Box 3
Folder 4

Memos to Olsen

4 of 6

102737384

dec INTEROFFICE MEMORANDUM

Meeting Ken Olsen's office 1030 AM 8/31

DATE August 31, 1962

SUBJECT Security Guards

TO K. Olsen
H. Anderson
S. Olsen
L. Prentice
M. Sandler
R. Mills
K. Fitzgereld
B. Towle

FROM Bob Lassen

We have reviewed several security agencies and Pinkerton's is our first choice. They are more flexible, show a greater interest and will be the easiest to deal with. Before we initiate a security guard program we should meet as soon as possible to establish the ground rules. All of our people should be notified in advance and perhaps a meeting should be called to brief our supervisors on this program.

The following are points of information and some suggestions which can be used as a starting point:

1. The major purpose of the program should be to provide a better personnel control by establishing tighter identification badge and exit/entry procedures with the help of trained security guards.

2. Cost per man hour - $2.35 (the difference in rates is negligible.

3. Each man should be fully trained.

4. Each man should be uniformed and unarmed .

5. We should interview each man before he is accepted for duty.

6. Each man will submit a daily written report (this is a normal part of their procedure).

7. Pinkerton's is unionized - they have a "no strike" clause in their contract.

8. We should discuss the hours of duty, the number of guards required, guard stations and periodic plant and exit/entry checks.

(a) Two guards on each shift should be adequate initially.

(b) A trouble spot could be between the hours of 5:00 P.M. and 6:00 P.M. Pinkerton suggests we lock all doors at 5:30 P.M. and that all people leaving the building after 5:30 P.M. should be let out by the guard.

(c) Another trouble area is during the hours of 7:00 A.M. to 8:00 A.M. This involves either a guard or a tight key control for early arrivals.

(d) One of the most important areas is our rather loosely arranged evening work schedule. Pinkerton's suggest that evening guards be given a list of all regularly authorized second shift employees. In addition they should be given a daily list of those people who have been authorized to work that evening - this is the individual's supervisor's responsibility.

(e) Our "extra" loading docks and so called common areas will bear special attention. All of the agencies were concerned about this.

BADGES

1. The various agencies felt that our present badge system is satisfactory. Pinkerton's feels that we should make no exceptions or special cases and that Visitors and Contractors should turn in their badges daily. I am inclined to agree.

2. The Personnel Office is currently responsible for the ordering and original issue of all badges.

3. Blocks of Visitor and Contractor badges have been issued to the receptionists in Buildings 12 and 5. The receptionists are responsible for the daily issue of all Visitor and Contractor badges.

4. The Personnel Office still continues to issue all Temporary and Permanent badges.

5. All badges are issued and received by written register.

6. Badges should be worn in a uniform place (left pocket or lapel for men - waist for women).

7. The security guards will help to enforce the proper wearing of badges.

August 31, 1962

PRIMARY RESEARCH CENTER REPORT

H. Anderson **Elsa Newman**

John Gilmore suggested I read the "Primary Research Center" report. I gave you. He believes there is material there for an article for DECUSCOPE either in the September or October issue.

May I please have the report to work from? What do you think of the August issue? I missed your guiding wisdom. Hope you had a nice vacation.

COPY

Ken Olsen

cc: S. Olsen
R. Best
R. Hughes
M. Sandler
C. Kendrick
G. Porrago
J. Myers
K. Doering
P. Green
D. Adams

QUALITY CONTROL INSPECTION REPORT

DATE: 8/30/62

ITEM Mounting Panels TYPE # 901 NO. all OUT OF _____

WHERE USED: (SYSTEMS, COMPUTER, FINISHED GOODS, MODULE)

Mounting panels for Laboratory Modules

DEFECT NOTED:

The power insert printed circuit board had the -3 volt decoupling capacitor in backwards.

FIRST NOTED BY: Paul Green

ACTION TAKEN:

The model was found to be wired wrong also. The model was corrected and all the printed circuit boards in test, and all 901 panels in finished goods were sent back to production to be corrected.

BY: D. L. Adams DATE: 8/30/62

dec INTEROFFICE MEMORANDUM

DATE 8/30/62

SUBJECT Program Library Progress Report

TO PDP Distribution List FROM Beverly Clohset

This memorandum serves as a progress report for the PDP-1 library from January, 1962 to September, 1962.

Table I lists the programs available to the DECUS members in January, with reference to the types and quantities of tapes, and whether or not a write-up existed.

The first major library project, therefore, was one of augmentation. Letters were written to users requesting copies of tapes and/or write-ups and a complete survey of available tapes at DEC was undertaken. Although DEC did not cover the floor space it does now, this became quite a project. Tapes were found in the computer room in file cabinets, tape trays, envelopes, or just laying on a table. Various employees possessed tapes and the problem arose as to which employee had the latest and best version of a program. A list was made of every tape known in the building and after consultation with John Koudela, the tapes which potentially seemed to have the most use to the library were duplicated and placed in the files for later editing.

It was felt, at this time, that to have a well organized and useful library, tape labels and program write-ups should be standardized. It did not seem wise to develop completely new ideas in these areas, but rather to improve upon existing methods so that there would be literally no transition problem for the users.

The customary color coded labels for the various tape types were used with a new color being added for MACRO Symbolic. The colors assigned were:

Red - DECAL Symbolic
Blue - DECAL Loader
Yellow - Read-In-Mode
Lavender - FRAP Symbolic
Tan - Binary
Purple - MACRO Symbolic
Green - Binary with Binary Loader

The following items were suggested as useful information to appear on the label:

Serial Number
Program Title
Tape Type
Starting Address
Registers Occupied
Sense Switch Settings
Arithmetic Precision
Tape Code

Standardization of write-ups became necessary due to the many forms available. Many write-ups were in the permanent memorandum files and not even found in the library. Many write-ups were written in paragraph form and left much to be desired in specific information needed by the programmer, such as, among other things, the operating procedure. On February 3, 1961, a memorandum to the PDP-1 Users was issued from Roland Silver and Edward Fredkin. The subject was "Standard Formats for Program Materials to be Distributed". Included in this memorandum was an outline for program write-ups that a number of users had found helpful not only in describing but also in studying the purposes and procedures of a program. This outline, with a few minor changes, was accepted as the standard outline for the library and is as follows:

1. IDENTIFICATION

    1.1 Serial Number; Program Title; Title Symbol(s) (if any); Type

    1.2 Author

    1.3 Date

2. ABSTRACT

    2.1 Purpose (one line)

    2.2 Example of the calling sequence

    2.3 Storage requirements and approximate execution time

3. PROGRAM SUMMARY

    3.1 Informal Description (a discussion of the program)

3.2 Variables and Parameters (non-descriptive symbols should be assigned to each variable, e.g., q = quotient, r = remainder, etc.)

3.3 Type of Variables and Parameters (integer, fraction, double length, etc.)

3.4 Example (a set of numerical values should be assigned to the variables with the appropriate values for the functions.)

3.5 Formal Description (description of the procedure that operates on variables to assign values to variables, in ALGOL notation, if possible.)

4. USAGE

4.1 Procedure (how to operate or compile the routine.)

4.2 I/O Devices Required

4.3 Switch Settings (sense switches and test word switches)

4.4 Miscellany (including special external equipment required)

5. CALLING SEQUENCE

5.1 Informal Description (a brief, clear description)

5.2 Example (should refer to section 2.2)

5.3 Formal Description (included in this discussion is the state of the machine at entry into the subroutine, definitions of words in the calling sequence, the effect the execution of a particular word has on the state of the machine, a description of the available result, and the way in which the subroutine returns.)

6. RESTRICTIONS

6.1 Subroutines Required

6.2 Registers affected outside memory block of program

6.3 Machine or set-up requirements

6.4 Memory required outside program block (e.g., common storage, sequence-break, jump cells set up)

6.5 Special Machine Status (e.g., sequence break mode status, status of any sequence break channel)

6.6 Special Status Changes

6.7 External Symbols (e.g., origin or other symbols which must be defined elsewhere)

6.8 Program Halts (the value of the program counter at a halt should be given)

7. PROPERTIES

7.1 External Symbols

7.2 Data Format

7.3 Accuracy (if appropriate)

7.4 Storage Required

7.5 Execution Time (preferably in cycles)

7.6 Useful Constants (as defined within the program and their addresses, relative to an external symbol if possible)

7.7 Other Properties

8. METHOD

8.1 Principle of Program (description of how it works)

8.2 Algorithm (should correspond to the procedure used in the program)

8.3 References (either to publications, or other program)

9. NOTES

9.1 Checkout Status

9.2 Program Listing

9.3 Miscellany

Al Blumenthal of DEC suggested the following outline for test program write-ups due to the different information necessary in diagnostic routines.

TEST PROGRAM WRITE-UP FORMAT

1. IDENTIFICATION

1.1 Serial Number; Title; Revision Number

1.2 Author

1.3 Date

2. ABSTRACT

2.1 Brief statement of purpose and important features

2.2 Memory requirements and execution time

2.3 Machine options required or restricted

3. USAGE

3.1 Manual controls and indicators

3.2 Operating Procedure

3.3 Error halts and diagnosing

4. MODUS OPERANDI

4.1 General Organization

4.2 Detailed Explanation

5. MISCELLANY

6. PROGRAM LISTING

7. FLOW CHART

After determining what could best constitute a basic library, considering what was presently available, a mass duplication of tapes, on the prototype, resulted. Write-ups were edited and in some cases completely written. On March 12, 1962, seventeen (17) DECUS Installation Members were recipients of tapes and write-ups, and nine (9) Individual Members received only the write-ups. This basic library, with a breakdown of types of tapes sent, is included in Table II. A small amount of mathematics indicates that a total of 595 tapes had to be duplicated to accomplish this service to the users group.

The service of the library to the users did not terminate at this point. The basic library has been updated by the following additions which have been distributed:

Addendums to:	BBN-1	FRAP
	DEC-3	FPC-8 to Concise for FRAP
	MIT-1	DEC Debugging Tape (DDT)
Write-Ups for:	DEC-16	Clear Memory
	MIT-2	(to correspond with tape)
Tapes for:	MIT-2	(latest version)
	MIT-3	MACRO Symbol Package
	MIT-3	MACRO Fio-Dec

Many DECUS Members have had occasion to use the library in requesting additional tapes and/or write-ups. An accurate record of every tape or write-up distributed has been kept by the librarian. Also, in this same mode, upon the issue of a Construction Requisition for a PDP-1, a basic library of software has been sent to the new DECUS Member.

To inform users of the progress of the library and keep them up-to-date on software materials that had been available, a column was written for the DECUSCOPE containing brief summaries of write-ups in the library.

The last full-scale project encountered was that of editing and duplicating tapes and standardizing write-ups. The condition of the library as of September 1, 1962, is listed in Table III. As can be seen the library is in two sections. The first section contains programs which have been satisfactorily debugged and checked out and are therefore available for distribution. Section two contains programs, which hopefully can be of some use to the programmers of DECUS, but unfortunately have not been completely debugged and can not be guaranteed.

Every write-up now contained in the library has been re-written, when necessary, so that all write-ups are in the standard outline form.

A good working program for the library that can be of service to a user, can be defined as one which contains both a symbolic tape and write-up. In January, 17 programs met these qualifications. In the ensuing months, symbolic tapes were developed and write-ups composed so that 31 programs are now included in this category.

In closing, a final mathematical investigation shows a total of 102 tapes in the library as of January as compared to 746 tapes in September.

NOTE:

The following abbreviations have been used in the column labeled tape type of the tables:

D.S. - Decal Symbolic
D.L. - Decal Loader
F.S. - Frap Symbolic
HBL - Hi Binary Loader
RIM - Read-In-Mode

TABLE I

PROGRAM LIBRARY (JANUARY, 1962)

Serial No.	Title	Tape Type	No. of Tapes	Write-Up
ADA-1	Analyzer			x
ADA-2	Frap Corrector			x
ADA-3	PRIM (Punch Read-In Mode Tape)			x
ADA-4	Typewriter Inquiry Control			x
ADA-5	AID	RIM	2	
BBN-1	FRAP	F.S.	1	
BBN-1	FRAP	HBL	7	x
BBN-2	Typewriter Control	D.S.	5	
BBN-2	Typewriter Control	D.L.	5	
BBN-2	Typewriter Control	F.S.	5	x
BBN-3	Binary Punch and Load	F.S.	5	x
BBN-6	Colossal Typewriter	HBL	6	x
BBN-10	Multiply Subroutine (FXD-18)	D.S.	4	
BBN-10	Multiply Subroutine (FXD-18)	D.L.	4	
BBN-10	Multiply Subroutine (FXD-18)	F.S.	5	x
BBN-11	Bit Manipulation Package			x
BBN-12	Decimal to Binary Conversion	F.S.	2	x
BBN-13	Binary to Decimal Printout and Punchout	F.S.	2	x
BBN-15	Gaussian Random Number Generator			x
BBN-21	Trace	D.S.	1	
BBN-21	Trace	D.L.	2	
BBN-21	Trace	F.S.	1	x
BBN-22	P-Trace and Octype	F.S.	4	
BBN-23	Random Number Generator (Coin, Random, Ranmodn)	D.S.	1	
BBN-23	Random Number Generator (Coin, Random, Ranmodn)	D.L.	1	
BBN-23	Random Number Generator (Coin, Random, Ranmodn)	F.S.	1	x
BBN-25	Rotate Test	F.S.	1	
BBN-27	Master Duplicator	F.S.	1	
BBN-31	Floating Point Package			x
BBN-32	Temporary-Storage Push-Down	F.S.	1	x
BBN-33	Pen Tracker Routines	F.S.	4	x
BBN-34	Display Line	D.S.	1	
BBN-34	Display Line	D.L.	1	
BBN-34	Display Line	F.S.	1	
BBN-37	Character Display	F.S.	1	x
BBN-43	Filter Computations	F.S.	1	x
BBN-45	Grid Plotting			x
BBN-46	Punchoff	F.S.	1	
BBN-46	Punchoff	HBL	2	x

TABLE I (CONTINUED)

Serial No.	Title	Tape Type	No. of Tapes	Write-Up
BBN-47	Divide Subroutine (FXD-18)	D.S.	1	
BBN-47	Divide Subroutine (FXD-18)	D.L.	2	
BBN-47	Divide Subroutine (FXD-18)	F.S.	2	x
BBN-50	Type, Punch, Display Decimal	F.S.	2	x
BBN-54	Compare	D.S.	1	
BBN-54	Compare	D.L.	2	
BBN-54	Compare	F.S.	1	x
BBN-65	Single Precision Floating Point	F.S.	1	
BBN-65	Single Precision Floating Point	RIM	1	x
BBN-66	Kalah	HBL	1	x
BBN-67	Debug	HBL	2	
BBN-500	Scope Raster	F.S.	1	
DEC-1	DECAL F 11	HBL	2	
DEC-2	MAC (Master Subroutine Control)			x
DEC-3	FPC-8 to Concise for Frap	F.S.	1	
DEC-3	FPC-8 to Concise for Frap	HBL	1	
DEC-6	Tape Punch Test	F.S.	1	x
DEC-7	Typewriter Controlled Frap			x
DEC-10	Read-In Mode Simulator			x
DEC-11	Checkerboard Test			x
DEC-12	Memory Addressing Test			x
DEC-13	Read Binary Test			x
DEC-14	Combined Reader and Punch Test			x
DEC-15	Multiply Step and Divide Step Test			x
DEC-16	Clear 4096 Word Memory	RIM	1	

TABLE II

BASIC DECUS PROGRAMMING LIBRARY FOR PDP-1

Serial No.	Title	Type of Tape Sent	Write-Up Sent
ADA-1	Analyzer	HBL	x
ADA-3	PRIM (Punch Read-In Mode Tape)	RIM	x
BBN-1	FRAP (Assembly Program)	F.S.	
BBN-1	FRAP (Assembly Program)	HBL	x
BBN-2	Typewriter Control	D.S.	
BBN-2	Typewriter Control	D.L.	x
BBN-3	Binary Punch & Load Package (HI)	F.S.	
BBN-3	Binary Punch & Load Package (MED, LO)	F.S.	x
BBN-10	Multiply Subroutine (FXD-18)	D.S.	
BBN-10	Multiply Subroutine (FXD-18)	D.L.	x
BBN-12	Decimal to Binary Conversion (FXD-18)	D.S.	
BBN-12	Decimal to Binary Conversion (FXD-18)	D.L.	x
BBN-13	Binary to Decimal Printout and Punchout (FXD-18)	D.S.	
BBN-13	Binary to Decimal Printout and Punchout (FXD-18)	D.L.	x
BBN-46	Binary Punchoff and Loader	D.S.	
BBN-46	Binary Punchoff and Loader	D.L.	x
BBN-47	Divide Subroutine (FXD-18)	D.S.	
BBN-47	Divide Subroutine (FXD-18)	D.L.	x
BBN-67	Debug	HBL	x
DEC-1	DECAL (Assembler)	HBL	
DEC-1	DECAL (Loader)	HBL	
DEC-3	FPC-8 to Concise for Frap	F.S.	x
DEC-5	Anytape Duplicator Verifier	F.S.	x
DEC-6	Punch Test	F.S.	x
DEC-11	Checkerboard Test (HI)	F.S.	
DEC-11	Checkerboard Test (LO)	F.S.	x
DEC-12	Memory Addressing Test	F.S.	x
DEC-13	Read Binary Test	F.S.	x
DEC-16	Clear 4096 Memory	RIM	
DEC-17	Instruction Test Programs	RIM	x
DEC-66	Simple Tape Control Program	F.S.	x
DEC-105	Divide and Multiply Test Using Random Numbers	F.S.	x
DEC-106	Type-Out Type-In Test	HBL	
MIT-1	DEC Debugging Tape (DDT)	HBL	x
MIT-2	Expensive Typewriter	HBL	x

TABLE III

PROGRAM LIBRARY (SEPTEMBER, 1962)

Serial No.	Title	Tape Type	No. of Tapes	Write-Up
ADA-1	Analyzer	HBL	8	
ADA-1	Analyzer	RIM	8	x
ADA-2	Frap Corrector	HBL	8	x
ADA-3	PRIM (Punch Read-In Mode Tape)	RIM	8	x
ADA-5	AID	RIM	6	x
BBN-1	FRAP (Assembly Program)	F.S.	6	
BBN-1	FRAP Concise Input	HBL	8	
BBN-1	FRAP Fio-Dec Input	HBL	8	x
BBN-2	Typewriter Control	D.S.	8	
BBN-2	Typewriter Control	D.L.	8	
BBN-2	Typewriter Control	F.S.	7	x
BBN-3	Binary Punch & Load Pkg. (HI)	F.S.	6	
BBN-3	Binary Punch & Load Pkg. (MED, LO)	F.S.	6	x
BBN-4	Sound Learning	HBL	8	
BBN-6	Colossal Typewriter	HBL	8	x
BBN-10	Multiply Subroutine (18-18 FXD Point)	D.S.	6	
BBN-10	Multiply Subroutine (18-18 FXD Point)	D.L.	8	
BBN-10	Multiply Subroutine (18-18 FXD Point)	F.S.	5	x
BBN-12	Decimal to Binary Conversion	D.S.	9	
BBN-12	Decimal to Binary Conversion	D.L.	12	
BBN-12	Decimal to Binary Conversion	F.S.	10	x
BBN-13	Binary to Decimal Printout and Punchout	D.S.	8	
BBN-13	Binary to Decimal Printout and Punchout	D.L.	6	
BBN-13	Binary to Decimal Printout and Punchout	F.S.	7	x
BBN-16	Histogram Subroutines	HBL	8	
BBN-21	Basic Tracing Subroutine	D.S.	12	
BBN-21	Basic Tracing Subroutine	D.L.	9	
BBN-21	Basic Tracing Subroutine	F.S.	8	x
BBN-22	Complete Program Trace	F.S.	8	
BBN-23	Several Random Number Generators (Coin, Random, Ranmodn)	D.S.	8	
BBN-23	Several Random Number Generators (Coin, Random, Ranmodn)	D.L.	8	
BBN-23	Several Random Number Generators (Coin, Random, Ranmodn)	F.S.	8	x
BBN-25	Rotate Test	F.S.	7	x
BBN-27	Master Duplicator	F.S.	7	
BBN-27	Master Duplicator	HBL	8	
BBN-32	Temporary Storage Pushdown	F.S.	8	x

TABLE III (CONTINUED)

Serial No.	Title	Tape Type	No. of Tapes	Write-Up
BBN-33	Several Pen Tracking Routines (Delay)	F.S.	6	
BBN-33	Several Pen Tracking Routines (Track Pen)	F.S.	6	
BBN-33	Several Pen Tracking Routines (Pen-Spot)	F.S.	6	
BBN-33	Several Pen Tracking Routines (Sprial)	F.S.	6	x
BBN-34	CRT Grid Plotting	D.S.	8	
BBN-34	CRT Grid Plotting	D.L.	8	
BBN-34	CRT Grid Plotting	F.S.	8	x
BBN-37	CRT Character Display	F.S.	8	x
BBN-40	Annotation Package	HBL	8	x
BBN-46	Binary Punchoff and Loader	F.S.	6	
BBN-46	Binary Punchoff and Loader	HBL	8	x
BBN-47	Divide Subroutine (18-Bit Fixed Point)	D.S.	11	
BBN-47	Divide Subroutine (18-Bit Fixed Point)	D.L.	12	
BBN-47	Divide Subroutine (18-Bit Fixed Point)	F.S.	7	x
BBN-50	Type, Punch, Display Decimal	F.S.	8	x
BBN-54	Compare Two Signed or Absolute Values	D.S.	8	
BBN-54	Compare Two Signed or Absolute Values	D.L.	8	
BBN-54	Compare Two Signed or Absolute Values	F.S.	8	x
BBN-57	Logarithm Base Two Subroutine	D.S.	8	
BBN-57	Logarithm Base Two Subroutine	D.L.	8	
BBN-57	Logarithm Base Two Subroutine	F.S.	8	
BBN-65	Single Precision Floating Point Pkg. (has been replaced by DEC-107)			
BBN-66	KALAH Game	HBL	1	x
BBN-67	Debug	HBL	8	x
BBN-111	Octype	D.S.	8	
DEC-1	DECAL Assembler	HBL	6	
DEC-1	DECAL Loader	HBL	8	
DEC-2	MAC (Master Subroutine Control)	D.S.	1	
DEC-2	MAC (Master Subroutine Control)	D.L.	1	
DEC-2	MAC (Master Subroutine Control)	RIM	1	x
DEC-3	FPC-8 to Concise for Frap	F.S.	7	
DEC-3	FPC-8 to Concise for Frap	RIM	7	x
DEC-5	Anytape Duplicator Verifier	F.S.	9	x
DEC-6	Punch Test	F.S.	7	x

TABLE III (CONTINUED)

Serial No.	Title	Tape Type	No. of Tapes	Write-Up
DEC-11	Checkerboard Test			
	(Old Version HI)	F.S.	8	
	(Old Version LO)	F.S.	8	x
	(New Version)			
	(Symbolic Listing Included in Write-Up)	RIM	8	x
DEC-12	Memory Addressing Test	F.S.	6	x
DEC-13	Read Binary Test	F.S.	6	x
DEC-16	Clear 4096 Memory (Symbolic Listing Included in Write-Up)	RIM	8	x
DEC-17	Instruction Test Programs (Symbolic Listing Included in Write-Up)	RIM	7	x
DEC-36	DECAL Library Tape Maker	D.S.	8	
DEC-36	DECAL Library Tape Maker	D.L.	8	
DEC-41	Dump DECAL Symbol Table	D.S.	8	
DEC-42	Symbol Search	D.S.	8	
DEC-42	Symbol Search	D.L.	6	
DEC-61	Prime Number Print in Decimal	HBL	7	
DEC-66	Simple Tape Control Program	F.S.	10	x
DEC-67	Music Programs	HBL	8	
DEC-105	Divide-Multiply Test Using Random Numbers	F.S.	7	
DEC-105	Divide-Multiply Test Using Random Numbers	HBL	9	x
DEC-106	Type-Out Type-In Test	F.S.	8	
DEC-106	Type-Out Type-In Test	HBL	8	x
DEC-107	Single Precision Floating Point	D.S.	8	
DEC-107	Single Precision Floating Point	D.L.	8	x
DEC-110	Input-Output Operational Subroutine Package for DECAL	D.S.	8	
DEC-110	Input-Output Operational Subroutine Package for DECAL	D.L.	8	x
MIT-1	DEC Debugging Tape (DDT)	HBL	8	x
MIT-2	Expensive Typewriter	HBL	8	x
MIT-3	MACRO (Assembly Program) Symbol Package	HBL	8	
MIT-3	MACRO (Assembly Program) Fio-Dec	HBL	8	x

The following programs have just recently been acquired by the library and have not been duplicated in quantities for distribution.

