

THE APPROACH

The book will be designed to be read in order and will be primarily tutorial in nature, although there will be a glossary and some summary charts at the end of the book. It is assumed that the reader is an intelligent person even though he may not be familiar with computers. For this reason the book must be very careful to avoid talking down to him (apples, oranges, grapefruit, take soldering iron in lefthand etc.) but equally careful to bring in new concepts and new terminology at a constant rate through the book, (not losing him with a simplified introduction then a jump into very technical material or, equally bad, losing him at the very beginning because of the use of too many computer orientated terms).

The potential reader is probably familiar with slot-in-the wall type computer installations and programmers discussing IJOB, printout, maps etc. We must convey the concept of man-machine interaction, and of the user controlling the machine not vice versa.

The book should be liberally sprinkled with applications to make the user feel that he understands how the computer works in different systems. This can be done by introducing him early to block diagrams and flow charts, which can then be used to illustrate the applications without getting into the details of specific programming logic and hardware.

The book will deal primarily with programming. There will be enough discussion of the mechanics of the operation and the hardware so that he knows how the machine is operated and how devices can be connected to it. At the end of the book he should be able to write and run a simple PDP-8 program which would allow him to add two numbers and type out the result or convert two voltages into a digital form, add them together, convert the result to decimal and type it out.

CONTENTS

Introductory Matter

This will cover the basic concepts of a digital computer, of programming, of I-O, and of real time computing. It will introduce the reader to block diagrams and flow diagrams, straight line programming, loops and breaks. It will show a photograph of the console, and explain the basic mechanics of reading a program in and out of a machine. Reasons for using a computer will be discussed in research terms.

Computer Logic

This section will discuss instruction format, the distinction between instructions and data, the parts of a computer (such as the program counter and instruction register etc.) and touch slightly on how operations are performed within a computer.

Arithmetic Programming

This section will discuss addition, subtraction, introduce him to the concept of complements, branching, index registers (and pseudo-index registers), fixed point versus floating point numbers, handling overflow, and calling subroutines.

Storage Devices

This section will discuss main memory and auxiliary memory and techniques for transferring information between them.

Binary Numbers

This will probably be a part of the arithmetic programming chapter but should be delayed in the book as long as possible since it is a rather tedious subject and, I believe, one of the things that most frightens prospective users. Subroutines

for binary-BCD conversion will be given and the fact that these subroutines can be called upon will be stressed.

Machine Hardware

This section will be a brief condensation of the material now included in the module catalogue. It will be covered only to the extent that is necessary to allow him to read through the I-O sections and understand how he can attach his devices to the computer.

Computer Aids to Computer Programming

This section will discuss compilers, assemblers, and tape editors what the difference is between these and how they can be combined to help the user prepare his program. Details will be left for the programming manuals.

I-O Hardware

This section will discuss data and program interrupt systems and will introduce him to the concept of buffered I-O and basic generalized I-O devices.

Man-Machine Communications, Alphanumeric

This section will explain how he can communicate with the computer in alphanumeric form and will illustrate using the ASR Printer Keyboard, Paper Tape Reader and Punch.

Man-Machine Communication, Graphic

This section will illustrate how he can communicate with the computer in a graphical form, i.e., display and light pen. By this time a large number of application notes and photos can be presented.

Machine-Device Communication

This section will discuss analog-digital conversion and connection to external devices for instrumentation, control, and simulation applications.

Systems Programming

This section will discuss how the arithmetic, storage transfer, and I-O programming are combined into a single

system with a simple example -- possibly John Jones' Defraction-Refraction System. This is a particularly good example because it is a closed loop system where the computer takes data from an external device, makes simple calculations on the data and controls the device on the basis of analysed data. The computer also displays the analysed data information to the user. Clearly this application will not be covered in detail but more with a flow chart, block diagram type approach.

Appendices

These will include the PDP-8 instruction list and a writeup on the mechanics of input and outputing of program on the PDP-8.

SCHEDULE

Our reader for this book is a prospect rather than a committed customer, so it is extremely important that we keep his attention through the book-particularly that we don't lose him by taking too large a jump. For this reason I feel it is most important to introduce the new topics and new terms at a constant rate through the book. To do this the entire book needs to be written and edited as one piece, rather than being published in preliminary chunks.

The first few weeks will be devoted to preparation of a detailed outline showing what new subjects will be introduced in each chapter. In the final book there will be approximately 15 chapters of 12 pages each (that's 25 pages typed double spaced).

When the book is completed, it then needs to be edited for consistency, style etc. Material can go to final typing and to the artists for illustration as it is being edited. It should be able to go to press within a week after completion of editing.

Copies of all material, outline, chapters, as they are written, and edited work, will be sent to Nick Mazzarese and Jim Burley. The completed book will be available for Wescon.