ScopeTrace - John R. Hayes
TED-An Off-Line Controlled Editing Program for the PDP-1 Computer - Charles R. Brown
and
Donald W. Connolly
Libtape for Decimal Input-Output Routines - BBN

The library contains only write-ups for the following programs:

ADA-4	Typewriter Inquiry Control
BBN-5	Tone Generation Routine
BBN-11	Bit Manipulation Package
BBN-15	Gaussian Random Number Generator
BBN-20	Time Delay Subroutine
DEC-10	Read-In Mode Simulator
DEC-14	Combined Reader and Punch Test

Following are programs which have not been edited

Title	Tape Type
Filter Computation Programs	F.S.
Plotgrid & Accessories	HBL
Scope Raster	F.S.
DECAL Dump	F.S.
Random Carry Patterns	BIN
Octype	D.L.
Octype	D.S.
Dec & Oct to Binary	D.S.
Punchoff	D.L.
Punchoff Loader	D.S.
Fredkin's Low Debug	HBL
Hi Punchoff	HBL
Primes	HBL
Eff. Address	D.S.
Eff. Address	D.L.
PTRACE	D.S.
PTRACE	D.L.
TYC (Eff. Addr.)	D.L.
TYC (Eff. Addr.)	D.S.
Punch English Title Block Subroutine	F.S.
Move Down	D.S.
Move Down	D.L.
Complete Typeout Pkg.	D.S.
Complete Typeout Pkg.	D.L.
Graph Paper	HBL
Time Sharing Colossal & TYC	HBL
Prime Number Program	F.S.
Frap Clear Memory	F.S.
W.C.'s Histogram & Bar Graph Generator	HBL
Typed Display	HBL
Track & Draw	HBL
TW	RIM
Program to Alpharead Card with Type-Out	RIM
Test Read Cards	HBL
See A Card	HBL
Frap Symb. for Type Out of Undef. Symb.	F.S.
Triumph IV	HBL

dec INTEROFFICE MEMORANDUM

DATE August 30th, 1962

SUBJECT

TO Jack Atwood

FROM Kenneth H. Olsen

I am attaching a mock-up of a booklet which the Greater Boston Chamber of Commerce is putting out on science based companies in the Boston area. They have asked us to fill out a questionnaire to be included in the text of this material, now they would like to sell us a page of advertising. This page costs $500.00. My first impression is that we should not bother with this, but I did tell them that we would consider it. I suggest that you send back the mock-up to them and send a note saying that we do not feel this is worthwhile because we are largely a civilian based company and could not take advantage of much of their distribution. We also have very good contacts in the area and so recruiting is not a problem for us in the technical schools.

If you have other ideas than this, do let me know.

Kenneth H. Olsen

I think your first impression was a good one. In addition to the points you mention, there are two other sufficient reasons for saving our $500.00:

(1) No customer, civilian or military, is likely to be more favorably inclined toward us because we participate in what is obviously intended to be a recruitment venture aimed at his personnel; and

(2) In spite of our research activities, we are much more manufacturer than research facility, and we are not located within the Standard Metropolitan Area of Boston to which the listings are by definition to be confined.

Jack

COMPANY CONFIDENTIAL

INTEROFFICE MEMORANDUM

DATE August 30, 1962

SUBJECT Fiscal '63 Net Sales Budget

TO Kenneth Olsen

FROM George O'Dea
Dick Mills

By way of preparation for your Sept. 11 Board of Directors Meeting, attached please find the schedule of Budgeted New Orders (Bookings), Net Sales (Billings), and Unfilled Orders (Backlog) for the Fiscal year ended June 30, 1963.

It calls for annual net sales of $10,800.M

Actually this value has been built up from careful consideration of each of the three principal segments of the business as follows:

Module Business (including accessories and high current pulse equipment.) The Fiscal '63 Sales Budget in this category is $3,000.

At this writing we have the advantage of knowing the actual results of the first 8 weeks of fiscal '63. It has been:

Unfilled order position at beginning of fiscal '62	$430
Add 8 weeks actual bookings	560
Less 8 weeks actual billings	770
Unfilled order position at 8/24/62	$220

In order to accomplish the Sales Budget of $3,000 for the year, and not eat into the backlog it will be necessary for new orders to run $2,230 in the 44 weeks remaining in fiscal '63. This is an average of slightly under $51/wk. The actual performance during the first 8 weeks has averaged $70/wk.

Prediction of the $3,000 sales volume for fiscal '63 is comforted when contrasted with the data on Module Allocation presented at the Works Committee Meeting of 8/20/62. The chart submitted to that group called for monthly module production for customers to approximate 36,000 units per year. Using the classical average sales price of $80.00 each brings that extended sales value quite in line with our $3,000 budget.

The fiscal '63 Sales Budget represents a 17% increase over the $2,558 volume actually recorded per fiscal '62 Financial Statements.

The allocation of bookings and billings to individual months as shown on attached schedule 1 is largely empirical and has cumulative trend value only.

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System Business: The Sales Budget for this phase of the operation is $1,000. The actual performance for the first 8 weeks for fiscal '63 has been:

Unfilled order position at beginning of year	$240
Add 8 weeks of new orders booked	270
Less 8 weeks of billings	230
Unfilled order position at 8/24/62	$280

A strong feeling of conservatism is reflected in the Systems forecast. Mr. Fadiman's current efforts to expand into foreign markets is taken as evidence that the domestic market ~~has reached~~ is approaching a saturation point. For purposes of a Fiscal '63 Budget we have assumed new foreign business, if any, will merely offset decline in domestic business, if any.

By way of contrast, Systems Budgeted Sales for fiscal '63 represent a standoff from the actual volume of $1,002 recorded in the actual fiscal '62 Financial Statements.

Allocation of bookings and billings to periods within fiscal '63 is largely empirical and of cumulative trend value only.

Computer Business: The Sales Budget for this phase of the operation is $6,800. The actual performance for the first 8 weeks of fiscal '63 has been:

Unfilled order position at beginning of year	$3,670
Add 8 weeks of new orders booked	660
Less 8 weeks of billings	1,690
Unfilled order position at 8/24/62	$2,640

Since this is the area in which the most dramatic increase is being predicted (approximately 140% increase over fiscal '62 actual of ~~$6,800~~ 2975.) the details supporting the assumption will be shown as follows:

PDP-4:		
Actual billings, 1st 8 wks. of fiscal '62	$-0-	
Add 1 unit/mo. x 10 mo. @ $60 *	600	
Total PDP-4 sales budget		$600
(note: does not include 2 PDP-4's to be capitalized)		
ADX:		
Actual billings, 1st 8 wks. of fiscal '62	$ 720	
6 machines currently on order for delivery by 2/15/63	1,920	
2 new orders forecast by Mazzarese 8/28	600	
		3,240
PDP-1:		
Actual billings, 1st 8 wks. of fiscal '62 (CRC, LRL, MIT)	$960	
1 unit/ mo. x 10 mo. @ $200 ea.	2,000	
		2,960
Total Computer Sales forecast		$ 6,800

Note that for the first 8 weeks, billings of $1,680, plus the unfilled order position at that time ($2,640) together represent $4,320 or nearly 2/3 of the Budgeted Annual Volume.

For purposes of establishing a budget of bookings for the remainder of the year we have set as a goal the following 6/30/63 open order target.

PDP-4: 3 orders @ $60 each	$180
PDP-1: 4 orders @ $200 each	800
ADX : 2 orders @ $310 each	620
	$1,600

The allocation of bookings and billings to individual months within the year is largely empirical and of cumulative trend value only.

By way of conclusion, the Fiscal '63 Sales Budget calls for an overall increase in business from the actual fiscal '62 value of $6,536 to $10,800 (approximately 65%.) As of 8/24/62 we show:

Billings, Fiscal '63	$2,690
Unfilled orders due for '63 delivery in the bag.	3,140
	$5,830

The $10,800 value does not seem presumptuous at this writing.

# # #

CC: Harlan Anderson

Digital Equipment Corporation
Fiscal 1963 Forecast
Bookings, Billings + Unfilled Orders

Schedule 1

($000 omitted)

	New Orders				Billings				ending Unfilled Orders			
	Total	Modules	Systems	Computers	Total	Modules	Systems	Computers	Total	Modules	Systems	Computers
June 30, 1962									4340	430	240	3670
July	$710	$270	$110	$330	$2000	$400	$120	$1480	3050	300	230	2520
August	810	290	170	350	720	400	120	200	3140	190	280	2670
September	690	230	60	400	580	220	100	260	3250	200	240	2810
October	710	230	70	410	890	220	90	580	3070	210	220	2640
November	730	230	80	420	960	220	80	660	2840	220	220	2400
December '62	730	220	90	420	850	220	70	560	2720	220	240	2260
January '63	700	220	80	400	850	220	70	560	2570	220	250	2100
February	700	220	80	400	850	220	70	560	2420	220	260	1940
March	700	220	80	400	850	220	70	560	2270	220	270	1780
April	700	220	80	400	850	220	70	560	2120	220	280	1620
May	690	220	70	400	550	220	70	260	2260	220	280	1760
June '63	690	220	70	400	850	220	70	560	2100	220	280	1600*
	$8560	$2790	$1040	$4730	$10800	$3000	$1000	$6800				

*Note: ending Computer Backlog to consist of

PDP 4	: 3 orders @ 60 K	180
PDP 1	: 4 orders @ 200 K	800
ADX	: 2 orders @ 310 K	620
		1600

8/30/'62

Box Index No 1

INTEROFFICE MEMORANDUM

DATE August 29, 1962

SUBJECT DEC Schematic Books

TO Schematic Book Holders FROM H. Shebak

A recent check of our Schematic Books revealed that many of our books have been loaned, given away or lost.

When a book is issued, you are assigned a number and you sign a receipt for the book. The only way this receipt is cancelled is when we get the book back.

DEC Circuit Schematic Books are issued to you for your personal use only. These books are not to be given or loaned to any other person. You are responsible for the whereabouts of this book at all times. If a book is lost, you should notify us immediately.

Upon termination or transfer, or if you no longer have need of the Schematic Book, it must be returned to the Technical Publications Department, Building 12, third floor, or the Personnel Department. Please do not pass your book along to someone else. The book will be reissued from the Technical Publications Department.

Please check the back cover of the book you now have to see if the number you now have corresponds with the number in the upper right hand corner of this memo. If the number differs or if there is any question in your mind concerning the books, please call Gertrude Loynd on Extension 370.

dec INTEROFFICE MEMORANDUM

DATE August 28, 1962

SUBJECT Quality Control

TO K. Olsen
M. Sandler
R. Beckman
B. Hughes
J. Cudmore
K. Doering

FROM J. Smith

Presented below are some of my ideas and suggestions on Q.C.

Inspection enforces the quality standards that engineering sets up, but I feel that it is wrong to say that inspection is responsible for quality. It just passes judgement and helps to spot causes of defects. Quality is the responsibility of all departments, Manufacturing, Engineering, and Quality Control.

Most companies have both in-process inspection and a quality control department. When a company such as ours does have both there may be some confusion about their duties. Inspection has mostly to do with passing judgement as products are made. Quality Control deals with incoming materials, purchased items, the finished components, and the finished whole products. Quality Control should make the standards known and set up control charts to help check quality during production.

In our particular company as with IBM and other leading companies, in-process inspection is the responsibility of the particular operation supervisor. This has proven quite successful here, as it has at IBM. We do put out a good quality product. Our problem is to show in black and white that we do have Q.C. organization and procedures. At the present time they are informal and must be sophisticated.

Inspectors actually do very little of all the inspection that goes on. Every worker inspects his own work enough to tell if he is doing a good job. If things go wrong, he and his supervisor try to straighten things out so that he turns out good products again. Workers catch a good bit of the bad work that comes their way from earlier jobs and throw it aside for inspectors to look over. Easily seen defects are usually caught this way. Formal in-process inspections catch the more difficult errors to find.

(continued)

Probably the heaviest responsibility for quality lies with Manufacturing. It makes the product. If it does not do its job well no amount of police effort by Inspection will catch all the defects and the end product will probably suffer. Even if Inspection does catch all the bad work, the factory's bad work makes it costly to get the proper quality into the finished product. This is due to both high scrap and inspection costs.

I am of the opinion that product quality itself is not our immediate problem. The immediate problem lies in four major areas. If these areas can be improved, product quality will automatically improve.

1. Routing of material from Receiving through the inspection departments to the Stockroom. Many items find their way into the Stockroom without inspection.

2. Handling of returned material from customers. A procedure for the repair or replacement of the item. Most important of all, its return delivery to the customer. Responsibilities for the carrying out of the procedure.

3. Final Q.C. inspection of all outgoing systems. Setting of criteria and procedures. On the last ITT system to be inspected there was quite a bit of discussion as to what was acceptable and what was not. The question went unanswered because of a lack of formalized criteria.

4. Documentation of Q.C. procedures and flow of responsibilities.

It is to the four above areas that I feel we should give our immediate attention. The documentation of technical, organizational, and functional aspects of Q.C. is a long hard job. The above areas need immediate investigation.

KHO

dec INTEROFFICE MEMORANDUM

DATE August 28, 1962

SUBJECT Standard Cost System

TO Harlan Anderson

FROM George O'Dea

In accordance with our recent conversation, here are a few thoughts on the subject of a standard cost system and some reasons for the recommendation that DEC adopt same for its module business.

Standard cost falls in the category of a "pre-determined" cost system as opposed to your present "historical" cost system. The primary difference between the two systems has to do with when cost of sales is to be charged with variations in the cost of separate performances of a given manufacturing function. As a consequence of this difference in timing the identity of the "variations" becomes lost in terms of the end product being shipped. Rather the variations become associated with their "cause" and hopefully point the finger to the place where remedial action may be taken.

Possibly the best way to illustrate the workings of the Standard Cost System would be to hypothecate a fictitious module and its components then show the differential in treatment under the opposing systems, Standard and Historical.

Assume the following facts:

Module A – consists of 10 units of component 1
5 units of component 2
1 unit of component 3
1 unit of component 4

It requires an average of 2 hours of direct labor in Dept. X
1 hour of direct labor in Dept. Y

Under a standard cost system we would establish the following facts in advance.

The standard purchase price of component 1 is	.10
of component 2 is	.50
of component 3 is	1.00
of component 4 is	5.00

This determination must be made in advance. Once made, it must be stuck to (unless it produces a substantial distortion-in which case a revision of standards must be undertaken. This can be a big job and is usually reserved for year end.) The term component is taken here to mean every single purchased item having a DEC part number.

As to the method of making these determinations one must consider his objectives. One school of thought is to go to the "best attainable" standard whereby the goal is set at perfection (example: possibly component 1 could be purchased for .08 if we doubled our ordering quantity.)

More commonly standards are set at "expected actual" levels (example: average of the last several purchases.) For our purposes this method is to be preferred. Freight-in may or may not be included in the standard price. Probably it would not be desirable to do so here.

Now we move to direct labor. We settle on a standard hourly rate of direct labor in each department. For purposes of this illustration let us assume the rates to be:

Dept. X	1.50/hour
Dept. Y	2.00/hour

Again the opportunity exists to set the standard time at "best attainable" or at "expected actual." In the absence of a strong methods engineering department the latter, based on recent averages, is probably the best starting point. Let us ascribe the standard time for Module A at:

Dept. X	2 hours
Dept. Y	1 hour

Lastly we come to overhead absorption. Let us assume the following budget of activity in our two producing departments.

	Dept. X	Dept. Y
Budgeted overhead expense	$2,000	$1,500
Budgeted direct labor dollars	$1,000	$ 500
Standard overhead rate	200%	300%

Now we are ready to start the application of our Standard Cost System in opposition to our Historical Cost System.

To highlight the difference in time let us assume 2 months of buying for, building, and inventorying our theoretical Module A in a quantity of 200 units. Since a standard cost system is predetermined, we know what the standard value of this production will be - namely:

Standard Cost of Module A:

	Material	Labor	Ohd.	Total
Component 1 10 units @ .10 ea	1.00			$1.00
Component 2 5 units @ .50 ea	2.50			2.50
Component 3 1 unit @ 1.00 ea	1.00			1.00
Component 4 1 unit @ 5.00 ea	5.00			5.00
Dept. X labor 2 hr. @ 1.50/hr.		3.00		3.00
Dept. Y labor 1 hr. @ 2.00/hr.		2.00		2.00
Dept. X Ohd. @ 200% of 3.00			6.00	6.00
Dept. Y Ohd. @ 300% of 2.00			6.00	6.00
	9.50	5.00	12.00	$26.50

Standard cost of production 200 units x 26.50 = $5,300

Now we come to the heart of the matter - assumption of facts.

For the first month we purchase all of the components as follows:

	Price	Actual Cost
Component 1 2000 units @	.11	$220.00
Component 2 1000 units @	.50	500.00
Component 3 200 units @	1.05	210.00
Component 4 200 units @	4.75	950.00
Actual cost of purchases:		$1,880.00

All of the 200 modules clear through Department X but they require 452 hours at an average rate of $1.60/hour or an actual direct labor cost of $723.00.

Departments X and Y miss their budgeted direct labor and budgeted overhead expense and come up with the following actual performance.

	Dept. X	Dept. Y
Actual overhead expense	$1,800	$1,400
Actual direct labor	$ 800	$ 400
Actual overhead rate	225%	350%

This concludes the first month of operations. Under our Historical Job Cost System we would:

Charge Raw Materials Inventory	$1,880
Transfer this to Work in Process as used	-
Charge Work in Process for direct labor	723
Charge Work in Process for overhead Dept. X $723 DL x 225%	$1,627
Total cost of 1st month Module A	$4,230

Under a Standard Cost System we would have a fractionation of that actual cost as follows:

	To Inventory	To Cost of Sales-Variance
Distribute Purchases:		
Component 1: 2000 units @ .10	$200	$20 dr
Component 2: 1000 units @ .50	500	-
Component 3: 200 units @ 1.00	200	10 dr
Component 4: 200 units @ 5.00	1,000	50 cr
Net recording of purchases	$1,900	$20 cr
Eliminate Direct Labor Variances in Dept. X		
200 units x std. labor of 3.00 ea.	600	
Labor variance: Actual DL less std.		123

Eliminate Overhead Variance in Dept. X		
Std. DL of 600 x Std. rate of 200%	1,200	
Std. DL of 600 x excess rate of 25%		150
Excess DL of 123 x total rate of 225%		277

(Note: this way of treating Ohd. variances was chosen to highlight the effects of just Module A production. In actual practice Ohd. variance would be treated departmentally.)

Thus at the end of month #1 our comparative position, Standard vs. Historical cost on Module A would be:

	Std. Cost	Job Cost
Work in Process Inventory	$3,700	$4,230
Cost of Sales	-	-
Standard Cost of Sales	-	-
Variations from Standard Cost:		
Originating from purchase price	20 cr	-
Originating from direct labor utilization	123	-
Originating from overhead	427	-
Actual Manufacturing Cost:	$4,230	$4,230

To carry the analogy through its second and final month let us assume our production lot of Module A clears through Department Y in 285 hours @ $1.90/hour. Lastly Department Y overhead for this month runs 290%.

The entries to reflect this on the books under a Historical Job Cost System would be:

Charge Work in Process for direct labor	$ 542
Charge Work in Process for overhead Dept. Y $542 DL x 290%	$1,572
Total cost of 2nd month of Module A	$2,114

Under a Standard Cost System the second months business would be reflected as follows:

	To Inventory	To Cost of Sales-Variance
Eliminate Direct Labor Variance in Dept. Y		
200 units x standard DL of 2.00 ea.	$400	
Labor variance: Actual DL less std.		$142
Eliminate Overhead Variance in Dept. Y		
Std. DL of $400 x std. rate of 300%	$1,200	
Std. DL of $400 x favorable rate gain of 10%		$40 cr
Excess DL of $142 x total rate of 290%		$412

So be it. For 2 months our comparative treatments and their disposition on the books of account read:

	Standard Cost		Historical Cost
	Inventory	Cost of Sales	Inventory
Inventory Input:			
1st Month Purchases	$1,900	$ 20 cr	$1,880
Direct Labor	600	123	723
Factory Overhead	1,200	427	1,627
2nd Month Direct Labor	400	142	542
Factory Overhead	1,200	372	1,572
Total Mfg. Cost:	$5,300	$1,044	$6,344

In both cases actual cost is the same ($6,344 divided by 200 units = $31.72 each.) But in the Standard Cost System we had pre-determined that this unit should have cost $26.50. The difference we have chosen to write off against the account Variation from Standard Cost ($5.22 ea. x 200 units = $1,044.)

Why do it this way?

There can be a number of reasons. Not the most important, but probably the most immediately beneficial of which is reduction in clerical effort.

Presently the raw material detail cards kept in Production Control are posted for each transaction, units and price. Once a set of Purchase Price Standards has been established, the posting of prices on individual transactions can be stopped. The posting effort is cut by one half.

In lieu of this the Cost Department assumes the responsibility of allowing into inventory only the standard value of the actual commodities received. Differences between the standard value and the actual invoice amount are immediately disposed of to the account Purchase Price Variance.

As regards withdrawal of items from inventory, pricing can be done at standard without laborious looking up of last lots, etc. Everything in the inventory moves at its pre-determined and readily accessible unit cost.

Direct labor variances need only be determined once a month. If Production Control can provide the Cost Department with a detailed list of how many of each module it produced for a given month, the Cost Department can extend these quantities x the standard direct labor per individual module and strike a variance amount - easily as a measure of departmental efficiency for the month - less easily as a departmental efficiency by individual module.

Overhead variances are most readily reflected as a measure of the function of a department or cost center - not as something necessarily inherent in the particular batch of modules which cleared through a department in a given period.

Now we come to perhaps the most important reason for contemplating a Standard Cost System. Sure it's nice to reduce clerical effort and to close the books early-but the real meat of the system lies in its ability to tell you where trouble is rising.

Take our example of fictitious Module A. Under your job order cost system you discover when the run is finished that the unit cost was $31.72 each. If this is sufficiently bad to be alarming you can, after the fact, go back and analyze the individual facets of the run and you will be able to find out why the target was missed. Two months however have elapsed and the analysis effort is significant.

Under the Standard Cost System the purchase price variance is known immediately-the direct labor variance-both as regards hours and rate is known at the close of the month (could be done more frequently by tab if standards are broken down by operation)-and the overhead variance is known at the close of the month. The latter, if integrated with a variable expense budget, is readily subject to analysis.

Thus what started out to be a time saving technique can become a philosophy of management. If you believe the standards it is easy to compute the variances and focus in on the source of trouble. You may or may not be able to do anything about it - but at least you will understand why the target has been missed.

You may wonder why the recommendation is only for the module phase of the business. That is because computers and systems are not sufficiently categorized to give you confidence in the standards you would have to use. Standard cost is at its best when individual commodities are produced in large quantities.

Looked at from the accounting point of view, installation of a Standard Cost System could be accomplished by January 1, 1963. It would probably involve a relocation of talent. We could drop the posting of detail job ledgers on most of the inventories - but would need a skilled person to make certain that inventory input was at standard (Cardinal Rule of a Standard Cost Man is never put anything into inventory that is not provided for somewhere on a Bill of Material and hence covered in Costing Sales, etc.)

If you are still favorably disposed to going ahead with the installation very serious consideration should be given to the question of just exactly who is going to set the standards. I would think for Purchase Price Standards the job would fall between the Purchasing Department and the Cost Department. The Direct Labor Standards between the Production Control Department and the Cost Department. The Overhead Standards between the Controller and the Department Supervisors.

Lastly, this technique permits the publication of variance reports from which we can hope a closer tie-in between the operating departments and the company in general will evolve. Supervisors will have a better appreciation of the consequences of their actions if provided with this feedback.

I strongly recommend we proceed with the installation of a Standard Cost System for the module aspects of our production.

# # #

CC: Ken Olsen ✓
Dick Mills

dec INTEROFFICE MEMORANDUM

DATE August 24, 1962

SUBJECT Shifting of Delivery Dates

TO K. Olsen ✓
H. Anderson
S. Olsen
M. Sandler
G. O'Dea

FROM Jack Smith

Who has the authority to shift a customer delivery date? Who is notified when a shift has taken place? Who should be notified when a shift has taken place? These questions have been causing me some concern for the past few weeks. The reason for my concern is that, try as I may, these questions go unanswered.

Just two days ago I found out quite by accident that the delivery date of the United Aircraft system was shifted from September to October. Was this shift necessary? Could a double work shift have prevented this? Could someone have been transferred from another job to help out? I'm not quite sure that these questions were reviewed by the right people in time to take preventative action. To the checkout people this shift was of no great concern. The customer was not greatly concerned. To our internal finance people this shift from one month to another could be of great concern. In this particular case I feel quite sure that this memo is the first time our finance people have heard of this shift.

Shifting of delivery dates should be made known as soon as possible, so decisions can be made. I feel that the people effecting delivery dates should be made to realize that shifting dates affects material procurement plans and module availability and other planning efforts. The authority to shift dates should be formalized and procedure for information flow installed.

Q of P file

INTEROFFICE MEMORANDUM

DATE August 24, 1962

SUBJECT MIT Computeriter

TO Ken Olsen
Harlan Anderson
Stan Olsen

FROM Bob Beckman

cc: "Quality of Performance" file

The Computeriter originally delivered with the machine donated to MIT had an extremely high failure rate. The original typewriter was eventually removed and "temporarily" replaced by a brown Computeriter.

The first Computeriter was brought back to the plant and completely overhauled. It was recently loaned to BBN and used for a month in their sound learning program. It operated quite reliably during this period. At the present time it is being rechecked, cleaned, and the case repainted.

The replacement Computeriter at MIT has been so reliable that the people there are very reluctant to part with it. I discussed this with John McKenzie and he has agreed to take back their original Computeriter on a trial basis so long as we leave the brown there as a spare. Assuming that the original machine operates as reliably as it did at BBN, we should wind up demonstrating that DEC can take even a "lemon" and get the maximum possible operation out of it.

MIT has a second Computeriter that they bought directly from Soroban. I think that, if they are willing, we should take it on ourselves to repaint this machine to match the computer.

dec INTEROFFICE MEMORANDUM

DATE August 17, 1962

SUBJECT Computer Documentation

TO Ben Gurley, Al Blumenthal, Gordon Bell

FROM Bob Beckman

cc: Ken Olsen
Harlan Anderson
Stan Olsen
Roger Melanson

Incorrect documentation (block schematics, wiring diagrams, and cable schedules) of computers in the field has been the subject of many customer complaints and has caused a great deal of difficulty and extra work in performing field maintenance and modifications.

The sources of documentation errors can be divided into two main catagories: initial errors at time of delivery, and errors generated as a result of field modifications. I suggest the following procedures as a means of helping to control this problem.

Most of the initial errors at delivery time are due to the fact that the people making up the documentation package to ship with the computer do not have an up-to-date list of applicable prints and/or drafting has not had time to make the necessary corrections. It is requested that the computer check-out groups supply an accurate list of appropriate prints for each computer. This list should be sent to Customer Relations as far in advance of the shipping date as possible and should be updated as necessary. At the end of the check-out procedure and before the final preshipment tests, marked up copies of all prints requiring changes should be turned over to drafting and a list of the prints being changed sent to Customer Relations. Shipment of the computer should not be made until all corrected prints are available and drafting should give high priority to the correction of these prints. Such a system does not necessarily mean that shipment of the computer will be held up waiting for the corrected prints. In most cases, it should be possible to make the necessary corrections during the time required for final testing of the computer and preparing it for shipment. If these procedures are followed, we can be reasonably certain that the initial documentation of the system is accurate.

Once control of initial documentation is acheived, it will be easier to keep up with changes due to modifications. In most cases it should be possible to accurately document a modification before the actual hardware has been changed. No modification work should be done until corrected prints are available and the customer's old prints should be removed and/or destroyed as soon as the change has been accomplished. On-the-spot changes should be nonexistant, or, at the most, very minor. In such cases, the personnel concerned should leave a hand-corrected copy of the new print with the customer and turn over another corrected copy to drafting for formal correction. The customer's hand-corrected copy must then be replaced as soon as possible.

I realize that these ideas are not new, but the number of difficulties and errors that have been cropping up indicate a need for more formalized and stricter procedures.

INTEROFFICE MEMORANDUM

SUBJECT: Manufacturing Cost of Basic Computer Minus Major Components

DATE: August 2, 1962

TO:
K. Olsen ✓
H. Anderson
S. Olsen
M. Sandler
B. Gurley
D. Mills

FROM: Jack Smith

How much of an investment is it to construct a basic computer minus modules, major components (reader, punch, typ.), and memory system?

1	813 P.S.	$ 185.00
9	728 P.S.	1340.00
1	734 P.S.	120.00
1	M.C. Panel	49.37
1	Punch Control Panel	105.02
1	Indicator Panel Ass'y	234.43
1	Operator Control Ass'y	824.16
1	4 Bay Cabinet Ass'y	1600.00
	Cost of 24 panels of wired logic (including material)	3578.00
	Assembly and wiring into cabinets	1920.00
	Total Manufacturing Cost	$ 9955.98

COMPANY CONFIDENTIAL

dec INTEROFFICE MEMORANDUM

COMPANY CONFIDENTIAL

SUBJECT: Manufacturing Cost of Basic Computer Minus Major Components

DATE: August 2, 1962

TO:
K. Olsen
H. Anderson
S. Olsen
M. Sandler
B. Gurley
D. Mills

FROM: Jack Smith

How much of an investment is it to construct a basic computer minus modules, major components (reader, punch, typ.), and memory system?

1	813 P.S.	$ 185.00
9	728 P.S.	1340.00
1	734 P.S.	120.00
1	M.C. Panel	49.37
1	Punch Control Panel	105.02
1	Indicator Panel Ass'y	234.43
1	Operator Control Ass'y	824.16
1	4 Bay Cabinet Ass'y	1600.00
	Cost of 24 panels of wired logic (including material)	3578.00
	Assembly and wiring into cabinets	1920.00
	Total Manufacturing Cost	$ 9955.98

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Memory System Cost

Wiring, inspection, and testing labor	$ 602.00
Memory stack cost	3300.00
Materials	105.00
Modules	3240.00
Total	$ 7247.00

Reader Cost

Digitronics Reader	$ 2330.00
Modification and testing labor	110.00
Total	$ 2440.00

Punch Cost

Punch	$ 739.00
Modification and testing	42.00
Total	$ 781.00

Typewriter Cost

Typewriter	$ 1910.00
Testing	14.00
Total	$ 1924.00

Installation Cost

Installation cost (labor)	$ 112.00
In-Out Equipment Total	$12604.00

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Module Cost

Central Processor, 419 at $30.00	$12570.00
Reader punch typewriter, 75 at $30.00	2250.00
Total	$14820.00

Total M.S. Reader, Punch, Typewriter, and Modules	$27424.00

Computer Total Estimate

Total major components	$27424.00
Basic construction	9955.00
Total	$37379.00

Estimated cost of computer (high) - - - $ 37,379.00

Manufacturing Process Time Basic Computer

Construction	7 weeks
Check Out	2 months

Manufacturing Process Time ITT System

Construction	9 weeks
Check Out	2 months

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Ken Olsen -

The attached article (California Management Review - Summer '62) on Dynamic Controls re affirms the confidence in the study we conducted here in late June + early July. Actually the parallel is amazing.

Without doubt, big Companies all will be doing something of this sort before the 1960's are over.

At its present size I'm convinced that dec does not need such a system - even at $15,000,000 per year you probably couldn't justify it economically. Above that point, probably yes. since we are in the unique position of being able to acquire the capital equipment at half of what it would cost others.

More importantly, we are computer manufacturers - we must lead the way into this fabulously fertile field!

It took Librascope 2 years to get their system going - that's just about the interval we were talking. At the moment dec is making money hand over fist - now is the time to spend 48¢ dollars on such a program

The biggest reason I wanted to come to work for you and Andy was the feeling that here are a couple of fellows who see far enough ahead to really push these new concepts. In time I'm sure you will OK going ahead with the Central Computer System we discussed earlier. When that time comes I want to spearhead the installation because

a) I've had 17 years of business experience - know what is and what isn't important
b) Have an open mind on the feasibility of such a system
c) Understand the massive resistance which the computer-type people will encounter from operating people - and am good at reducing this to a minimum

Now let me get down off the soap box and proceed with business as usual

George
8/1/'62

DYNAMIC CONTROL OF AN OPERATIONAL COMPLEX

W. F. GIROUARD

Only machines with built-in memories and automatic computing talents can hope to cope with the mountain of paperwork and complex needs for continuously up-to-date information which face today's military suppliers and tomorrow's big business. Here is a case history of how one firm designed such an operational control system and the way in which it works in practice.

A TIMELY flow of pertinent information to decision-making personnel is essential for management control of a modern business. Decisions are based on reports reflecting production rates, costs, deliveries, vendor shipments, man-hours, schedules, inventory—every facet of a company operation.

LOCS (Librascope's Operation Control System), now in operation, provides a carefully disciplined control of this data; provides it where it is needed and when it is needed; provides it at machine speed and with machine accuracy. It is a control medium for an entire business complex—or a series of complexes—not just control of a single function such as accounting or inventory.

Its salient features are:

- Data are handled manually only once. Subsequent use of a part number, delivery date, cost figure, or any basic fact is printed out by the system.
- A comprehensive report on an entire project or on the status of a single part (ordered from a vendor or made internally), the cost of any part, the total investment to date in a project, complete inventory, or any required information can be produced on demand.
- The system is kept informed of the progress of a project by information entered at remote dispatch stations—in receiving, inspection, production shop, or at any key spot where an event takes place. The event can be the completion of a part, the withdrawal of a tool or material from stock, a purchase-order initiation or completion, or any event that normally transpires in a business complex.
- Management reports are based on a comparison of the current status of a project, or any detail of a proj-

Mr. Girouard is Director of Industrial Engineering for Librascope Division, General Precision Inc. He served in the Marine Corps during World War II and the Korean conflict, was educated at Oberlin College and the University of Southern California, is a Sigma Xi and member of numerous engineering societies, among them AIIE. He is chairman of the national technical committee of AIIE devoted to studies of industrial data collection and information retrieval.

ect, with a predetermined standard of performance. The reports are practically concurrent with events.

- The raw information entered into the system can be correlated into numerous vital reports whenever necessary. All information required to control a manufacturing process is instantly available.

Need for Management Control

In the not-too-distant past most businesses were small, and owners kept such records as were necessary in a single memo book. Very little, if any, accounting needed to be performed for the government.

Today, due to the increased growth and complexity of business and the stringent requirements of the government, record keeping has become voluminous. An illustration of this is the fact that the number of clerical or white-collar workers has risen 450 percent during the past 50 years, while the number of industrial workers has risen only 80 percent.[1] Further, it is well established that the cost of clerical labor is following a definite upward trend and will continue to do so in the foreseeable future.

The amount of data which has become necessary for control in modern industry is staggering. One company, operating at about the $40-million sales level, was found to be manually handling about 10,000 pieces of data daily in production and inventory control alone.

Drowning in Paper Work

The opportunity for mishandling, losing or improperly recording information is obvious. It is no wonder that information becomes "lost in process," reports are so late as to be worthless, and accuracy disappears. It is interesting to note that if we process a piece of information 30 times, with 99 percent accuracy, the chances of the final data being incorrect are one in four.

If management must exercise control from reports produced by such archaic, error-prone methods, then, indeed, it is attempting to operate with too little information, produced too late, and less than factual at best. Not only are these indictments true, but what is even more important is the fact that management can be, and often is, shielded from the truth by such methods. It is no wonder that the question, "Why didn't I know about this before such a condition developed?" is heard so often from top management who are the victims of such methods.

Properly designed dynamic operational control systems can not only prevent the conditions stated, but they can also present to management much information that heretofore was considered simply not available. And this information can be presented in real time, accurately, and in a form which promotes dynamic control.

The Industrial Engineering Department at Librascope, recognizing the need for operational control systems, especially in the burgeoning electronics industry, designed and installed such a system for company use.

Systems Consideration

Many businesses now have some type of electronic data processing system installed in one or more areas. Applications of EDP may vary from computer-based systems to unit records and may appear in diverse areas such as payroll or inventory control. At the time we began to consider LOCS, Librascope's only EDP application was in payroll accounting; operational con-

trol was entirely manual. Therefore an early choice had to be made between converting the manual system to unit record and later computerizing it or conversion directly from manual to computer. The decision made was to follow the latter course of action. Concurrent with this, it was also decided to develop the system as an integrated concept.

Some of the problems these decisions posed for the systems designers can be gathered from the statement of D. G. Malcolm and A. J. Rowe when they wrote in the spring 1961 issue of the *California Management Review* that:

> "It is obvious that the interlinkage between decision points, as well as the density of information flow, has a direct effect on the nature of the organizational structure required for successful operation. Thus, the constraints of the existing organization must be ignored, and the specifications for an effective organization to make required decisions should be based on the system design activity."[2]

Employee Information Program

Careful consideration was given, early in the design of the system, to its effect on personnel and their reaction to the possibility of the installation. Management was concerned, as any alert management should be, that its employees would be confused about the intention of the proposed system and wonder what its impact might be on their jobs. It was decided that the best course was to meet the situation head on. Therefore, regularly scheduled meetings were conducted with all personnel to explain the system to them.

Employees were told why the system was being designed, how it would operate, and what its effect would be on company operations and on their jobs. It had been predetermined that expansion, transfer and normal attrition, besides retraining and upgrading in the system, would take care of any employees who were made surplus by the installation of LOCS.

Management's honest approach, its consideration for employee welfare, and the employees' own interest in the system created a healthy climate for the system designers. Without this attitude on the part of management it is difficult to see how the system could ever have been achieved.

Although systems analysis and development, research into other systems, and equipment considerations all took place concurrently and influenced one another, they must in a paper of this type be treated as if they had occurred serially.

Initial Research

The Industrial Engineering Department at Librascope undertook two large-scale research studies for this project. One of these had as its object the disclosure of any type of electronic data processing equipment which might in any way be usable in the system. This included study of foreign and domestic equipment as well as equipment not yet marketed but for which specifications were available. This was an extensive and time-consuming task, but it did pay dividends, for, when equipment was selected for the system, we could be reasonably sure that no other piece of equipment would turn up which might have made the system design any easier.

The other study was a survey of the

specifications of similar existing systems on which information was available. Research disclosed that there were a number of systems under consideration. Some were for private companies for their own use; others were being considered by data processing equipment manufacturers for possible sale. Again, as in the equipment study, the results of this research were invaluable in disclosing what had been done and need not be redone by the systems designers for LOCS.

Incidentally, the latter study disclosed that, as well as could be determined at that time, there were no systems in effect which offered real-time control of a complete operational complex. There were various systems in effect which controlled some part of a complex, such as production control or procurement, or which utilized a computer on a part-time basis, but none which offered that which the Librascope Operation Control System, has achieved for its management.

Developing the System

LOCS was developed entirely by our Industrial Engineering Department. Other departments, both staff and line, made important contributions to the success of LOCS, however, and credit is due them for their efforts.

The system itself was designed with three basic requirements in mind. The first was to produce a system which would generate those reports ideally suited to give each level of management the tools needed for purposeful decision making. The second was to utilize as inputs to the system only the basic data necessary to accomplish the reporting function. (Much of the so-called essential data in many businesses, when critically analyzed, turns out to be protective logging.)

Real-Time Control

The last of the requirements was to design a dynamic system. Another term used by the military to indicate what is meant here by dynamic is "real-time control." Dynamic or real-time control in LOCS means that active information is processed directly into the centralized computer simultaneously as an event occurs. It is then immediately available for use and, as will be illustrated later, can compare itself with certain control criteria and issue a call for corrective action.

One of the basic tools used for systems analysis and design by the industrial engineers was the familiar flow chart. True, additional symbols had to be invented for this purpose, yet one of the most rudimentary tools of the industrial engineer again proves its value and flexibility. Data flow was depicted, using these charts, for every area and department which in any way affected or was affected by the system. These charts were analyzed in detail to determine which information was essential to performance and which was extraneous. They were also analyzed to determine ideal information flow without regard to organizational constraints.

'Captured' Data Saves Reprocessing

It became quite obvious, in studying the flow charts, that the same identical data was being reprocessed and, therefore, recopied many times. This led to the inclusion in the design of the system of what is best described as the "captured-data" concept. Once data have been generated or "captured" in the system, they are never again manually prepared. The system has been designed and the information flow so arranged that whenever data are neces-

sary they are at hand in some form capable of regenerating themselves.

To achieve simplicity of design, industrial engineers working on LOCS used the concept illustrated on page 49 that the company "buys" everything needed to make an end item, either from an outside vendor or from itself. Therefore, except for documents for internal control and manufacturing instructions, the system design for "make" follows very closely the design for "buy."

A system of the magnitude of the Librascope Operation Control System, affecting as it does the very core of the operations of the company, cannot be perfectly designed and installed in one fell swoop. Rather, the full concept of the system is first laid out; certain portions of this concept are then selected for closer analysis and implementation, and then these portions are installed.

Their installation should not and does not mean that any "present" system is discontinued. It is imperative that the two systems function in parallel until the newer system has been thoroughly debugged and proven in operation. The fundamental basis upon which all LOCS design concepts have been oriented has been that of a totally integrated, real-time, collection, storage-retrieval, and display system for necessary industrial operational information, corporate-wide in scope.

Many organizations have designed and installed EDP systems that plan and control individual areas, departments or segments of business; however, very little work has been recorded paralleling the work Librascope is doing on totally integrated, operational systems such as the aforementioned. This firm has pioneered not only new systems concepts, in this area, but also new equipment and programming.

To justify portions of the system, to learn by doing, and to prove the practicability of heretofore untried portions of the total system, implementation has been divided into phases. LOCS Phase I encompasses all operations from engineering release to shipping. As additional phases of LOCS are implemented, the system will encompass more and more until total operational control from receipt of order through shipping is achieved.