INTEROFFICE MEMORANDUM

DATE January 12, 1965

SUBJECT Status - PDP-7 Production

TO K. Olsen
H. Anderson
S. Olsen
R. Belden
E. Harwood
W. Hindle
N. Mazzarese

FROM J. Smith

PDP-7-2, Stanford

Modifications to the central processor were completed Thursday, January 7, 1965. The machine is presently undergoing checkout. The machine was delivered to Checkout with all modules and modifications installed.

Options

34 display has been installed.
550 tape control undergoing off-line checkout; will be available for installation the end of the week.

Problem Areas

Extended arithmetic element and reader, punch - unless wiring schedules are received on these items by Friday, January 15, 1965, checkout will be greatly hindered.

Shipping date to customer - February 23, 1965

PDP-7-5, New York University

Modifications to the central processor were completed Monday, January 11, 1965. Checkout commenced Tuesday, January 12, 1965. The data communication system has been installed in conjunction with the central processor modifications to help expedite matters at a future date.

Options

340 system - undergoing off-line checkout. Will be available for "tie-on" the end of the week.

630-12 data communication system - has completed construction and has been installed. D. Smith has agreed to help with on-line testing.

Problem Areas

Once again, the extended arithmetic element and reader, punch are not released.

Shipping date to customer - February 15, 1965

PDP-7-6, Delft

Schedule date to Checkout - January 22, 1965

Central processor logic has been received and is currently being modified. Memory logic is undergoing ring out. Device select and manual function logic is being constructed.

System will be delivered to Checkout on schedule.

Shipping date to customer - March 5, 1965

INTEROFFICE MEMORANDUM

DATE January 11, 1965

SUBJECT Vote for 1/12/65 Directors' Meeting

TO K. Olsen
H. Anderson
W. Hindle

FROM R. Mills

Following is a proposed vote for the leasing of new areas as discussed:

VOTED: That the President and/or the Vice-President are authorized to negotiate lease agreements for the following areas in the present Maynard Mill complex:

Floor	Building	Sq. Feet	Occupancy Date
3	4	12,000	On or before 7/1/65
3	6A & B	9,200	Immediate
3	8	8,400	Immediate
3	11	9,000	Immediate
		38,600	

Total rental will approximate $20,000. annually.

We have negotiated the above property to run concurrently with our lease for Bldgs. 12, 3, & 4 which terminates 8/31/66. On this basis there will be a 3¢ per sq. ft. increase on 9/1/65, except Bldg. #4, if we take up the 5 year option available to us. Maynard Industries has offered to eliminate the 3¢ increase if we will exercise the 5 year option now, in effect giving us a 6½ yr. lease versus a 1½ yr.

Under our present lease for Bldgs. 12, 3, & 4 we must exercise the renewal option by 8/15/65. If we should exercise the option now on the new space we would save approximately $4,000 over the 5 years.

dec INTEROFFICE MEMORANDUM

DATE January 7, 1965

SUBJECT BBN SWAPPING DRUM

TO K. H. Olsen
N. J. Mazzarese
G. Rice

FROM T. G. Johnson

Jack Brown called to inquire as to a reasonable cost and approximate delivery for expanding their 32 field swapping drum to a 64K swapping drum.

INTEROFFICE MEMORANDUM

DATE January 6, 1965

SUBJECT NEW PERSONNEL AUTOMOBILE POLICY

TO All field offices FROM Ted Johnson

Attached is a copy of the new mileage allowance policy. This is effective as of January 15, 1965.

Please outline and discuss this policy with your regional salesmen and field service personnel. Send me a memo listing present or planned automobiles and those who wish to take advantage of the $30.00 monthly fee.

A memo outlining the personal income tax aspects of this mileage policy will follow.

We believe this to be a good policy. I'd be happy to discuss this with you if you have questions.

TJ/pr

cc;
N. Mazzarese
Jack Atwood
✓Ken Olsen
Winn Hindle
Harlan Anderson

Ted

DEC AUTOMOBILE MILEAGE ALLOWANCE POLICY

It is DEC's policy to reimburse employees required to use their personal automobile for business purposes.

A DEC employee to be reimbursed for mileage falls within one of two schedule categories, depending on whether he is a field office assigned employee (either sales or field service) or assigned to Maynard.

Field Office Sales and Service personnel will receive 9 cents per mile plus a fixed amount of $30.00 per month, the latter conditional upon the employee's automobile being qualified by committee through the Field Sales Manager.

The fixed fee reimbursement is done on a monthly basis. Employees are required to submit their travel figures on expense reports and to keep their own records for tax purposes. The fixed fee reimbursement will be made at the beginning of each month, separate from the salary payment and paid automatically to persons who qualify. Per mile allowances will be paid upon receipt of travel vouchers.