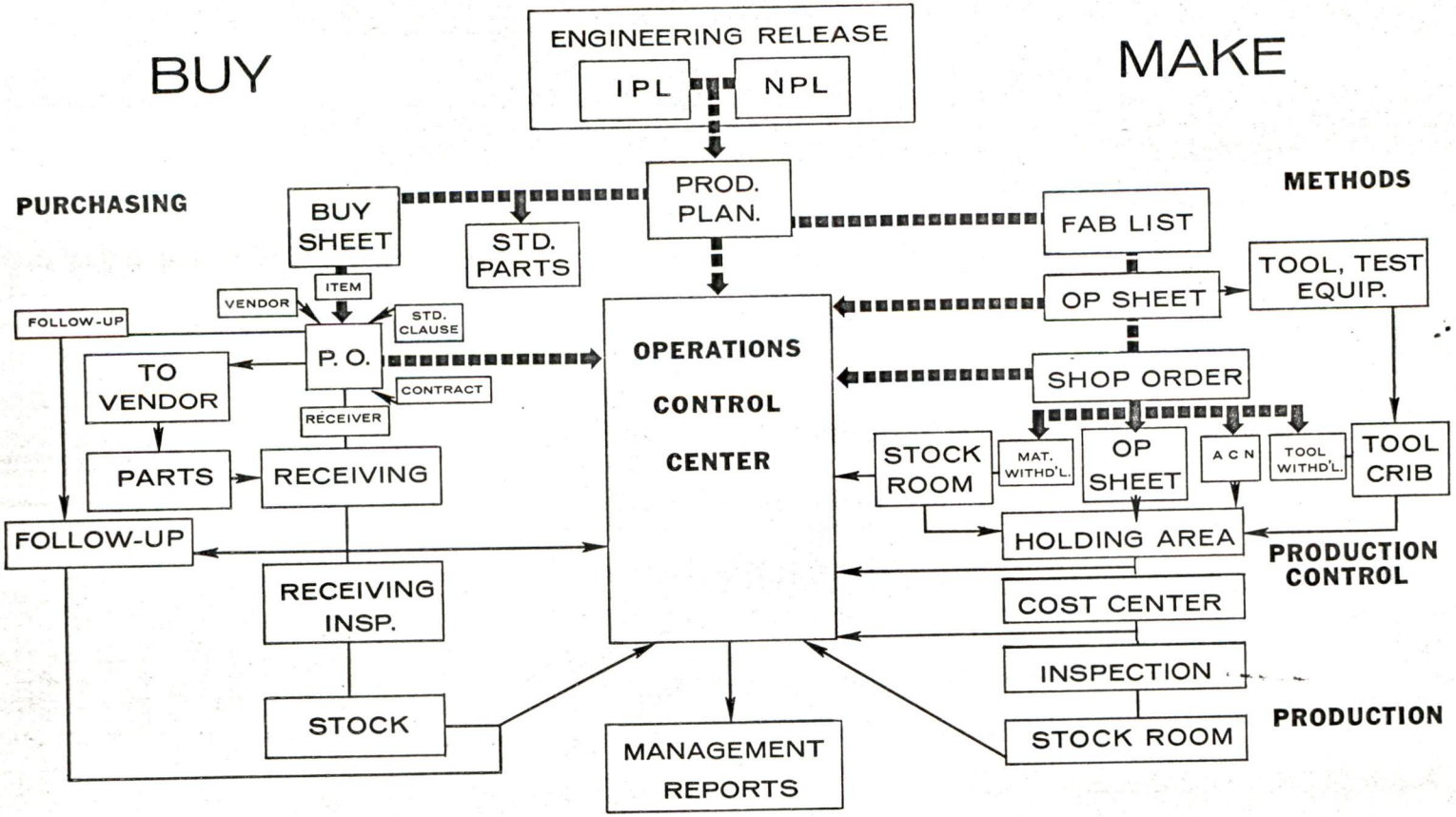
Phase I

To follow the presentation of Phase I, it will be helpful to present a brief outline of some of the equipment involved and its operation.

Dispatch stations are strategically located in widely dispersed areas throughout the plant—in Receiving, Receiving Inspection, Stock Rooms, Tool Rooms, and in the Production Work Centers. Data are continuously updated and entered directly into a centrally located computer simultaneously as an event occurs in an area controlled by a dispatch station.

Input centers are also located throughout the plant—in Engineering Release, Production Planning, Manufacturing Planning, Purchasing, and Production Control. Each input center is equipped to originate automatically purchase orders, shop orders, and other documents requiring action. Punched cards and punched paper tape are simultaneously prepared for the entry of data from the input center into the computer, for transfer of data from one center to another, or to serve later for data entry from the dispatch stations to the computer.

The delivery of engineering draw-



This diagram illustrates the flow of information from Engineering Release through the Control Center. Note that the philosophy of system design is maintained by the similarity of operations on both Make and Buy sides. Initial inputs are compared with performance in the Control Center allowing the preparation of Management Reports.

ings and specifications to the Engineering Release Group is the initial action in Phase I. These items are machine-prepared in Indented Parts List (IPL) form. An IPL lists, in "gozinto" or Christmas-tree order, each item in a project. It contains necessary identifying information for the item such as part name, number, using assembly, amount used, PERT or Line of Balance number, etc.

The IPL is entered into the computer file for later Master Status reporting. The IPL is necessary for identifying which and how many parts constitute a subassembly and which subassemblies make up an assembly and a completed product. Identical parts, however, are listed repeatedly under various subassemblies. Thus the IPL is not workable as an operational tool where the need is for total numbers of a given part. The identical information contained in the IPL is sorted in Numerical Parts List (NPL) form for operational purposes. In the NPL each part and assembly is listed numerically with multiple-use parts or assemblies appearing as many times as they are used in the final product.

The NPL is forwarded to Production Planning for the entry of further operational data. Each item is coded indicating, generally, whether it will be "make" or "buy." Further information is contained in the Part Code indicating whether this is a detail part, subassembly, major assembly, etc. Such information is not pertinent, however, to this explanation.

Besides the Part Code, other information is added to the NPL such as Manufacturing Day on which the item must be in stock, and raw-material information such as nature, size, amount, etc.

The completed NPL is then sorted by Part Code. From this sort several additional lists are available. They are:

- A list of items to be purchased directly for this project and which will go into a project inventory;
- A list of items needed for the project but which are already available in general inventory;
- A list of items to be fabricated at Librascope. This last list is re-sorted to produce a list of raw material.

Purchasing Cycle

The list of items to be purchased directly for the project is forwarded to the Purchasing Department. It is accompanied by a separate card (Buy Card) for each item. These cards are prepared automatically as a by-product of the preparation of the NPL list.

In Purchasing, the list serves as a control of the status of the cards, each card being sent to the proper buyer for procurement action. The buyer receives the card in a specially designed envelope bearing "blocks" for data entry on its face. The buyer completes the blocks with such information as vendor number, contract number, terms, delivery, standard clause numbers, etc.

The Buy Card and special envelope are given to a purchase-order typist who prepares the purchase order on a Flexowriter programmed to accept manual entry, read punched cards, and simultaneously prepare other punched information. Because of these features, preparation of the purchase order is vastly simplified.

The purchase-order typist, by using the codes on the envelope, selects previously prepared punched cards containing the information indicated by the buyer when he completed the

blocks. By "feeding" these cards into the read unit of her machine, they are automatically typed, without error, on the purchase order. Further, they are typed at machine speed rather than manual speed.

In the entire purchase order preparation, only variable information—such as price, terms, and date—is entered manually.

The preparation of the purchase order, in turn, creates a need for an Open-Purchase-Order file for follow-up, and for receiving. As the purchase order is created, the following automatically occurs: (1) the purchase order is entered into an Open-Purchase-Order file in the computer; (2) a follow-up notice is prepared and sent to Purchasing Follow-Up; and (3) a punched-card receiver is prepared and sent to Receiving to await the receipt of the ordered items.

The Open-Purchase-Order file is periodically interrogated by the computer. If it is indicated that an item may be overdue, the computer issues a notice that follow-up action is required.

When the ordered items are received, this fact is transmitted to the Open-Purchase-Order file, using the prepunched receiver card. In the normal course of events, shipping containers can be opened, contents identified, the identifying receiver card taken from the file, and notice of receipt electronically transmitted to the computer in about the time it takes to tell it.

At times, items will be received in damaged condition and overages and shortages will occur. A means must—and does—exist for handling these conditions.

When Receiving personnel note that one of these conditions exists, they transmit the receipt of the items in the usual fashion; however, they add a code to the message which indicates the condition. When the message is received in the computer file, an emergency circuit is also activated.

The emergency circuit consists of several printers linked to the computer. Located in such control areas as, in this example, Purchasing and Purchasing Follow-Up, the printers send out the emergency message that a critical situation exists and special action must be taken.

A report of these emergencies and the corrective action taken is maintained to assure that they were properly and promptly corrected.

If the ordered items are received without need for corrective action, they pass directly into Receiving Inspection. The punched-card Receiver accompanies them through inspection results. The results of receiving inspection are entered directly in the Open-Purchase-Order file.

If the items are correctly received, pass inspection, and enter stock, the open purchase order is cleared for payment and inventory is updated to show the receipt of the items.

Management Reports Simplified

The concept of Management Reports generated by LOCS follows the "exception principle."

Reports are based on comparisons between actual events in an operational routine and a predetermined standard.

A running account of an operational routine is entered in the computer files as the events occur. Comparing this account with the standard produces useful reports—reports which require action, not reports that are needless piles of useless history.

Reports of this type which occur in the purchasing cycle are numerous. A few will serve to illustrate this principle.

The Past-Due Material Report is produced when material ordered will be past due when received unless corrective action is taken. This report continues to indicate this condition until action is taken which will clear it up.

The Vendor-Analysis Report analyzes vendor action statistically. It indicates how often and by how much time a vendor misses shipments, what percent of his items pass inspection, how often his shipments are short, and how often they are over.

This statistical information is used for many purposes. It may disqualify a vendor entirely; or it may be used to prompt action if his shipment threatens to arrive late. However, if a vendor practically never misses a shipping date, always ships what is ordered and generally ships material that passes inspection, then computer notification of his action and consequent follow-up need not be as stringent as with a vendor whose performance record is quite the opposite.

The Dollar Commitment Balance Report, as a final example, is particularly useful to the financial people. It is possible to generate this report at any time. It indicates, as its name implies, the open dollar commitment for all purchase orders. Its uses are obvious for those concerned with financial details.

Manufacturing Cycle

The list of items to be fabricated at Librascope is sorted from the Numerical Parts List and forwarded to Manufacturing Planning—or the Methods Department, as it is called there. Here the first action is the preparation of an Operation Sheet.

Punched Tape Guides Production

The Operation Sheet is standard in form, indicating manufacturing instructions, load centers, standard times for set-up and run, and tools needed. A copy of the completed Operation Sheet and a punched paper tape, automatically produced as a by-product of its preparation, are forwarded to Production Control.

Production Control determines the quantity of the item to be manufactured, the number of lots this quantity will be divided into, the manufacturing schedule, and then prepares the Shop Order.

Since the Shop Order duplicates much of the information contained in the Operation Sheet, the punched tape, produced when the Operation Sheet is prepared, is utilized to automatically prepare the Shop Order.

Variable information concerning quantity, lot, and schedule is entered manually by Production Control personnel. Standard time per piece for each operation multiplied by the amount to be manufactured is computed automatically for the Shop Order.

By-products of the preparation of the Shop Order are a Work Ticket, one for each operation and inspection, and Material and Tool Withdrawal Cards.

The Operation Sheet, Shop Order, Tickets, and Cards and any necessary illustrations make up the Shop Order Release Package. When the package is released to the shop, an Open Shop Order File is created in computer memory. This file resembles the Open-Purchase-Order file noted earlier. The Release Package is sent to the dispatch

station indicated by the first operation on the Shop Order.

Notification of the withdrawal of tools, material, or parts is transmitted immediately to the Open Shop Order File. The medium for this transmittal is the item's withdrawal card. If the items are not available at the time needed, this fact is transmitted to the emergency circuit. Emergency printers in the proper area, Tool Control in this case, note that the Shop Order is stopped because of a missing tool and corrective action is taken immediately.

The operator assigned to complete the initial operation is given his tools, material, and instructions. A card, identifying the machine he will use, and the Work Ticket, which notes standard time per piece, are used to transmit the start of this operation to the Open Shop Order file. Time, date, and shift are sent automatically with every transmission.

Thus, the Open Shop Order File shows the first operation has been started, at a certain time, by a particular operator. When the operator completes the operation, the computer is notified as to time, date, shift, and number of pieces manufactured.

The computer closes out the first operation on the Shop Order, computes actual time per piece, and compares with standard time. The latter piece of information is held for later variance reporting.

If it is ever necessary to determine the status of a part in progress, the computer may be easily interrogated. It will issue a line-by-line report of the progress of the particular item. Operations completed, number of pieces made, and the operation now in progress will be indicated. Ready access to accurate information of this type is invaluable especially when manufacturing or engineering changes are being considered.

The Shop Order is processed from dispatch station to dispatch station, operation by operation, in the manner just described until the completed items are inspected and stocked. As with the procurement cycle, the last transmission carries the completed items into inventory.

Manufacturing Reports

A procedure similar to that followed in the procurement cycle is used in generating a number of manufacturing management reports.

A Performance Report—Standard versus Actual—has been alluded to earlier and does not need any further explanation.

A Work Center Scheduling Report is prepared from a computer analysis of Shop Orders. This report indicates exact work loads for each center for the next 15 days. Since the report is updated and issued weekly, each foreman knows exactly which jobs are coming to his center, and of these, which have slipped, are exactly on, or have exceeded schedule. In this way he can adjust his work force and load to most efficiently operate his department and also to correct schedule deficiencies.

Master Status Report

Perhaps the most significant report prepared by the Librascope Operation Control System is the Master Status Report. This is a report of the overall status of every project, prepared by project. It indicates, in sufficient detail for the using manager, where each component of the project is located, from Engineering Release through Shipping. Using the exception

principle, it indicates only those components which are behind schedule, and the reason for the slippage. The Master Status Report is issued weekly, bi-weekly, or monthly, depending upon the requirements of the level of management to which it is directed.

In a paper of this type, an explanation of a system such as is typified by the Librascope Operation Control System must necessarily be abbreviated. It has been possible to give only a thumbnail sketch of what is really only one phase of the system. In so doing, many important points have been brushed over.

To mention a few, LOCS is designed to work with partial or incomplete release of engineering drawings or specifications. Because of the nature of Librascope's operations, the release of a project from Engineering usually occurs in stages, as designs are finalized. Only those who have had experience with such a condition can fully appreciate how this can complicate the design of an operational control system.

Can Encompass Many Firms

Although Phase I of LOCS encompasses the operation from Engineering Release through shipping, the system when complete is designed to provide control of an entire industrial complex. Just as a company such as ours can control its operations with LOCS, so can multicompany operations be controlled from one operations center; or, similarly, several subcontractors working on the vast and complex military contracts typical of today's missile age can be tied together by an on-line, real-time control system.

The LOC System has been designed to be, whenever possible, fail-safe. Failure to transmit information where information should be transmitted is noted and reported by the computer.

Self-Policing

If the transmission of the quantity of items passing receiving inspection exceeds the number received, or if the quantity of items completed in Operation No. 2 exceeds the number completed in Operation No. 1, the discrepancy will be reported by the computer. If the opposite occurs, some adjustment may be required; but, as can be seen, a fail-safe condition exists. These are just a few of the many ways in which the system operation is protected.

Simulation Uses

By taking the control center off-line, it is possible to simulate plant operation. This provides management with a valuable tool for judging the effect on plant activity of various schedule changes, increased or decreased production loads, changing product mix, etc., without affecting the operating system. This ability may be one of the most important characteristics of LOCS.

No Substitute for Management

It must also be pointed out that the Librascope Operation Control system is not a decision-making system. It is our opinion that systems of this type will never replace experienced management in making business decisions. LOCS can and does compare information and indicate that a decision must be made, but it does not make decisions. It prepares management reports which are practically concurrent with the conditions they relate so that management's decisions can be made in time to be effective.

Conclusions

It is an interesting exercise at this time to look back with 20–20 hindsight over two years' experience with the design and implementation of LOCS to see what its effect has been and what has been learned.

First, and most positively, LOCS has increased management's control of company operations. The advent of accurate, on-time reports has provided the information necessary for purposeful decision making. Management's control will increase in scope as further phases of the system are implemented.

LOCS, even in Phase I, will be an economic success. The operation of the system will pass the breakeven point in the not-too-distant future.

Although the system has gained acceptance throughout the company, there were times when the going was pretty rough. As stated earlier in this paper, the system concept was explained to all personnel; and it won their interest and acceptance. The problems which occurred in the LOCS activity were operational in nature. Healthy differences of opinion existed between the systems engineers and operating personnel as to the manner in which the system would operate and as to its effect on the areas under their control.

The LOCS personnel feel that these problems could very well have been minimized by using the approach that the operating personnel were part of the design team and were responsible for changes in their departments. Man is an animal who will resist change simply because it is change, and none are more aware of this than the LOCS designers.

The industrial engineers who designed LOCS initially viewed the system function as a computation problem. Their view has changed, however, and they now realize that the system function is essentially one of mass information storage and retrieval, with computation exercising an essential, but subordinate, role.

The design approach for this system was to develop an integrated system which would provide control of the entire industrial complex, and then implement the design in phases. This approach has proven its value as the system implementation proceeds into further phases. Problems of incompatibility in data, information, and method have been designed out of the system.

Must Be Completely Integrated

Industrial engineers are perhaps more aware, from their training and experience, of the dangers and pitfalls of the "adding-on" approach than any other group. The I.E.'s who tackled the LOCS design problem were determined, from the beginning, that they would design a completely compatible total system. Fortunately, they had management backing for their decision and as additional phases are implemented the system remains integrated.

Future Belongs to Similar Systems

Putting aside the subject at hand, we might ask ourselves "What will the future bring?" One thing we can be sure it will bring is more and more systems similar to the Librascope Operation Control System. Management is all too aware that manual or even unit-record systems cannot keep pace with the demands of today. With automated manufacturing processes, tape-controlled machine tools, and

automatic warehouses all making greater demands, anything less than real-time operational control will be useless.

Such systems as are designed must be completely integrated. The add-on approach is economically and functionally unsound. We would not tolerate such an approach in a modern weapons system, why should we tolerate it in an operational system?

The course of events will not be without its problems. As we are facing a situation of technological unemployment today due to automation in the factory, so shall we face white-collar unemployment due to automation in the office.

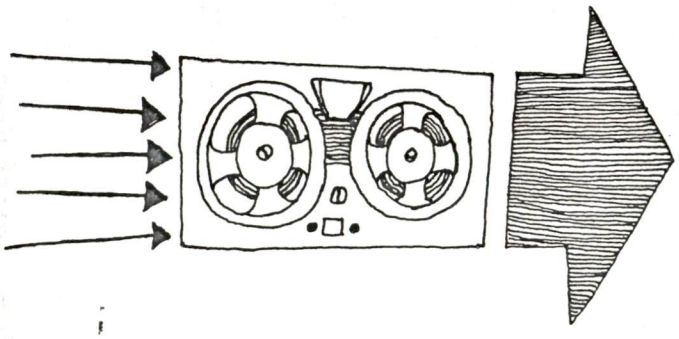
Must we all reinvent the wheel as we attempt to develop integrated systems for our own use? The answer to that question is, of course, no. We can and should draw heavily on two sources for information and assistance. These sources are the electronic data processing machine manufacturers and the universities. Many EDP machine manufacturers are developing systems teams, such as the LOCS team, which are especially well qualified to render expert assistance. The universities are developing graduate programs of industrial engineering, business administration, mathematics, and economics whose graduates will provide leadership in this new era.

The future in this era promises to be exciting, challenging, and rewarding. Whether we are rewarded depends upon whether or not we accept the challenge.

REFERENCES

1. E. F. Hutton and Company, "Market and Business Survey," Vol. 18, No. 3, March, 1960.

2. Malcolm, D. G., and Rowe, A. J., "An Approach to Computer-Based Management Control Systems," *California Management Review;* Vol. III, No. 3, Spring, 1961, pp. 4–15.



dec **MEMO**

file

DATE 7/31/62

TO Ken Olsen FROM S. O'Dea

This sort of thing gets to be unique to each company. There would be administrative problems to us (probably payroll deductions - and associated paperwork).

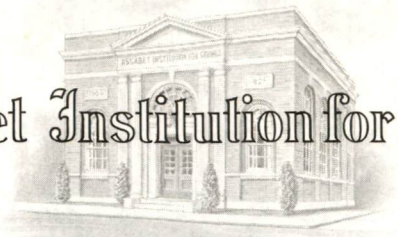
I've always felt an employee's savings account is his private affair.

Unless you feel there are hidden benefits to the employee I'd regard this as one more mouthfull which needs chewing - with no tangible benefit to dec.

George

DAP 984

INCORPORATED MARCH 31, 1904



Assabet Institution for Savings

Maynard, Massachusetts
TWINOAKS 7-2963

July 27, 1962

Mr. Kenneth Olsen, President
Digital Equipment Corporation
Maynard, Massachusetts

Dear Mr. Olsen,

On June 6th we wrote you of a proposal of creating within your company a "Payroll Savings Plan". The success of this plan in other cities, as well as here in Maynard, seems to us to justify its consideration especially in regard to its mutual benefits.

Since this Payroll Savings program has the effect of taking the place of a self-supported Credit Union, we feel that the advantages of its adoption would certainly prove out its worth.

It is well to mention that one of the many services directly compatible with the Payroll Savings would be the Unsecured Personal Loan, available to all responsible applicants of Digital.

I would consider it a favor if you would allow me to talk this proposal over with you or any one of your designated Department Heads.

Yours very truly,

Gage W. Russell

Gage W. Russell, Asst. Treasurer

MUTUAL SAVINGS BANKS
STABILITY
OF MASSACHUSETTS
ALL DEPOSITS INSURED IN FULL

dec INTEROFFICE MEMORANDUM

DATE July 31st, 1962

SUBJECT

TO Kenneth H. Olsen
Harlan Anderson
Stan Olsen
Dick Best
Ben Gurley

FROM Russ Doane

There will be a meeting in Ken Olsen's office at 8:30 a.m. on Thursday, August 2nd to discuss the status of VHF modules and decide about announcing them at WESCON.

COMPANY CONFIDENTIAL

dec INTEROFFICE MEMORANDUM

DATE July 27, 1962

SUBJECT Fiscal '63 Forecast

TO Harlan Anderson

FROM George O'Dea

In accordance with our conversation of yesterday, as a starting point for our Complete Corporate '63 Forecast we have taken the detail submitted to the National Shawmut Bank on May 14 and are considering it in light of today's knowledge.

Net sales for the first 10 months of fiscal '63 were shown at $9,509,000. Actually the last 3 months of the Shawmut forecast were estimated at $1,060,000 each. On the strength of this, we have extended that volume through June of '63 and come up with a net sales volume of $11,629,000. (See attached schedule.)

Before we can even think of going any further, we must clear the air on this figure. According to the books, you did $2,658,000 for fiscal '61, appear to be about to show $6,500,000 for fiscal '62, and now look forward to more than $11,000,000 for fiscal '63!

I'm just not accustomed to such staggering success! May we be so bold as to use this figure in our fiscal '63 forecast?

The records appear to justify optimism. The DEC unfilled order position at the close of fiscal '62 shows the following backlog.

Modules	$ 434,000
Systems	242,000
Computers	3,665,000
	$4,341,000

We therefore had more than half of the computer business in hand before the year even began.

The actual bookings of new orders for the first 3 weeks of fiscal '63 have been:

Modules	$ 294,000
Systems	118,000
Computers	334,000
	$ 746,000

COMPANY CONFIDENTIAL

Simple arithmetic would annualize that performance at more than a million dollars greater than the sales volume being quoted as the fiscal '63 forecast!

There has been a great deal of talk about module production being the limiting factor to shipments. If we use Dick Mills ratios of 25% of systems sales = module cost, and 22½% of computer sales = module cost, then assume the average module bears a unit cost of $35.00, the forecast as it reads now would call for annual module production of 101,500 units as follows:

Product	Sales Value	% Module Cost	Module Cost	Units (@ $35 ea.)
Modules	$ 4,215,000	44%	$1,855,000	53,000
Systems	1,225,000	25%	306,000	8,700
Computers	6,189,000	22½%	1,393,000	39,800
	$11,629,000		$3,554,000	101,500

Perhaps this is a bit disturbing. Maynard is shooting for 12,000 units per month commencing in September.

All of which leads us to the next subject. What size sales volume will we be shooting for in early '64? The last few months of fiscal '63 will bear the early production costs of '64 sales. In general, should we figure another 40% increment in sales? (For computing cash strains, this would seem wise.)

Your early comments on these figures will be appreciated, Harlan. From here we can jump to our quick forecast of fiscal '63 financial statements.

# #

CC: Ken Olsen ✓

COMPANY CONFIDENTIAL

Net Sales Forecast – Fiscal '63

($000 omitted)

	Total	Modules	Systems	Computers
July	$ 1,089	$ 250	$ 79	$ 760
August	733	250	146	337
September	811	250	100	461
October	821	385	100	336
November	930	385	100	445
December	935	385	100	450
January	1,010	385	100	525
February	1,060	385	100	575
March	1,060	385	100	575
April	1,060	385	100	575
May	1,060	385	100	575
June	1,060	385	100	575
Total	$11,629	$4,215	$1,225	$6,189

COMPANY CONFIDENTIAL

dec INTEROFFICE MEMORANDUM

DATE July 27, 1962

SUBJECT Retaining Industrial Stylist

TO Kenneth Olson

FROM Loren Prentice

Some time ago you asked me to make inquiry of various engineers in regard to retaining a company or individual as a consultant to our company in industrial styling. This is essentially a report of this inquiry.

Ben Gurly Ben believes as far as PDP1 is concerned that no change should be effected in the appearance of the cumputer and that he is in favor of small improvements as long as they do not impair the present appearance. He believes that any change would affect our customers adversely as they have become accustomed to the appearance of PDP1. This I think is what could be termed "Volkswagon Styling". He has no new projects in mind until we build a new computer, presumably PDP5. He also indicated that he thought that the work done by Scott Miller was satisfactory and that we had satisfactory coverage in this field.

Gordon Bell thinks that this type of guidance that we are proposing is necessary and we should start immediately to work on PDP4 and PDP5. Specifically he has in mind the restyling of a magnetic tape unit to go with PDP4.

Dick Best We should have this type of service but has no specific projects in mind. He believes that it is essential that we have an overall coverage in industrial styling and that it is a good thing to have somebody looking over our shoulder.

Dick Whipple believes that this would be of some help to him in special projects, such as the IBM Memory Tester and other new systems that they have in mind of building.

John Fadiman wants to continue adaptation of present cabinetry to his work; major concern is a new color scheme, preferably compatible with the use of doeskin tweed on standard panels with some other color for cabinetry doors and panels, etc. He believes that the doeskin tweed cabinet is unsatisfactory to at least some of his customers, that they believe that it is old fashioned. This probably comes about from in plant visits by people who see our blue cabinetry and admire it over the doeskin.

I believe these represent the viewpoints of the various people. I am sending a copy of this to each of the people mentioned so if they do not agree with it they can make their protests known.

Specific design projects that we have at the present time are new logos for all equipment, adaptation of auxiliary equipment for PDP4, redesign of 31 display unit - this is probably the largest and most complex project - packaging of IBM high speed tape unit, repackaging of a dual magnetic tape unit for use with PDP4 and new color styling for Special Systems.

I believe this question of retaining an industrial stylist should be discussed with our marketing people and they should be polled as to whether they think that some of our designs are inadequate from their standpoint or not.

P:o

Loren B. Prentice

cc. Ben Gurly
Gordon Bell
Dick Best
Dick Whipple
John Fadiman
Scott Miller
Ken FitzGerald

K. Olsen

INTEROFFICE MEMO

Subject: Computer Shipments Date: 7/27/62

To: PDP-1 Distribution List From: Bob Beckman

As a result of experience with several computer shipments in the past few months, it has been decided that the standard policy on computer shipments will be to crate all items and to make shipments by electronic, air-ride van with impactograph.

Justifiable deviations from this policy are permitted, but in such cases the packing and shipping people (Ken Fitzgerald and Jim Myers) must be notified well in advance.

INTEROFFICE MEMORANDUM

DATE July 26, 1962

SUBJECT W. R. Grace & Company

TO Ken Olsen

FROM Harlan Anderson

Dorothy Rowe telephoned yesterday and said that General Doriot had spoken with his friend Alex Daignault, who is Executive Vice President of W. R. Grace & Company. His office is in New York, and his telephone number is Digby 4-1200. Apparently he asked General Doriot who they should go to to get advice on whether their approach to automation in their chemical processing was reasonable. Apparently they have been exceedingly conservative, and have done very little along these lines, and are wondering whether they should continue that way or become more aggressive. He was considering hiring John Diebold Associates as consultants, but the General suggested that he really ought to talk to us first. Mr. Daignault will be in Boston on Tuesday, July 31, and is going to call us early in the afternoon to arrange for a get-together later in the afternoon and possibly dinner that evening. These arrangements were made when I telephoned him to follow up a commitment that Dorothy Rowe had made to him earlier in the afternoon. I explained that we felt we knew very little, if anything, about his business and that we certainly weren't consultants, at which point he said he understood and did not want to impose on us, but would like to have a short discussion.

# # # #

INTEROFFICE MEMORANDUM

DATE July 25, 1962

SUBJECT Training Program

TO Ken Olsen
Harlan Anderson
Stan Olsen
Dick Best
Ben Gurley
Maynard Sandler
Bob Lassen
Bob Hughes

FROM Gordon Bell

TRAINING PROGRAM: - The enclosed diagram attempts to clarify (in my own mind) the steps through which individuals with technical background (without an engineering degree) entering DEC progress. It is shown graphically to condense, the boxes and how they interact, and that all details are not shown are relatively unimportant. The sequence should be important since it would be nice to maximize the individual's affectiveness and minimize training time, holding quality and output constant.

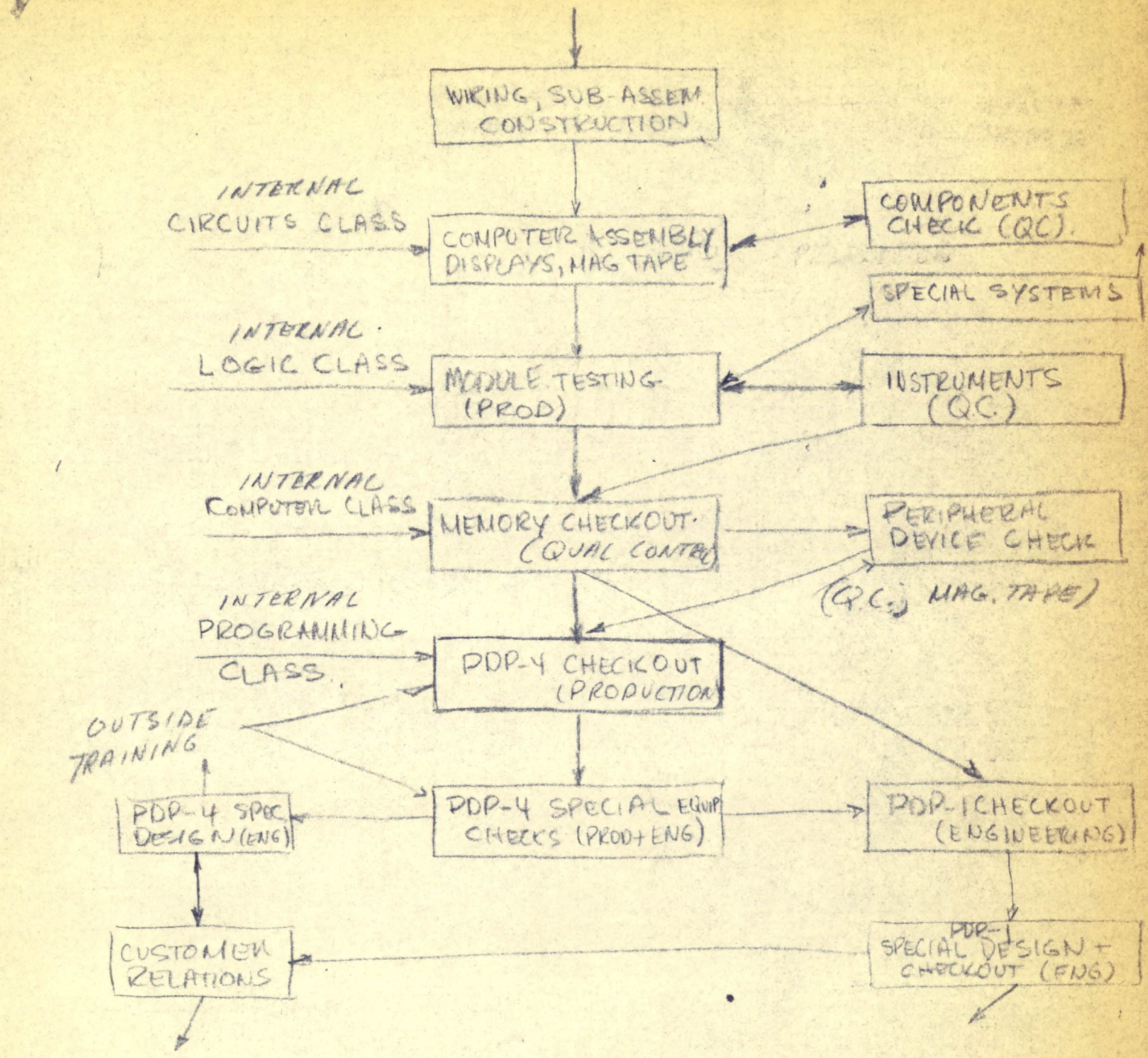
Our present promotion scheme is informal (good perhaps for a small company), but it often promotes good individuals too rapidly without long enough training and on the other hand forces us to look outside to fill jobs, simply because our training leaves gaps, and is inadequate. This, of course, is because we grew very rapidly and needed lots of trained individuals and didn't have time to train internally. (A good example of this is PDP-1 checkout personnel)

Basically, I would like to have a more formal procedure. Ingredients of the procedure perhaps are:

1. State the various stages of training
2. Rotate people through jobs that are necessary, assuming they will eventually progress.
3. Evaluate the people at the various boundaries
4. Insert DEC internal training at the appropriate times and stages. (We'd probably have fewer in the programming classes, but more who knew what they were doing.)
5. Allow outside training at higher stages

CONCLUSION: Let's define.

######## ########



President

PERSONNEL TRAINING

INTEROFFICE MEMORANDUM

DATE July 25th, 1962

SUBJECT Industrial Dynamics Meeting - August 2nd

TO Group 1 (3:00 to 4:30 p.m.)
Ken Olsen
Gordon Bell
Dick Best
Ben Gurley
Dick Mills
Maynard Sandler
Bob Savell

FROM Aynne Manning

Group 2 (4:30 to 6:00 p.m.)
Harlan Anderson
Jack Atwood
Bob Beckman
Jon Fadiman
George O'Dea
Stanley Olsen

Dave Packer has asked that I remind you to carefully read Chapters 17 and 18 of Industrial Dynamics before your scheduled meeting on Thursday, August 2nd.

July 24, 1962

Solder splashes

Cy Kendrick

Bob Hughes

I was in the solder dip area the other day and noticed that many units had splashes of solder on the component side of the etched board.

The reason for this was that the jigs which hold the etched boards are wearing out and have large gaps which allow the solder wave to flow up and over the components.

I think we should build new jigs and get this fixed as soon as possible.

COPY

cc: Ken Olsen
Jim Cudmore

dec INTEROFFICE MEMORANDUM

DATE July 23, 1962

SUBJECT

TO Harlan Anderson FROM George O'Dea

It has now been one month since I joined DEC, and the time has come to make my first recommendation of a course of action.

That recommendation is to set up a complete corporate forecast for fiscal 1963.

The reason for this particular recommendation is graphically illustrated by our present cash dilemma. In spite of spectacular growth and substantial profits, we are almost certain to default on the note payments due Shawmut in August and September.

Yes, they will probably go along with the default, and may even be delighted to increase the loan, but right now I doubt if anyone knows how much more we'll need, or when we'll need it.

Specifically, the fiscal '63 forecast should begin with sales. From this estimate (I think it should be dignified by being made by yourself and Ken) we can strike a quick P&L. On the basis of this quick P&L, you and Ken can decide how much we will plow back for development, and how much you feel we can tie up in the acquisition of new capital equipment and other balance sheet type of expenditures.

We may then prepare a quick balance sheet and approximate our cash strains.

Once the quick forecast of financial statements has been prepared and okayed, we will be in a position to go into the necessary detail to identify the significant areas of income and commitment with those individuals responsible for their execution. These matters can then be flagged to fall out from our regular monthly financial statements in order that our progress can be measured.

I strongly urge that you approve this undertaking and will start it off with a forecast of sales for fiscal '63. This would be best if it were in the form of new orders received.

# # #

CC: Ken Olsen ✓

dec INTEROFFICE MEMORANDUM

DATE July 23, 1962

SUBJECT DEC Participation in Parachute Contest

TO File

FROM Harlan Anderson

At a meeting on Friday, July 20, I told the representatives of the sport parachuting contest that we would definitely participate in the parachuting contest by loaning them a PDP-1 computer and providing some incidental support. The machine which we plan to loan them is a PDP-1 scheduled for delivery to Minneapolis-Honeywell. Basically, our participation will involve the following three things:

1. Loaning the computer and assuring that it works properly.

2. Donate $300 to the contest. We hope that they will use this money to help provide support for Bill Mann in doing the programming and particularly operation of the computer during the contest.

3. We will provide and install the special cables and switches for the judges. This includes probably two master cables, each terminating in a junction box from which the five judges can connect in their individual boxes with a wire extension. The judges' boxes should have the three buttons labeled in three languages with names that they will provide for us in the near future. If we silk screen this, we probably should put on the symbol of the World Sport Parachuting Contest, and also a credit to Digital Equipment Corporation.

I told the people that we wanted the right to veto whatever building they came up with to house the computer if we deemed it unsatisfactory. I said that in the event we did veto their building that we would provide a building instead. I urged them not to take advantage of this, but to continue looking for a satisfactory building. The following schedule was worked out for the details relating to our participation:

Friday, 20 July: Preliminary draft of specifications for program completed.

Wednesday, 25 July: Specifications for program agreed upon in final form at meeting to be held at DEC at 2 p.m.

Monday, 30 July: Start building and start laying cable at Orange if necessary.

Wednesday, 1 August: Check program for contest on the Orange PDP-1 at DEC's factory.

Friday, 3 August: Building complete with power installed and air conditioning installed. Also, the cables should be complete by this time. They will have installed a telephone by this time also.

Monday, 6 August: Ship computer to Orange.

Friday, 10 August: Demonstration day for final check and the press.

Saturday, 11 August: First day of the meet.

There will be many intermediate items of work that will have to be completed, but they will all be built around the above schedule framework.

# # #

CC: Ken Olsen
Stan Olsen
Jack Atwood
Jack Smith
Alan Kotok
Ken Fitzgerald
Tom Leonard

dec INTEROFFICE MEMORANDUM

DATE 7/20/62

SUBJECT Definition of Standard DEC PDP-1 Program Library

TO PDP-1 Distribution List FROM John Koudela, Jr.

A meeting was held on July 11, 1962, to define a Standard DEC PDP-1 Program Library. The following personnel were present:

H. E. Anderson
G. Bell
R. Beckman
H. Morse
M. Graetz
J. Koudela

The purpose of defining such a library is to be able to precisely describe and guarantee exactly what "software" is to be delivered with each PDP-1. This has never been adequately done in the past.

The Standard Library will consist of two sections: (1) maintenance programs, and (2) all other programs (which may be called "general programs"). This library is to be clearly distinct and independent of the DECUS Library (programs written by users). DEC, however, may contribute to the DECUS Library in the sense of a "user".

For the sake of uniformity, program classification and labelling can be the same for both libraries.

Program Numbering

DEC NNN-M

where NNN is a serial number in octal and M represents the letters A through Z (used sequentially) to designate revisions.

Punched Tape Labelling

Labels will be color-coded and measure 1 by 6 inches:

Yellow	RIM	Read-In Mode Format
Purple	MS	Macro Symbolic Format
Green	BSL	Binary with RIM Self-Loader
Tan	BIN	Binary without Self-Loader

A punched tape label may indicate any or all of the following items:

1. Program Number
2. Short Program Title or Title Symbol
3. Tape-Type Abbreviation (RIM, MS, etc.)
4. Starting Address (SA=NNNN)
5. Registers Required (Reg=NNNN-MMMM)
6. Halt Address (HA=NNNN)
7. Arithmetic System and Precision (FXD-18, FLT-18-18, etc., for fixed point 18-bit arithmetic, floating point 18-bit fraction-18-bit exponent arithmetic, etc.)
8. Sense Switch Settings
9. Tape Code (FIO-DEC, CONCISE, etc.)

Program write-up format and content has been fairly well standardized and is described elsewhere.

Standard DEC PDP-1 Program Library

1. MACRO Assembly Program (presently MIT-3), including

   a. MS Tape of MACRO
   b. BSL Tape of MACRO
   c. MS and BSL Tapes of Standard MACRO-Instruction Definitions
   d. MS and BSL Tapes of MACRO Symbol Package
   e. Technical Write-up and Program Listing
   f. Program Write-up (including description of MACRO Binary Self-Loader)

2. DEC Debugging Tape (DDT), presently MIT-1, including

   a. MS Tape
   b. BSL Tape (Hi Loader only)
   c. Program Write-up

3. Expensive Typewriter (presently MIT-2), including

   a. MS Tape
   b. BSL Tape (Hi Loader only)
   c. Program Write-up

4. Punchoff (presently BBN-46), including

   a. BSL Tape (Hi Loader only)
   b. Program Write-up

5. Simple Octal Debugger (to be written), including

   a. MS Tape
   b. BSL Tape (Hi Loader only)
   c. Program Write-up

6. Simple Tape Duplicator (to be written), including

   a. BSL Tape (Hi Loader only)
   b. Program Write-up

7. Arithmetic Routines (MS Tape only and Program Write-up for each)

   a. Multiply Subroutine (FXD-18) presently BBN-10
   b. Divide Subroutine (FXD-18) presently BBN-47
   c. Random Number Generator (FXD-18) presently BBN-23
   d. Single DEC Floating Point Package (FLT-18-18) presently DEC-107

Summary

1. Number of Tapes (all types) in Standard Library: 18
2. Number of Write-ups in Standard Library: 11
3. Status of programs to be converted to MACRO:

   a. Punchoff: Write-up and Frap Symbolic Tape available
   b. Multiply and Divide Subroutines: Write-ups and Frap and Decal Symbolic Tapes available
   c. Random Number Generator: Write-up and Frap and Decal Symbolic Tapes available
   d. Single Dec: Write-up available; basic program and interpreter in Decal Symbolic; function generator subroutines in Frap Symbolic

This memo is submitted to the addressees for approval and comment.

July 19, 1962

Approved Open Requests For Personnel

R. Mills — R. Lassen

Senior Clerk	Library	65 - 70
Library Asst.	" (replacement)	62
File Clerk	"	62
Secretaries	K. Olsen (replacement)	75 - 85
	S. Olsen "	75 - 85
	M. Sandler "	75 - 85
	R. Melanson "	75 - 85
	G. Bell (new)	75 - 85
	A. Blumenthal (new)	75 - 85
	N. Mazzarese(replacement)	75 - 85
Clerk/Typists	R. Melanson	62
	J. Myers	62
Accounting Clerk	R. Mills	65 - 70
Asst. Adv. Mgr.	J. Atwood	7500 - 9500
Adv. Trainee	" "	65 - 70
Art Specialist	" "	75 - 85
Lab. Tech.	" "	65 - 70
Public Relations Spec.	" "(replacement)	6000 - 7000
Repro Typist	" "	70 - 80
Clerk/Typists (2)	" "(1 replacement)	62
Buyer Trainee	H. Crouse	80 - 95
Wiremen (2)	J. Fadiman	
	R. Boisvert	62
Apprentice Machinists	L. Prentice	65 - 70
Machinist	L. Prentice	70 - 80
(2)Sheet Metal Trainees	L. Prentice	62
Sheet Metal Mechanic	L. Prentice	70 - 80
Carpenter	L. Prentice	75 - 95
Tool Crib Attendant	L. Prentice	70 - 80

COPY

Draftsman (detail)	R. Melanson	65
Draftsman (mechanical)	" "	80
Draftsmen (3) (electrical)	" "	80 - 90
Jr. Accountant	R. Mills	4400 - 6000
Office Services Supv.	" "	6000
Tab. Operator	" "	65 - 75
(OPEN) Assemblers (female)	M. Sandler	62
" Wiremen	" "	62

We also need several young men for maintenance, silk screening and shipping.

Electrical Engineers (2)	J. Fadiman	
	R. Savell	8000 - 10000

cc: K. Olsen
H. Anderson
M. Sandler
S. Olsen

COPY

INTEROFFICE MEMORANDUM

DATE: July 18, 1962

SUBJECT: PDP-4 QUANTITY DISCOUNT PRICE SCHEDULE

TO: H. Anderson, B. Beckman, G. Bell, R. Best, P. Bonner, J. Burley, D. Denniston, J. Fadiman, B. Gurley, T. Johnson, J. Koudela, K. Larsen, N. Mazzarese, R. Mills, J. O'Connell, G. O'Dea, K. Olsen, S. Olsen, B. Stephenson

FROM: George Rice

The quantity discount for PDP-4's will be computed from a table*. This table price will permit customers who buy computers in quantity to obtain a discount. The discount will be greater for high volume customers and will be the same as the present price sheet for one computer customers.

The discount applies to the current price of the computer at the time the purchase order is placed. The discount schedule is available only for the PDP-4A or PDP-4B and the following options:

Type 17 (4096 Word memory module),
Type 25 (Real time option),
Type 65 (Printer-keyboard and control),
Type 75 (Paper tape punch and control).