The general qualification of the field employee's automobile is that the car be 2 years old or less (rated January 15 of each year) and comfortably seat 5 persons. The class B automobile is the recommended standard. (A full size Chevrolet or Ford.) High standard compacts will be qualified at the discretion of the Field Sales Manager. If the automobiles do not qualify, the $30.00 rate is forfeited and only the 9 cents per mile rate applies.

It is to be stressed that qualification for the $30.00 allowance is dependent upon the employee's primary responsibility being customer work requiring extensive use of his automobile in his locally assigned region. Should the employee's job classification change, the qualification will be reviewed and revised at the discretion of the field sales manager.

Other DEC employees will be reimbursed at a rate of 9 cents per mile.

Field Sales and Service people assigned to the home plant (training, in-plant service, etc.) do not qualify for the Field Office reimbursement plan.

Qualificants as of December 22, 1964

FIELD SERVICE (Field Only)

John Mutzeneek
Claude Payette
Frank Hibberd
Jim McPherson
Bob Brackett
Gene Henton
Charles Surbur
Al Roberts
Lloyd Murray

FIELD OFFICE SALESMEN

Denny Doyle
Jack Richardson
Tom Quinn
Bob Stiver
Jerry Murphy
Dave Denniston
John Jorgenson
Ken Larsen
Ken Weir
Ray Lindsay
Howie Painter
Don Henderson
Jack O'Connell
Don Barker
Dick Musson
Ken Brown
George Rice
Charlie Kosaftis
Bob Maxcy
Fred Gould
Barbera Stephenson
Bob Oakley

dec INTEROFFICE MEMORANDUM

DATE January 5, 1965

SUBJECT Benelex 70

TO K. Olsen

FROM H. Crouse

cc: W. Farnham

I purchased (on Purchase Order 42393) three sheets of "BENELEX 70" from New England Hardboard Co. in Worcester.

4' x 3' x 1/4	$0.47/sq. ft.	$ 5.64
4' x 3' x 1/2	0.90/sq. ft.	10.80
4' x 3' x 5/8	1.12/sq. ft.	13.44

Additional thickness are available 3/4" @ $1.35/sq. ft., 1" @ $1.74/sq. ft., 1 1/2" and 2".

New England Hardboard will not offer any substantial discount. However, they are a fabrication house, if we wish to shape the masonite, I suggest we ask them to price the fabrication for us.

Henry J. Crouse

INTEROFFICE MEMORANDUM

DATE January 4, 1965

SUBJECT PDP-7 Production Schedule

TO K. Olsen ←
H. Anderson
S. Olsen
R. Belden
E. Harwood
W. Hindle
N. Mazzarese

FROM J. Smith

Three weeks ago at a meeting with Ken, it was agreed that Production should undertake a "crash program" on the construction of PDP-7 basic computers.

At that time, the J.P.L. and Bell Laboratories systems were undergoing checkout. These machines were constructed in conjunction with the prototype and therefore, were in reality prototypes themselves. Extensive modifications were being generated on a daily basis. Stanford and all subsequent machines were virtually non-existent, due to the status of the machines under test. It was agreed that Production should strive to construct one machine per week starting January 4, 1965. We were informed that extensive modifications to the central processor, reader, punch and E.A.E. were in the process of being generated, but it was decided to go with what we had. We agreed on the attached schedule.

The attached status memo will give you an idea of what has transpired since that time; and also, what remains to be accomplished. A great deal has been accomplished, which can be readily witnessed by the number of PDP-7's in advanced stages of construction on the production floor. Conditions seem very favorable, and all schedule dates beyond machine number five should be met if modifications can be held within reasonable limits.

Planned Production Rate:

Number	Assigned Customer	To Checkout
PDP-7-2	Stanford	1/4/65
PDP-7-5	New York University	1/8/65
PDP-7-6	Delft	1/22/65
PDP-7-7	Cambridge University	2/6/65
PDP-7-8	III	2/13/65
PDP-7-9	RPI	2/20/65
PDP-7-10	Mass. General	2/27/65
PDP-7-11	Aeronutronics Div. (Ford Company)	3/8/65
PDP-7-12	Oxford	3/15/65
PDP-7-13	Univ. of Texas	3/22/65
PDP-7-14	Royal	3/29/65

Six in April - Six in May..

Present Status:

PDP-7-2, Stanford, Due to Checkout today, January 4, 1965

C.P. and Memory completely wired. All power wiring and cabling complete.

550 Control - Undergoing off-line checkout.
34 Display - Has been installed.

Items unreleased to date:

E.A.E. wiring schedules
R.P.T. wiring schedules

Engineering changes on the C.P. started to come through from Ron today. He expects to have all changes in our hands by the end of the day. At that time, we will be able to determine what the delivery delay to Checkout will be. The present estimate is Thursday, January 7, 1965. We will attempt to make up some of the time lost by checking the memory while the mods to the C.P. are being installed.