PDP-4 DISCOUNT TABLE

Total number of machines ordered during past year plus number of machines in present order.	Price per machine by per cent of current price.	Discount per cent
1	100	0
2	94	6
3	88	12
4	82	18
5	76	24

This discount schedule allows for discounts up to 24%. There is no provision for cancellation for customers who buy

*The table will give a per cent discount depending upon the size of the order and on the previous orders made during the past year.

many machines to obtain a low price then cancel part of the order. If a customer should cancel part of an order, they will be subject to a penalty which will adjust the price upward to that which would apply for the number of machines delivered plus a fixed penalty. The amount of the fixed penalty will be determined by the number of machines cancelled and the time differential between the cancellation notice and the delivery date of the cancelled machines.

COMPANY CONFIDENTIAL

INTEROFFICE MEMORANDUM

DATE July 17, 1962

SUBJECT Basic PDP-1 Schedule

TO K. Olsen
S. Olsen
P. Bonner
J. Smith
B. Gurley

FROM H. E. Anderson

	1st of the Month	15th of the Month	
July	ADX - 2	M.I.T.	DEC
August	ADX - 6	Honeywell**	
September	ADX -7	United Aircraft	
October	ADX - 3	Adams	
November	ADX - 8	J.P.L.*	
December	Electronic Assoc.* ***	AEC (Canada)	
January	ADX - 9*	AFCRC*	

* Tentative
** To be used at Orange, Mass., on August 15, and ACM in Syracuse
*** To be used at FJCC in Philadelphia, December 1

Note: Actual delivery dates to customers may be slightly later than the months shown above, since the purpose of this chart is to keep track of our two computer per month philosophy.

COMPANY CONFIDENTIAL

dec INTEROFFICE MEMORANDUM

DATE July 17, 1962

SUBJECT EMPLOYEE HANDBOOK

TO ✓K. Olsen, H. Anderson, S. Olsen, R. Mills, M. Sandler, R. Lassen, B. Charnock, J. Lozouski

FROM J. Atwood

We would like to get the new employee handbook into production as quickly as we can.

Since the proposed text will have been in everyone's hands exactly one month on Thursday and since most of the people immediately concerned with the subject matter are not on vacations or sales trips at the moment, it seems reasonable to try to schedule a review session this week.

Would you be able to spend approximately two hours on this project on Thursday afternoon at 3:00 in my office? We might be able to wind it up faster than that if we all have our comments ready, but there are so many policies covered in the text that I would hesitate to guarantee anything less than the two hours.

We will check with you tomorrow to see if everyone who wants to participate will be available.

Ken Olsen

dec INTEROFFICE MEMORANDUM

DATE July 16, 1962

SUBJECT Computer Maintenance Contracts

TO PDP-1 Distribution List FROM Bob Beckman

Attached is a brief description of the recently established field maintenance policies and charges.

Several of our customers, whose warranties have already expired, have been receiving free service for the past few months. These "extended warranties" will expire at the end of this month and further service of their equipment will be subject to the charges described here. As others' installations reach the end of their warranty period, the organizations concerned will be notified and further maintenance work by DEC personnel will be subject to these charges.

FIELD MAINTENANCE SERVICES AVAILABLE

Digital Equipment Corporation offers field maintenance service for PDP computers and associated equipment on a per call basis, or one of two maintenance contract plans. The following is a brief discussion of the services available and charges involved.

The services discussed here are available anywhere within the continental limits of the United States. For convenience, two "areas" are defined: Area 1 is everything within a fifty (50) mile radius of a DEC service center. Area 2 is everything outside this 50 mile radius. At the present time, DEC service centers are located at 146 Main Street, Maynard, Massachusetts, and 8820 Sepulveda Boulevard, Los Angeles, California.

PER CALL BASIS

Maintenance work performed on a per call basis is subject to the following charges:

1. $20.00 per hour of actual on-site work (minimum charge, $20.00).
2. Transportation at $.10 per mile (automobile) or actual cost of commercial transportation.
3. Cost of replacement parts.
4. Additional charges for installations in area 2.
    a. $20.00 per day (including travel time).
    b. Minimum charge $100.00 plus transportation.

MAINTENANCE CONTRACTS

Charges for maintenance contract plans #1 and #2 will be figured as a percentage of the base value of the equipment. The base value for this calculation will be the current published retail price of standard equipment, the last published retail price of a discontinued item, or the selling price of equipment unique to a particular installation, as applicable.

With one exception, the maintenance contracts provide for preventative and corrective maintenance on all PDP computers and associated equipment. No contract maintenance is available for

computer typewriters that have been in service for more than eighteen (18) months.

PLAN NUMBER 1

This plan provides minimal preventative maintenance service and limited corrective maintenance service. It is intended for those users who plan to do a portion of the necessary maintenance themselves. The plan provides for one (1) preventative maintenance call per month, to be scheduled by DEC, and a limited number of trouble calls per year. The number of trouble calls allowed is a function of the complexity of the installation. Twelve (12) trouble calls per year are allowed for a basic computer with no options, and the number of calls will be increased by one (1) call per year for every $600.00 per year (or portion thereof) over the charge for a basic computer. Once the limit on trouble calls has been reached, additional calls will be on a per call basis. Charges for plan #1 are:

1. 2% per year of the base value of the equipment.
2. Cost of replacement parts.

PLAN NUMBER 2

Plan number 2 provides the same monthly preventative maintenance calls to be scheduled by DEC, but places no limit on the number of trouble calls during the contract year. Charges for plan #2 will be figured on the basis of 5% per year of the base value of the equipment.

ADDITIONAL PROVISIONS

All service is on a "working hours only" basis. Working hours are defined as 0800 to 1630, Monday through Friday, (Excluding holidays). The calls must be placed within these hours. Work once started will continue as long as necessary.

Troubles traced to modifications or to additions not supplied or approved in writing by DEC, will be charged for at the per call rates regardless of any existing maintenance contracts.

Items of equipment that are still within the original warranty period will continue to receive free service as in the

past. As warranties expire, the items concerned can be added to existing maintenance contracts with appropriate adjustment in charges.

For further information concerning field services and maintenance contracts, contact:

R. J. Beckman
Manager, Customer Relations
Digital Equipment Corporation

dec INTEROFFICE MEMORANDUM

DATE July 16, 1962

SUBJECT

TO
K. Olsen
H. Anderson
S. Olsen
M. Sandler
B. Gurley

FROM Jack Smith

We are currently quoting customers a 4 month delivery for Mag. Tape Type 50 Units. Determining factor being our method of ordering potters. Customer order type method is now in use. On receipt of customer order for a type 50 we in turn order a potter unit and assign this unit to the customer order. Potter requires a 14 week lead time, thus determining our four month delivery quotation. If this delivery is sufficient, we can continue to order potters on a customer order bases. Shorter delivery of type 50 units to customer will require manufacturing for stock and we will have to start to forcast our needs as soon as possible. Please advise.

INTEROFFICE MEMORANDUM

DATE July 13, 1962

SUBJECT DELIVERY OF MEMORY STACKS

TO K. Olsen
H. Anderson
B. Gurley
H. Crouse

FROM Jack Smith

Replies have been received from G.C. and Ferroxcube confirming their shipping dates of Memory Stacks to us. Ampex is bringing in the second spare Memory for MIT Monday. The fifth spare Memory for ADX-2 was installed into the system today; this completes the system. Arrival of the second MIT spare Memory from Ampex Monday morning will bring to a close a slight panic, which was not quite as bad as it first seemed. Delivery of the ADX-2 system was delayed just a matter of a few days. The MIT system is still on schedule according to Al Blumenthal.

Both G.C. and Ferroxcube have confirmed that they will ship early next week. This will put us back on schedule for all future computers.

Delivery dates of Readers, Punches and Typewriters have been confirmed and offer no problem outside of constant attention.

dec INTEROFFICE MEMORANDUM

DATE July 12, 1962

SUBJECT Programming

TO Ken Olsen
cc. Harlan Anderson
Ben Gurley

FROM Dit Morse
Gordon Bell

Programming:
The following people will be working in these projects for the next two months:

DEC Business Programming- Dit 1/5, G.B. 1/8, Alan Kotok 1/3

Compiler for PDP-4, thru PDP-1 - Alan Kotok 2/3, Dit

Maintenance and In/out Routines- PDP-4 Steve Piner

DEC Library for PDP-1 - S. Graetz, Carol Austen

Double Precision Floating Point 1 PDP-4 - Julie Cole

General Coding - Nancy Lambert

COMPANY CONFIDENTIAL

dec INTEROFFICE MEMORANDUM

DATE July 12, 1962

SUBJECT Long Range Objectives of the Office of Treasurer

TO Kenneth Olsen ✓
Harlan Anderson

FROM George O'Dea

This will confirm our conversation of yesterday afternoon in which the long range objectives of the position of treasurer were described as including the following four items:

1. Accounting System Feedback - It is important that the non-accounting personnel of the company become a significant part in the feedback of information in order that their participation in derivation of future information is made more realistic.

2. Cash Forecasting - The subject of cash forecasting is to be given an immediate priority, again leaning heavily on the bringing of other people into the establishment of the figures, particularly as regards delays in major shipments and certain substantial procurements.

3. Current Ratio - It is recognized that Digital Equipment Corporation should aim for a minimum current ratio of 2 to 1. This office will attempt to improve the existing current ratio by getting more people aware of their responsibilities in this regard.

4. Accounting Organization - It is recognized that the accounting organization needs an over-all upgrading in the eyes of the company.

As to sequence, Item #2, Cash Forecasting, will be approached first.

By way of final comment, every effort will be made to accomplish these objectives through present Accounting Personnel.

# # #

COMPANY CONFIDENTIAL

INTEROFFICE MEMORANDUM

DATE July 9, 1962

SUBJECT PDP-1 Field Service Summary

TO PDP-1 Distribution List FROM Bob Beckman

Attached is the first of a series of monthly summaries of field service performed on PDP-1 installations.

The purpose of these summaries is to keep everyone up to date on the amount and type of field service work being performed. Anyone who wants more specific information on particular failures can let me know and we'll run off Xerox copies of the actual field service report.

###

SUMMARY OF FIELD SERVICE

June, 1962

Number of calls: 15
Man hours: 161

Maynard Area		Calls	Los Angeles Area		Calls
PDP-1B	BBN	6	PDP-1C-7	BBN	0
PDP-1C-1	ITEK	1	PDP-1C-12	LRL	*
PDP-1C-3	CRL	0	PDP-1C-13	JPL	0
PDP-1C-4			PDP-1C-15	BECKMAN	5
PDP-1C-5	MIT	1	PDP-1C-16		
PDP-1C-6	CRL (OAL)	1			
PDP-1C-9	GEOTECH	1			
PDP-1C-17	SRL	0			

BBN

An unusual amount of service calls to BBN this month. This is due in part to the recent additions and modifications to the PDP-1B.

One problem was the intermittent pick-up of bit 7 in memory. The trouble was traced to a defective inhibit driver for the afore mentioned bit. An interesting point about this problem was, checkerboard program would run, even though the inhibit driver for bit 7 was defective. Another service call found an open solenoid for bit 16 in the off-line typewriter, and a defective forward escapement clutch on the off-line punch (the off-line punch is a tally punch on the PDP-1B).

While trying to initiate a sequence break on any channel, the inclusive Or of channel 7 would always occur. This problem was traced to an open transistor in the decoding of MBD_7.

* Installation Phase

Problems with done pulses on both typewriters when manually striking a key. This problem was due to PDP-1B logic and a logic change was put in the computer so that it would operate in the proper manner.

Another service call for new memory problems at BBN were traced to the 1701 voltage regulator module in the 735 power supply. The defective regulator caused fluctuations of the inhibit current. Replacement of this module and readjusting the read/write and inhibit currents solved this memory problem.

After a few days of operating the PDP-1B, it was found that when the computer was first turned on that TW 1 >AC during deposit would not put bit one into the accumulator. This problem was traced to defective 1201 flip-flop in the accumulator. Replacement of the flip-flop corrected the malfunction. It was also found on this service call, that during a jump instruction we were not clearing the program counter. Investigation revealed a shorted transistor in an 1105 module which was loading down the input to the clear the PC pulse amplifier. This module was used when an external control pulse from the drum would clear the PC. Replacement of the transistor in the 1105 module corrected this problem. A complete test was performed on the PDP-1B and its peripheral equipment. During this test it was found that there were low margins on hole number 2 in the reader. Adjustment of the hole number 2 amplifier corrected these low margins and all tests which were then run on the PDP-1B proved successful.

The PDP-1B is rapidly evolving into quite a system. Some of the recent additions to the PDP-1B are:

Automatic multiply and divide.
IOT Control flip-flops and minus one to the program counter logic.
Mag Tape Type 51.
Additional Memory and Field Extension Type 15.
Time Sharing Logic.
FIO-DEC and Parity Coding for the off-line typewriter and punch.
Magnetic Drum, with the storage capacity of 22 memory modules.*

* Installation Phase

ITEK

Service was required for the Teletype punch at ITEK. The punch had excessive oil and chad in the die block head. A thorough cleaning of the die block head and re-oiling of the head corrected the punch difficulties.

MIT

A service call to MIT was necessary when the Type 30A Display showed no deflection in the left quadrant. Removal of the deflection coil cable in the display and a continuity check from the right deflection amplifier to ground read 20Ω. This 20Ω reading was traced to a shorted 2N 1719 transistor in the heat sink unit of the Type 30A Display. It should be noted that this problem caused the plus 50 volt NJE power supply to go into an overload condition, and the supply output measured only 45 volts.

CRL

The light pen which is used with the Type 30A Display at the OAL installation was excessively noisy. An electrical tape used as an insulation around the sides and bottom of the light pen amplifier shield, eliminated most of the high frequency noise. A check of the light pen then showed its signal to noise ratio to be greatly improved.

GEOTECHNICAL CORPORATION

An intermittent trouble at Geotech would occur from time to time and it seemed to happen mainly when the computer was cold (i.e. for the first hour after turn-on). When we arrived at Geotech the computer had been left off all day so that the same problems would show themselves. The symptoms were that all types of programs would fail and the usual result was a cleared instruction register with the computer halting in an illegal op.

It was determined that a LAC instruction was also doing a partial add and a carry. The partial add and carry pulse amplitudes were inversely proportional to warm-up time. After a series of waveform checks and power ups and downs (to insure the computer stay cool), it was determined that the instruction register decoding for 10 and 00 was only going from ground to -1.5 volts. A shorted .01 m.f.d. capacitor in the -3 volt clamp circuit of an 1104 module was the cause of this problem.

I think that it should be noted that the .01 m.f.d. capacitor which failed is an Automatic Components capacitor, which has also shorted in other modules in two different installations. These capacitors are not up to DEC quality and are no longer used in DEC modules, however, there are some of this type in modules which are now in the field.

BECKMAN

Our service calls were necessary at Beckman for breakdowns of peripheral equipment. Two punch problems developed at the Beckman installation, one of which was caused by excessive oil and chad jammed in the die block assembly. Cleaning the punch and die block assembly solved the problem. The other problem was caused by the use of reel tape as the reel was hitting the tape guide. Adjustment of the tape guide solved this problem. A series of reader problems has seemed to plague Beckman during the past month. Some of the problems which developed were a defective feed hold amplifier, brake and clutch adjustments on one reader, two shorted SPA modules in an on-line and a spare reader, and a shorted -30 volt rectifier stack on still another spare reader.

dec INTEROFFICE MEMORANDUM

DATE July 6, 1962

SUBJECT Revision of Tape Control 52 Pricing

TO
K. Olsen
H. Anderson
S. Olsen
B. Gurley
E. Harwood
J. Koudela
R. Maxcy

FROM N. Mazzarese

The present scheme used in pricing Tape Control Type 52 has led to some confusion when two Tape Controls are purchased with a single computer, or when a Tape Control is purchased without a computer.

The problem arises due to the fact that the High Speed Channel Control Type 19 is included in the price of the Tape Control, and that one Type 19 can handle up to three Type 52's.

It is, therefore, recommended that the price of the first Mag Tape Control Type 52 for a given computer be:

$29,000	Mag Tape Control
+ 9,000	High Speed Channel Control
$38,000	Total

and that the price of a second Mag Tape Control on the same computer be $29,000.

This price schedule is presently being offered to ITT on ADX-5.

dec INTEROFFICE MEMORANDUM

DATE July 3, 1962

SUBJECT Terminations

TO Stan Olsen

FROM Barbara Charnock

As a result of a hearing I attended Monday, July 2, 1962, regarding Fran Morris and Dorothy Spaulding, I found in order for an employer to protect himself against a hearing determination resulting in the favor of the claimant that we should tighten up our policies and practices in the following manner:

1. Institute a written warning system to unsatisfactory employees.

2. Establish a company policy as to how many written warnings should be given. (Note: In a recent discussion with Arthur Sesserman of National Metal Trades he quoted, "A company that is not consistent in its policies is asking for union threats.") We could give ourselves leeway in this respect by not establishing a time limit.

3. If an employee is to be terminated on a specific day, his supervisor should note the activities of the individual in question and the actual time involvements.

4. If an employee is away from his work station for an unreasonable time, every effort should be made to find said individual so his whereabouts could be witnessed. In this respect time and offense should always be noted on the warning slip.

5. The company policy of giving two weeks' termination notice for hourly employees and one month's notice for salaried should be more strictly enforced. I would like to suggest that each employee who terminates must indicate such in writing through use of a form which the Personnel Department would supply.

BGC/jfr

INTEROFFICE MEMORANDUM

DATE

SUBJECT WORK SCHEDULE, JULY-DECEMBER, 1962

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

INTRODUCTION

The accompanying schedule shows the predictable work load in our department for the third and fourth quarters of 1962. It is broken down into regular monthly jobs, trade show activities, and other presently known projects.

The work required to produce these jobs is shown in "work-weeks" by function at the bottom of each weekly column. (One "work-week" equals one week's work by one person or one day's work by five persons or any combination totalling five work days.)

These figures are not definitive; they are only educated guesses. More precise scheduling will depend on the availability of time card data for the specific jobs shown.

A basic effort has been made to spread the work load evenly by job functions throughout the period. However, it would certainly be possible to make further adjustments by changing delivery dates on non-critical projects.

In actual practice, the time required for various projects will vary from the norm. Preparations for any given trade show, for example, depend entirely on the type of display to be used and the kind of equipment to be shown.

All figures on Sheet 4 include a "base load" factor equivalent to the average amount of time required for routine jobs, which are not listed separately, such as the issuance of the Biweekly Report and the printing of test data sheets. The factors are: copy, ½ ww.; art, ½ ww., photography, 2 ww.; typing, ½ ww.; printing, 1½ ww.; and mailing (including collating and binding), 1 ww.

The average work loads shown are calculated individually for the third and fourth quarters since most of the fourth-quarter projects which should appear on Sheet 3 are not known at this time. Thus, the third quarter figures more closely approximate the normal situation.

Sheet 4 suggests the use of temporary help to meet peak requirements in the mailing function, which includes collating and binding. This has been a satisfactory solution where no special skills are involved.

Other than temporary help, the only provision for outside services included in this schedule is in the printing function. Because of the growing volume of in-house work, such as forms and memoranda, and because our equipment is not designed for top-quality commercial results, only a relatively small share of the total departmental printing has been assigned internally.

EXHIBITS

Sheet 1 - Regularly Scheduled Monthly Jobs

Covers general monthly mailings, space advertising (when done), promotional and operational publicity, employee publication, customer mailings, and sales force mailings.

Sheet 2 - Trade Show Displays and Mailings

Covers design, construction and crating of displays and packing of show literature. Also covers promotional mailings in connection with specific shows. ("OK" indicates period when design is approved and materials are ordered.)

Sheet 3 - Projects Presently in Prospect

Covers publications currently in process and some of those which should be undertaken during this period.

Sheet 4 - Work Load by Job Function

Plots the number of work-weeks required to produce the jobs listed on Sheets 1, 2 and 3 together with average work loads for each function.

CONCLUSIONS

1. This schedule covers only the basic ingredients of a sound promotional program and only the minimum publication requirements.

2. Maintenance of the schedule depends on (1) the availability of qualified personnel and appropriate equipment and (2) strict adherence to all dates by all parties concerned.

3. Maintenance of the over-all work load depends on (1) full use of departmental services by "customers" within the company and (2) the careful integration of new projects into the existing schedule.

4. Minor fluctuations in functional work loads can be accommodated, when necessary, by overtime operation or the temporary shifting of personnel between functions. Major fluctuations will require either adjustments in the schedule or the short-term use of outside specialists.

5. While all but one of our present personnel have reached a satisfactory, or better, level of professional competence, the department is not yet adequately staffed with qualified permanent employees in certain critical areas. For example, our reproduction typist and our two clerk-typists are temporary help. They can be trained today and gone tomorrow.

6. The third-quarter deficiencies indicated on Sheet 4 are approximately as follows:

	Available	Required	Lacking
Copy writing	1	3	2
Art	2	3	1
Photography	3	3½	½
Typing	1	2¼	1¼
Printing	1	2¼	1¼
Mailing	3	5½	2½
	11	19½	8½

In addition to the 11 shown, the department includes four other persons (Helene Shebak, Gert Loynd, Jackie Micklay, and myself) whose time is devoted almost entirely to administration, planning, production, training, and other supervisory work.

RECOMMENDATIONS

1. This schedule, together with any modifications, should be approved as soon as possible so that it can be used as a guide for activities commencing July 1.

2. Depending on the effect of any modifications, approval should also be given for the addition of the following personnel as quickly as qualified candidates can be located:

a. Assistant advertising manager - who can help on copy writing and supervision.

b. Reproduction typist - who can come with us on a permanent basis to handle technical typing and part of the general typing load.

c. Two clerk-typists - who can also come on as permanent employees and do typing, collating, binding, or mailing, depending on the work load in each area. (One of these would be a replacement for Frances Morris.)

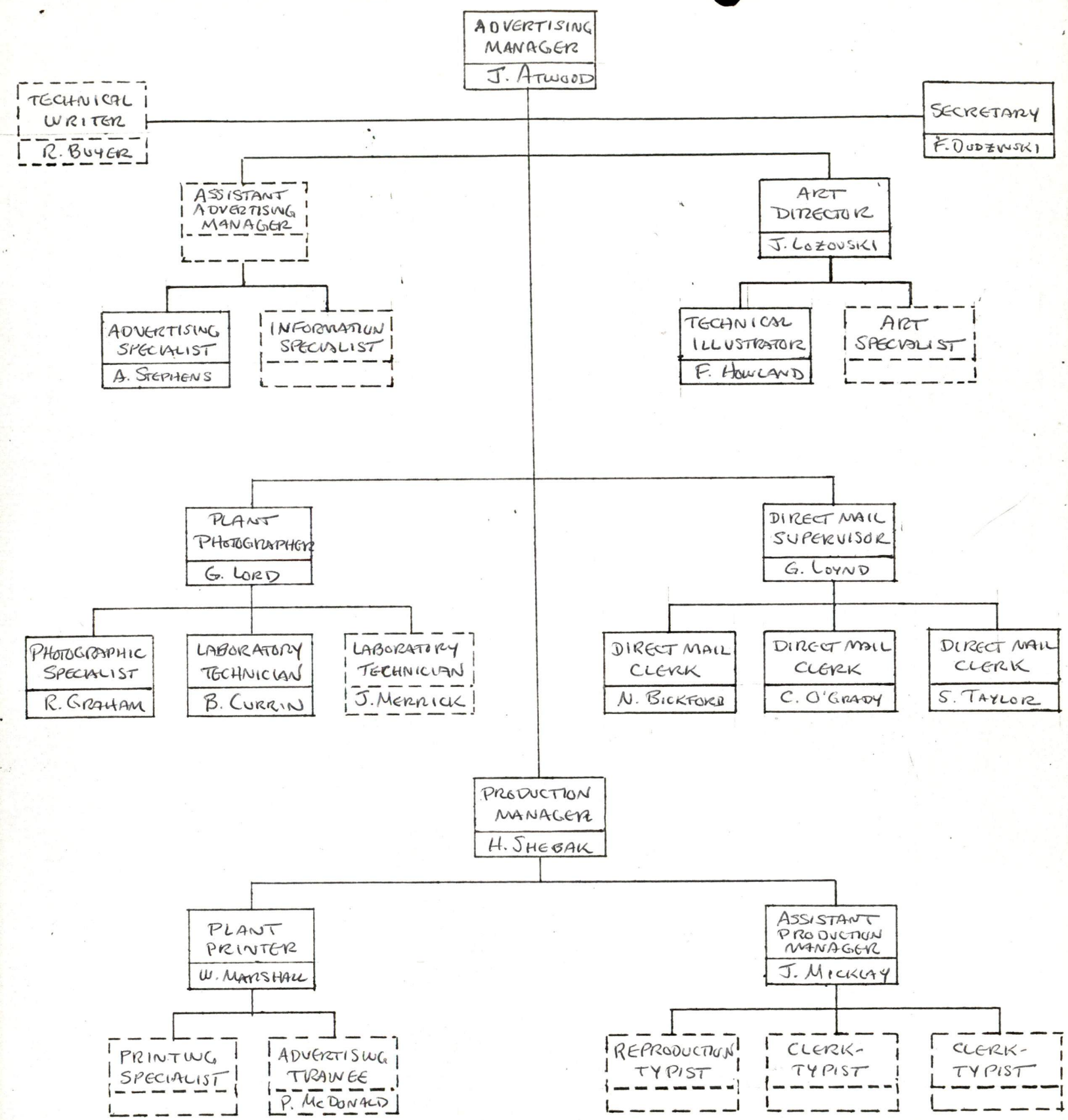
d. Advertising trainee - who can be assigned to printing, photography or mailing, depending on the work load. (Paul McDonald is scheduled for transfer to this job, which would meet the fractional personnel requirements listed in No. 6 above.)

e. Laboratory Technician - who can handle the growing volume of photocopying and duplicating. (Joan Merrick is due to transfer to this job, which is intended to be the start of the Office Services operation.)

3. If the functional work loads continue as forecast, approval will also be needed for an information specialist, who could concentrate on publicity and public relations work; an artist, who could do paste-ups, forms, signs, and other routine art work; and another printer, who could put in full time in the press room.

4. Since the department is now to be known as "Technical Publications," consideration should be given to the possible transfer of Bob Buyer, the technical writer, from Engineering to Technical Publications. This would give him more freedom and encouragement to promote his services to potential customers in the company, and it would put him in close working relationship with the typists, artists, photographers, and printers who can help him get his material into finished form. It would also provide our group with competent technical editing assistance on product literature and publicity.

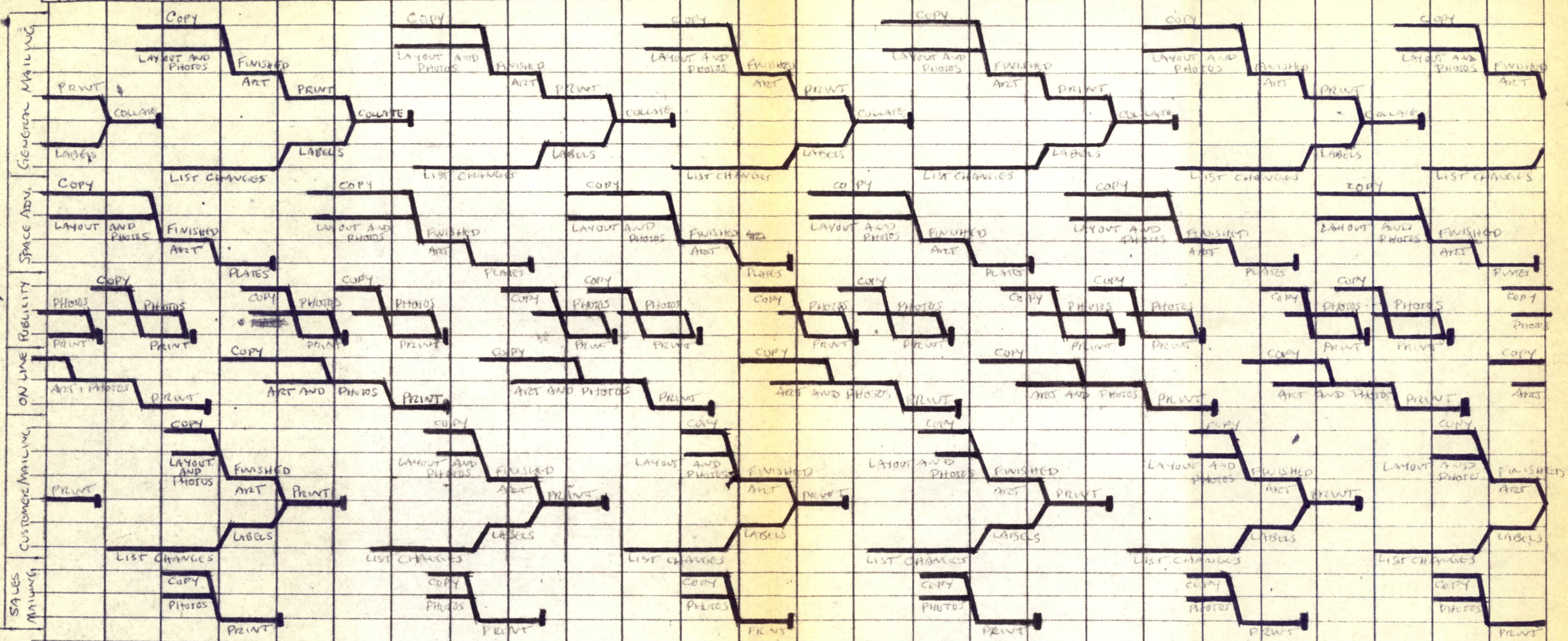
Acceptance of these recommendations would permit us to have a functionally oriented department with direct lines of responsibility, as shown by the chart on the following page.


ADVERTISING MANAGER
J. ATWOOD
TECHNICAL WRITER
R. BUYER
SECRETARY
F. DUDZINSKI
ASSISTANT ADVERTISING MANAGER
ART DIRECTOR
J. LOZOVSKI
ADVERTISING SPECIALIST
A. STEPHENS
INFORMATION SPECIALIST
TECHNICAL ILLUSTRATOR
F. HOWLAND
ART SPECIALIST
PLANT PHOTOGRAPHER
G. LORD
DIRECT MAIL SUPERVISOR
G. LOYND
PHOTOGRAPHIC SPECIALIST
R. GRAHAM
LABORATORY TECHNICIAN
B. CURRIN
LABORATORY TECHNICIAN
J. MERRICK
DIRECT MAIL CLERK
N. BICKFORD
DIRECT MAIL CLERK
C. O'GRADY
DIRECT MAIL CLERK
S. TAYLOR
PRODUCTION MANAGER
H. SHEBAK
PLANT PRINTER
W. MARSHALL
ASSISTANT PRODUCTION MANAGER
J. MICKLAY
PRINTING SPECIALIST
ADVERTISING TRAINEE
P. McDONALD
REPRODUCTION TYPIST
CLERK-TYPIST
CLERK-TYPIST

1962

JULY | AUGUST | SEPTEMBER | OCTOBER | NOVEMBER | DECEMBER

2 9 16 23 30 6 13 20 27 3 10 17 24 1 8 15 22 29 5 12 19 26 3 10 17 24 31



COPY	1	1	1 3/4	3/4	3/4	1/2	1 3/4	1	3/4	1/2	3/4	1 3/4	3/4	3/4	1	1 3/4	3/4	1/2	1/2	1 3/4	1 1/4	3/4	1/2	3/4	1 3/4	3/4
ART	1/2	3/4	3/4	1 1/2	1/2	1/4	1/2	1 1/2	1 1/4	1/4	1/2	3/4	1 1/2	1/2	3/4	1 3/4	1 1/2	1/2	1/4	1/2	1	1 3/4	1/4	1/2	3/4	1 1/2
PHOTO	3/4	3/4	1	1 1/4	3/4	3/4	1	3/4	3/4	3/4	1/2	1/2	1 1/4	3/4	3/4	1	3/4	3/4	3/4	1/2	1/2	1 1/2	3/4	1/2	1 1/2	1 1/4
TYPING	1/2	1/2	3/4	1 1/4	1/2	1/4	1/2	1	1 1/4	1/4	1/2	3/4	1 1/4	1/2	1/2	1	1 1/4	1/2	1/4	1/2	1	1 1/4	1/4	1/2	3/4	1
PRINT	1/4	1/4	1/4	1/4	1/2	1/4	1/4	1/4		3/4	1/4		1/4	1/2	1/4	1/4	1/2	1/4	1/4		1/4	1/2	1/2		1/4	
MAILING	5 1/4	8 1/4	5	4 1/4	6	8 1/4	5	4	2 1/4	6	8 1/2	4 3/4	4 1/4	6	8 1/4	5	4 1/4	5 3/4	8 1/4	3	4 1/4	4 1/4	6	8 1/2	4 3/4	4 1/4
TOTAL	8 1/4	11 1/2	9 1/2	9 1/4	9	10 1/4	9	8 1/2	6 1/4	8 1/2	11	8 1/2	9 1/4	9	11 1/4	10 3/4	8 3/4	8 1/2	10 1/4	6 1/2	8	9 3/4	8 1/4	11 1/4	8 1/2	9

digital EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

ORIGINATOR J L ATWOOD

DEPARTMENT ADVERTISING

DATE 6/21/62

PROJECT SHEET 1 - REGULARLY SCHEDULED MONTHLY JOBS
(■ = MAILING OR SHIPPING DATE)

DF100-6

1000-6/62

1962

JULY | AUGUST | SEPTEMBER | OCTOBER | NOVEMBER | DECEMBER

2 9 16 23 30 6 13 20 27 3 10 17 24 1 8 15 22 29 5 12 19 26 3 10 17 24 31

(D) = DISPLAY
(M) = MAILING
= SHIPPING OR MAILING DATE

PACK AES
OK BUILD PACK
COPY ART PRINT INSERT
OK BUILD PACK
COPY ART PRINT INSERT
DESIGN OK BUILD PACK ACM
COPY ART PRINT INSERT
DESIGN OK BUILD PACK
COPY ART PRINT INSERT
DESIGN OK BUILD PACK NEC
COPY ART PRINT INSERT
DESIGN OK BUILD PACK NCIRE
COPY ART PRINT INSERT

DESIGN OK BUILD PACK
COPY ART PRINT INSERT
WESCON
INTERDATA
DESIGN OK BUILD PACK NSSET
COPY ART PRINT INSERT

DESIGN OK BUILD PACK ISA
COPY ART PRINT INSERT
DESIGN OK BUILD PACK NEREM
COPY ART PRINT INSERT
DESIGN OK BUILD PACK CMM
COPY ART PRINT INSERT
DESIGN OK BUILD PACK ARSAE
COPY ART PRINT INSERT
DESIGN OK BUILD PACK FJCC
COPY ART PRINT INSERT
DESIGN OK BUILD (EEE)
COPY ART PRINT

COPY	1		1/2	1/2	1/2		1/4	1		1 1/2	1 1/2	3/4	1/4	1		1 1/4	1		1/4	1/2	1/2							1/4	1/2	1/2		
ART		1/2	1 1/4	3/4	1/2	1/2	1/2	1		1 1/4	1 1/2	1 1/2	1	1		1 1/4	1		3/4	1/2	1/2	1/2							1/4	1/2	1/2	1/2	
PHOTO			1/2			1/4					1/4	1/2	1/4			1/4	1/4		1/4			1/4										1/4	
TYPING		1/4	1/4	1/4	1/2		1/4			1/2	1/4	1/2	1/4	1/2		1/4	1/2		1/4	1/2	1/4	1/4			1/4					1/4		1/4
PRINT				1/4	1/4		1/4					1/4	1/4	1/2					1/4	1/2		1/4			1/4							1/4
MAILING	1				2		4		1	1				1		1	3	1			3		2	3		2	1					
TOTAL	2	3/4	2	1/2	1	3/4	3	3/4	1	1/4	3	4	1/4	3	1/2	3	1/2	6	3	3/4	1	3/4	5	3	1/4	3	3/4	1/2	2	1	1/2	1	1	1/4	3/4	1/2

digital EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

ORIGINATOR J L ATWOOD
DEPARTMENT ADVERTISING
DATE 6/24/62

PROJECT SHEET 2 - TRADE SHOW DISPLAYS AND MAILINGS (SEE KEY AT UPPER RIGHT)

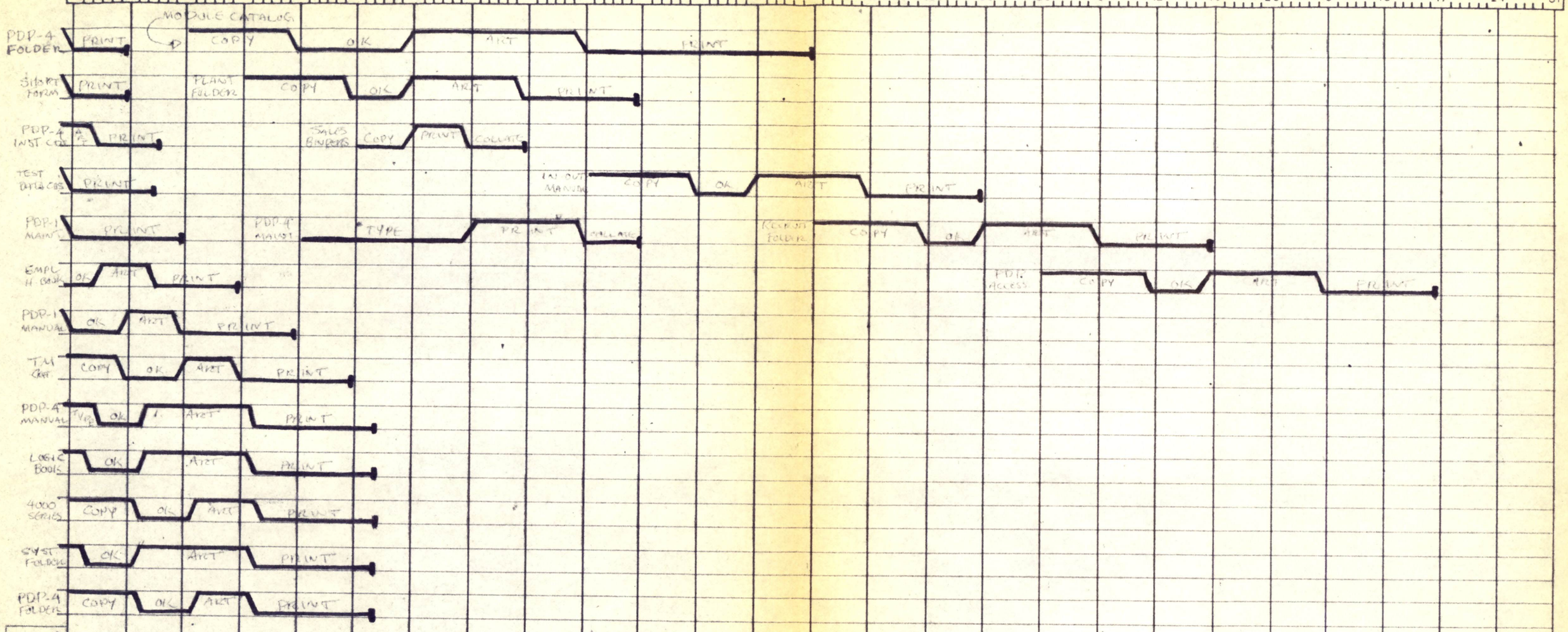
DF100-6

1000-6/62

1962

JULY | AUGUST | SEPTEMBER | OCTOBER | NOVEMBER | DECEMBER

2 9 16 23 30 6 13 20 27 3 10 17 24 1 8 15 22 29 5 12 19 26 3 10 17 24 31



COPY	2		1/2	1/2	1	1	1		1/2			1	1		1/2			1/2	1/2	1/4		1/2	1/2	1/4								
ART	1 1/4	2		2 3/4	1/4	1/4	1/4	1		1		1/4	1/4			1/2		1/2	1/2			1/2	1/2									
PHOTO		1/2	1	1 1/2		1/2	1/2	3/4	3/4			1/4	1/4			1/4		1/4	1/4			1/4										
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PRINT	1		3/4	1 1/4				3/4	1/2	1										1/2	1/4											
MAILING	1	2		1					1/2			1																				
TOTAL	6 3/4	6 3/4		6 1/2	1 3/4	4 1/4	4 1/4	5	2 3/4	2		2 1/2	2		3/4			1 1/4	1 1/4	1/2	1/4	1 1/4	1 3/4	1/2	1/4	1/2						

digital EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

ORIGINATOR JL ATWOOD

DEPARTMENT ADVERTISING

DATE 6/24/62

PROJECT SHEET 3 - PROJECTS PRESENTLY IN PROSPECT
(⊣ = DELIVERY DATE)

DF100-6

1000-6/62

1962

JULY | AUGUST | SEPTEMBER | OCTOBER | NOVEMBER | DECEMBER

2 9 16 23 30 6 13 20 27 3 10 17 24 1 8 15 22 29 5 12 19 26 3 10 17 24 31

COPY

ART

PHOTO

TYPING

PRINT

MAILING

TOTAL LOAD

LOAD EXCLUDING TEMPORARY HELP

digital EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

DF100-6

ORIGINATOR J L ATWOOD

DEPARTMENT ADVERTISING

DATE 6/27/62

PROJECT SHEET 4 - WORK LOAD BY JOB FUNCTION
(- - - = AVERAGE LEVEL FOR QUARTER)

1000-6/62

dec INTEROFFICE MEMORANDUM

DATE June 28, 1962

SUBJECT Meeting of Tuesday, June 26th, to discuss future computer development at DEC.

TO
K. Olsen
H. Anderson
H. Morse
A. Kotok
S. Piner
E. Fredkin
M. Gretz
J. Koudela
R. Doane
A. Blumenthal
G. Bell

FROM Bob Savell

The question under discussion was, "Should we build a new machine, and if so what sort of machine should it be?"

It was agreed that we should make the decision not on the basis of what the competition is doing, but on whether we can offer something new and different. Price probably is not of much concern. However, the new machine must be really new and significantly different from anything else in the field, because it is in building equipment that is really new and different that DEC stands out and can make a significantly greater profit than if we are building to compete.

Some discussion was held about the type of clientele and type of business that we should go after, one suggestion being that we might go after the business end of the computer business. Gordon Bell suggested possibly a 1401 type machine with lots of IO gear. Fredkin's comment on this was that he felt it would tend to discourage good people from working at DEC, because this sort of business would be really competitive. The conclusion was that unless someone has a special interest in business data processing we will not try to enter the field.

Large scale 7090 like machines were discussed and the conclusion reached that we would not like to build machines on this scale for many reasons. One is that customers for such large systems are few and far between and they require much sales effort.

The Character oriented machines, such as the Burroughs B-5000, were discussed. There was no definite feeling generated that DEC should build a machine of this sort. The B-5000 is an soft-ware oriented machine, and when one buys a machine of this sort one is buying an entire system rather than just a computer. It was felt that DEC now has in PDP-1 a simple straight-forward machine and that there is much to be said for keeping any computer that we build simple and straight-forward.

John Koudela was pushing for a powerful arithmetic element, also for a longer word length. He felt that the things that people have most asked for are longer word length, index registers, and built-in floating point. The chief objector to this was Ed. Fredkin who is

quite convenienced that five years from now the largest use of computers is not going to be for doing arithmetic primarily, but for doing more routine processing of data.

Ben Gurley inquired whether the group felt there would be a market for a PDP-1D, an improved engineering model of the PDP-1C, possible a smaller or lower cost version , easier to manufacture but other than that identical to the present PDP-1. The general consensus was that we should not devote engineering time to this kind of machine. Ben also brought out the point, in reply to John Koudela's arguments, that machines such as John described with somewhat longer word lengths, 24 bits or so, and with index registers and built=in floating point now exist but they are apparently not selling very well. Ben wondered why. He brought up the example of a machine built by ASI with a 24-bit word length and 2 microsecond memory as an example. The general consensus was that this machine is sort of a "kludge", and that is the reason that it is not selling.

We discussed peripheral equipment very briefly, mainly magnetic tape units, and reached the conclusion that most customers that have bought tapes from us are using them not for storage but to communicate with other machines, and therefore compatability is indeed a prime requirement for any tape system we build. One other suggestion by Gordon Bell was that we build a Jack Brown type Tape Unit. This is a cartridge tape unit with 20 track serial recording, approximately 1000 bits per inch. It would have low access time, simpler mechanics and electronics. Nothing definite was decided to whether we would go ahead on anything of this sort.

I think Ed Fredkin generated themost interest with his suggestion that we should build plug-in processors and plug-in memory modules that will truly allow people to expand their memories up to very large capacities and to plug in extra processors as more computing power is needed. He is talking about ultimate capabilities of millions of instructions per second executed on a number of processors each of which may be capable of doing only 200,000 or so instructions per second.

He proposed a machine using delay lines for storage with a possible delay time of say 15 microseconds with a storage capability of about 500 bits. In this machine all registers with the exception of memory buffer and memory address would be eliminated and storage would be accomplished within the delay lines themselves. Transferring bits from one register to another would be accomplished in external flip-flops and would require very little time in most cases since the registers would be stored in the delay line in an inter-leaved fashion. ie: bit 0 of pc, bit 0 of io, bit 0 of ac, bit 1 of pc, bit 1 of ac, bit 1 of io etc. Ed feels that the cost of building a machine like this would be lower than for a comparable built with our present techniques, however, we are not all convinced of this.

He feels that the computing center of the future will be comprised of large machines of this sort, that have a huge memory available so that all routines may be stored permanently with many users running programs simultaneously on their separate processor. There would be no splitting of programs so that part of one program would run on one processor and another part on another processor, just many users each running single programs on a lot of separate processors. These processors would be simple devices without built in high-speed multiply and floating point, etc. One argument against this is that lots of this large memory would be used up at a great rate for storing tables that would be necessary without the high speed features built into the hardware. Ed also feels that a considerable amount of computer time is spent

today in programming and that if each programmer had his own central processor available he would be much more efficient.

In conclusion the one thing that we all seemed to agree upon was that DEC, if it is going to maintain its place in the computer field must indeed build a new machine within the next few years, and that it must be completely new and different from machines that other people are building.

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dec INTEROFFICE MEMORANDUM

DATE June 28, 1962

SUBJECT Repair & renovation of elevators in Bldg. #5

TO Ken Olsen

FROM L. Prentice

1. Elevator in west end operating between floors 4 and 5 the following items: replaced the flat belt drive with V belt drive including a high cart starting motor necessary to be stopped and started faster than the present motor, an overspeed governor, renovation of the two gates on the two floors and puch-button operation of the car. Total price: $5602.

2. Oldest elevator center of Bldg. 5 install two-blade gate in the rear of the elevator and install a two-blade gate to protect the elevator pit when the elevator is in the loading position. $1835.

3. Install four two-blade gates in to replace the old wooden gates on the operators side of this same elevator. $2,232. This is an item expense at least a part of which should be borne by Maynard Industries subject to negotiating with them.

4. A letter will be forthcoming from Payne Elevator explaining in detail these charges. This is expected to be on hand on Monday, July 2nd.

dec INTEROFFICE MEMORANDUM

DATE June 27, 1962

SUBJECT

TO Ken Olsen FROM Ken Fitzgerald

Since we have always had many difficulties in the past in getting any type of a special test system or computer system shipped on time or efficiently, I have been doing a bit of research on the problem and have come up with what I feel is a plan that will alleviate many of the short comings of our present methods and insure a more efficient method of handling our shipping problems.

I A packing, crating and shipping area must be established.

A. This area to contain a minimum of approximately 1600 square feet of floor space, with the minor dimension being no less than 20 feet.

B. This area should be in close proximity to the final check-out area, and readily accessible to a shipping and receiving dock.

C. This area will be located adjacent to the carpenter shop.

D. This area will contain all of the necessary tools, equipment, and materials needed for packing, crating, and preparing for shipment of all systems, computers, in-out gear, etc., or any other products requiring crating.

E. This area will be the responsibility of the Shipping Department and be staffed while a system is being crated by one carpenter from the Mechanical Engineering Department, one carpenter's helper from the Shipping Department, one mechanical assembler, when needed, from the Mechanical Engineering Department, and one electronic technician supplied by the group responsible for the particular system and familiar with that system.

F. This area will also be used for the preparation for shipping of all other components and parts(replacement doors, blank panels, special panels, repair parts, etc.)

II Definite rules and responsibilities must be established to insure that all last minute details have been accounted for before the unit is shipped.

A. The engineer in charge of the unit must request final mechanical assembly from the Mechanical Engineering Department and the detail electrical and mechanical inspection from the Inspection Department prior to the final acceptance test.

B. The final acceptance test should be performed by the check-out group when the machine is in a completely assembled condition. No haywire, all doors and mechanical components on, all rejects noted by the Inspection Department remedied, etc.

C. When the machine has passed its final acceptance test the engineer in charge should be certain that the following things are done:

1. Disconnected from power.

2. Completely uncabled, with cables placed in standard Digital cartons.

3. The reader punch typewriter and any other items that must be removed will be removed and placed in their original shipping containers or equivalents.

4. The recording of module serial numbers, securing of the modules(masking tape) tightening up or tying down of any loose items within the cabinets and clean-up of all odds and ends.

5. Final electrical inspection should be conducted before the system is moved to the packing, crating, and shipping area.

III Preparations for packing and crating.

A. The engineer in charge should request that the Shipping Department move the system to the packing, crating and shipping area. An electronic technician from the group of the engineer in charge should be available to help at this stage.

B. The engineer in charge should deliver to the shipping people a complete list of the items in the system, and peripheral gear that is to be shipped with it.

C. All of the small equipment and materials that are to be shipped with the machine should be packed for shipment in standard Digital shipping boxes.

D. Customer Relations Department should enter the picture at this time and:

1. Deliver all of the accessory gear items packed in standard Digital cartons or original shipping containers to the packing, crating, and shipping area.

2. Deliver a list of these items to the Shipping Department.

E. The final mechanical inspection and clean-up will be done as soon as the machine reaches the crating, packing, and shipping area.

IV Packing and crating.

A. All systems, computers, peripheral gear, and special line units, etc., will be packed and crated according to the following specifications:

1. All units will be on a skid designed to be lifted by our pallet trucks.

2. The unit will be bolted to the skid in a minimum of two places.

3. All plenum door shipping bolts will be tightened at this time.

4. The unit will be completely washed down and covered with a plastic shroud.

5. The complete unit will be covered with a minimum of one layer of Kimpack and crated on all four sides and top with half inch Plyscored.

6. Three quarter inch signode steel straping will be used to hold the crate in position and the machine to the skid(a minimum of nails will be used to hold the crate together preparatory to straping).

7. No free-hand writing or marking of the crate will be done. All markings necessary for the shipment of the crate will be applied with stencil and stencil ink.

8. The markings will be applied in the following manner:

   a. Digital Equipment Corporation, silk screen or stencil will be applied to the upper left corner of both the front and back of the crate.

   b. Immediately below that will be the box number. Located in the central portion of the crate, on both the front and back, will be the name and address of the consignee.

   c. When there is a definite front or back to a unit, it will be so labeled with a stencil on the lower portion of the crate about ten inches from the floor.

V Shipping.

A. The Shipping Department will handle all paper work necessary for the actual moving of the equipment from our packing, crating, and shipping area to the movers equipment.

B. The Shipping Department will supervise the actual loading of the unit.

cc: Harlan Anderson
Stan Olsen
Dick Best
Ben Gurley
Jon Fadiman
Bob Beckman
Nick Mazzarese
Jim Myers
Loren Prentice

dec INTEROFFICE MEMORANDUM

DATE June 28, 1962

SUBJECT DELIVERY OF STACKS

TO K. Olsen

FROM Jack Smith

VENDOR	NO.	DUE DATE	ASSIGNED TO:
G.C.	1	7/6	MIT
AMP.	1	7/9	MIT
Fer.	2	7/15	DEC
			ADX-7 (Central Processor)
Amp.	1	7/16	DEC
G.C.	1	7/23	PDP-4 (DEC)
Amp.	1	7/27	ADX-6
Fer.	2	7/30	ADX-6
			ADX-6
G.C.	2	7/30	U.A.
G.C.	1	8/6	A.A.
G.C.	1	8/13	ADX-3 (Central Processor)
Fer.	3	8/15	ADX-7
			ADX-7
			ADX-7
G.C.	1	8/20	Standard (9000-4550)
G.C.	1	8/27	ADX-3
Fer.	3	8/30	ADX-3
			ADX-3
			ADX-3
G.C.	1	9/3	ADX-3
G.C.	1	9/10	ADX-8 (Central Processor)
G.C	1	9/17	ADX-8

Ampex has confirmed that they will be shipping 3 stacks per month starting in August. Before intergrating these into our schedule, I would like to wait for more conclusive information that they will meet this schedule.

June 28, 1962

Plant Security - Identification Badges

L. Prentice

Bob Lassen

The following are some suggestions and comments regarding Identification Badges:

1. The badge system will never be completely successful until official company exit/entrances are established. All other entrances should be closed off to prevent people from entering or leaving the plant unofficially.

2. A trained receptionist should be assigned at each exit/entrance The receptionist should be responsible for issuing badges to Visitors, Contract Workers and DEC Employees who forget their permanent badge. Badges should be issued on a sign in, sign out basis - the company register is currently being used for this purpose.

3. Normally Visitor and Contract Worker badges should be issued on a daily basis however, there will be cases where it will be more practical to allow certain visitors and contract workers to keep their badges during extended stays with the company. This could be handled at the discretion of the "host" department head and he will assume responsibility for the badge.

4. We also have a few "permanent" contract workers who should be allowed to keep their badge at all times. Perhaps this badge would contain the person's name.

5. The Personnel Office should have the responsibility for all original badge issues and maintaining appropriate records. This would include ordering new badges, original issuing of badges to employees or receptionists (including temporary badges to newly inducted employees).

6. Enforcement of the system is the responsibility of: the receptionists (for people entering or leaving the plant), the supervisor (for people who may have slipped through unnoticed), the Personnel Office (for people who continuously forget or lose their badge) and the Plant Security Officer who should have the overall supervision of the system.

The system is now in operation and appears to be working reasonably well. If we tighten up some of the areas mentioned above, we should wind up with a good identification security system. It is my observation that our people are taking the system more seriously.

I suggest we meet in the near future to discuss our badge system. It is possible that others have strong feelings on the subject and they might wish to take part in such a meeting.

cc: K. Olsen
H. Anderson
S. Olsen
M. Sandler
R. Mills

COPY

INTEROFFICE MEMORANDUM

June 26, 1962

TO: H. Anderson
M. Sandler
B. Gurley
N. Mazzarese
E. Harwood
cc: Ken Olsen

FROM: Jack Smith

PROGRESS OF COMPUTER CONSTRUCTION

SYSTEM NO.	DEL. DATE TO CUST.	SCHEDULE DEL. TO CHECKOUT	SYSTEM WIRED* COMPLETE	COMMENCE CHECKOUT**
ADX - 2 (2192)	6/15/62	4/27/62	5/4/62	5/21/62
ADX - 6 (EN2184)	8/15/62	6/11/62	6/15/62	6/19/62
MIT (EN2290)	6/30/62	5/14/62	5/14/62	6/7/62
DEC (100-0368)		5/28/62	5/23/62	
(EN2239)		6/18/62	6/21/62	

* On the date listed the systems were completely wired and ready for Checkout. Modules were not available.

** On the date listed enough modules were received to begin checking out the system.

INTEROFFICE MEMORANDUM

DATE June 26, 1962

SUBJECT Diode Type D-007

TO R. L. Best

FROM Bob Hughes

We have been using the 1N270 and 1N67A diodes in memory switches. These diodes are quite ancient in so far as specifications go. The 1N67A has a forward current spec. of 5 ma at 1 volt, and the 1N270 has no recovery specification, etc. The price of these diodes is $0.30 and $0.27 respectively.

Now due to state of art improvements and a competitive situation, we can buy a diode to replace both of these types for a price of $0.19.

The yearly usage of the 1N67A and 1N270 is about 25,000.

The number of the new diode is DEC type D-007. A copy of D-007 specifications is attached.

cc: K. Olsen, M. Sandler, H. Crouse, C. Fuller, D. Mangsen, R. Melanson, G. Porrazzo, H. Norton, A. Parks, D. Adams, D. White, J. Cudmore, A. Falco, R. Doane, B. Gurley

DIGITAL EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

SPECIFICATIONS FOR DIODE TYPE D-007

Case style	Subminiature glass E.I.A. designation D-07.
Color Code	Black, black, violet coded from cathode end.
Material	Germanium

MAXIMUM RATINGS @ 25° C

Average power dissipation	80 milliwatts
Derating above 25° C	1 milliwatt/°C
Ambient temperature range	-65° C to + 90° C
Storage temperature range	-65° C to + 100° C
Continuous operating voltage	100 V.D.C.
Continuous DC forward current	100 MA.
Surge current for one second	500 MA.

ELECTRICAL CHARACTERISTICS Measured @ 25° C

Forward Voltage Drop	≤ 1 Volt @ 200 MA.
Leakage @ peak inverse voltage	≤ 100 microamps @ 115 volts
Reverse current	≤ 80 microamps @ 100 volts
Shunt capacitance F = 1 MC. ERMS = 25 MV. Bias = -3V.	≤ 2 pf.
Forward Recovery * (measured as peak voltage drop)	≤ 1 volt @ I_F = 20 MA. I_R = 1 MA.
Reverse Recovery * (measured from reference marker to 0 volt point)	≤ 0.3 microsec. @ I_F = 20 MA. I_R = 1 MA.

Stabilization bake: All units are to be baked for 100 hours @ 100° C prior to testing.

Seal Test: All units are to be submerged in ethylene glycol solution at a pressure of 150 P.S.I. for 30 minutes prior to testing.

Quality: Units shall have less than 0.25% failures for all causes. (D.E.C. incoming inspection)

* Measured by Tektronix Type "S" Plug-in unit in a Tektronix 540 series oscilloscope.

Approved by:

R Hughes

dec INTEROFFICE MEMORANDUM

DATE June 21st, 1962

SUBJECT

TO Ben Gurley

FROM Gordon Bell

Attached is a listing of Pros and Cons of On-Line Typewriter facilities.

cc: Kenneth H. Olsen
Harlan Anderson
Bob Beckman
John Koudela
Nick Mazzarese
Dit Morse
Bob Savell

ON-LINE TYPEWRITER PROS AND CONS

	Teletype Con	Teletype Pro	Soroban Con	Soroban Pro	Selective (IBM) Con	Selective (IBM) Pro	FIO-DEC Con	FIO-DEC Pro	Tele 8 Con	Tele 8 Pro
Character Set	Almost Adequate			Excellent		OK if Icon scientific (Stretch)		Excellent	Office Electric Character Set	
Design Status		Exists		Exists	Not Engineered			Marginally Engineered	Not Engineered	
Logic Packages		22		28 (25)	$>$ 28		$\approx$ 28		$>$ 25	
Cost of Unit		1250	2000			1350	3500		2500	
Special Features	Teletype Corp. Sluggish	Paperfeed		Quiet	New Product	Fast, Popular, In, Paperfeed, Quiet	Everyone hates Flexo Out Noisy	Off/Line Punch & Reader Old Product	Teletype Corp. & New Product Quiet	Paperfeed
Reliability		1	4		3			2		1-$\frac{1}{2}$
Service	Unknown (We)		We & IBM			They		They	Unknown (We)	
DEC Code Cont.	No			Yes	No			Yes	No	
Availability		3-$\frac{1}{2}$ mo.		In Stock	5 mo.	say (60-90) days	None in Stock	3-$\frac{1}{2}$ mo.	4th $\frac{1}{4}$ - 1962	

dec INTEROFFICE MEMORANDUM

DATE June 21, 1962

SUBJECT Switch Box

TO Ken Olson

FROM Barbera Stephson

The model of the switch box, which was built by the model shop some time ago, has seven indicator lights with drivers and seven switches, each with two output plugs. The -3 volt sources use clamp load resistors so that neither the switch box nor the modules can be damaged by any incorrect wiring. We used it to check out the multiplexed D to A for MIT, and also in the D to A converter investigation that Bob Jankie is doing right now, and we found that it is a pretty handy thing to have around for this type of work as well as for logic kits. However, as it stands now it is quite expensive and not particularily attractive. I have not tried to figure a cost estimate for it, but, judging from the prices of the 901 mounting panel, the 1669 indicator driver package, and the 1000 Clamped Load Resistor package, the total price will be somewhere in the neighborhood of $150 to $175 dollars. I am afraid customers would find this price a little upsetting unless we changed the switches and terminals to make the box a little more attractive. Also, to include this as part of the logic kit we should have some simple application sheets which explain how it would be used. For example, an adder circuit with the switches used as an incident number register and something like a binary-to-octal decoder circuit to illustrate how logical gating is performed. (Here three of the switches could be used as inputs and the seven indicator lights could be used to indicate numbers one through seven and maybe a flip-flop light could be used to indicate zero.)

I hoped that Bob Jankie might be able to work on the switch box and corresponding application notes this summer, but we are still having a lot of customer inquiries on A to D conversions which seem at the moment to be more immediately necessary. However, I hoped that either when Bob is finished with the A to D investigation, he could work on it, or, as the application department has expanded somewhat, I can find sometime to work on it soon.

dec INTEROFFICE MEMORANDUM

DATE 6/20/62

SUBJECT Change in PDP-1 Price List

TO PDP-1 Distribution List FROM John Koudela

Effective June 19, 1962, the price of the Visual 16-inch CRT Display (Type 30) was increased to $14,300.

Please make this change on the Price List that was issued to you.

INTEROFFICE MEMORANDUM

DATE June 20, 1962

SUBJECT Employment Advertising

TO K. Olsen

FROM R. Lassen

Listed below are our most urgent personnel needs. Since the employment agencies are not much help at this level, I feel we should advertise locally (possibly including Worcester, Lowell and Framingham).

Secretaries (Junior and Senior)

Male Trainees - young men for wiring, silk screening, sheet metal, mail room.

Accounts Payable Clerks

IBM Operator - to wire and operate all our equipment.

Jr. Accountant

Tool Crib Attendant

Draftsmen - Mechanical and Electrical

Machinists - one apprentice - one with experience

Sheet Metal Worker - experienced

INTEROFFICE MEMORANDUM

DATE June 20, 1962

SUBJECT Proposed List of Personnel that should receive keys to Groups I and II (Buildings 12 and 5).

TO Ken Olsen FROM Brad Towle

An initial order has been placed for thirty (30) main entrance keys (fifteen (15) for each group). The following is a list of ten (10) personnel who have departmental responsibility and should be able to control access to those areas of the plant where special projects require odd working hours. Each department head should be responsible for providing access to the plant for personnel under his supervision.

Group I (Building #12, 3 and 4)	Group II (Building #5)
Richard Mills	Dick Best
Jack Atwood	Ben Gurley
Roger Melanson	Jon Fadiman
Ken Fitzgerald	Al Blumenthal
Dick Best	Bob Savell
Ben Gurley	Loren Prentice
Jon Fadiman	Maynard Sandler
Bob Savell	Bob Hughes
Loren Prentice	John Culkins
John Culkins	George Brown

The balance of five (5) keys will be attached to large markers and made available to authorized personnel for after hours or weekend access to the plant. These keys will be issued on a temporary basis and must be returned the following day.

Additional keys can be provided by the manufacturer within a few days from date of the request.

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INTEROFFICE MEMORANDUM

DATE June 18, 1962

SUBJECT Plant Layout Abstract

TO Kenneth H. Olsen

FROM Loren Prentice

This plan or system outlines to be of an exploratory nature, a series of suggestions, and alternate proposals defensible only in regard to overall needs and provisions for future expansion in those sections of the company where this expansion is deemed necessary and for those parts inadequately housed at the present time. This is the first suggestion arrived at without consultation with others which it must have to be ultimately discussed to be successful.

General Outline

This plan is based on outline by Richard Muthers of Richard Muthers Associates, a consultant in this field. The overall plan is based on line production or layout by product for major items as listed below.

Module Production
Power Supplies
Power Controls
PDP-1
PDP-4
Mag Tape
In-Out Equipment
Special Test Equipment built by Jonathan Fadiman

Within areas of the above sections must be laid out function. Other areas which are laid out by function are:

Quality Control - which is partial only as a combination of function and line layout
Sheetmetal - Machine Shop, and the Model Shop

Those sections of the company now believed to be adequately housed and not apart of this discussion are:

Administration
Accounting
Sales
Advertising
Photo Services
Special Systems - Jonathan Fadiman

Those sections of the company not adequately housed are as follows:

Module Production
Power Supplies
PDP-1 Computers
PDP-4 Computers
Mag Tape
In-Out Equipment
Inspection
Purchasing
Receiving and Shipping
Cabinet Assembly
Engineering (Including Drafting and its other services)
Stock
Inspection and Reject areas, particularly for the receiving of outside vendor's work

This plan attempts to deal with these inadequately housed operations and services. This plan necessarily has to be accompanied by at least a rough layout of the areas talked about in Building 3, 4, and 5. In the first layout not much attention will be paid to existing partitions, building services, or the convenience of personnel who are to operate in these areas.

We need to expand the sheetmetal fabrication area and install a larger chromicoat area and seperate from the present sheetmetal fabrication some of the heavier production areas such as handles, and cases, into the area now occupied by the present Machine Shop. The re-layout of the top floor, Building 4, and a study should be made of this for the best use of this area. This will allow for approximately double the production now going on in the sheetmetal area.

The Machine Shop would then move to the end of Building 3, next to Building 4, according to the plans already outlined earlier.

There is a good possibility that painting should be moved to the top floor of Building 5, adjacent to the Cabinet Shop.

The customer's area now in the top floor of Building 4 could be moved to the area now occupied by Servodyne in the top floor of Building 5. The reason for this suggestion is that more adequate parking, better plant security could be maintained in that area than in the present area. Draftimg could be moved to the area or an expanded portion of the area now occupied by the customer services to provide more room for Engineering in Building 4.

The top floor of Building 5 would be given over to receiving storage from vendors.

Painting and cabinet assembly and a carpenter shop, adjacent to the center elevator to provide for all of our cargenter area, plus room for making and crating for shipping and shipment would be made from the center elevator of Building 5 and either loaded off the present dock or out of the side door that is provided at the side of the elevator, if the renovation of this elevator is feasible. The rest of the top floor of Building 5 would be devoted to the production of PDP-1 and PDP-4, In-Out equipment, and Mag Tapes. These would be tested, assembled and shipped from this floor.

The fourth floor of Building 5 would be used to house receiving and shiping, purchasing, finished goods, personnel, inspection, and with areas adjacent to the inspection for storage and reject areas, main stock of module boards, production test for modules, pre-wiring area for systems, offices to house all the present personnel and a cafeteria area near the center elevator; in the area now presently occupied by silk-screening.

Painting could either remain in its present location, or be moved to Building 5.

Main expense items to be considered in compliance with the above plan would be:

1. Addition of power and air services in the section used by the Machine Shop in Building #3. Additional power requirements in the top floor of Building 5. If painting is moved to Building 5 considerable expense will be involved in exhausting the paint fumes. A solution would be to exhaust the paint through tubes up on the roof area or up through the roof area, because of the weight of our paint this would probably take two blowers per duct, and require possibly three or four ducts. Renovation of the elevators in Building 5, particularily in the center elevator in Building 5, to provide proper shipping facilities for our systems. Some expense of course would be incurred in moving the drafting floor to the top floor in Building 4, in the area now operated by Customer Services. Power and ducting requirements here are not extensive. Adequate power facilities have already been provided in this area. The top floor of Building 5, the toilets there are at either end of the building and are adequate only so long as the number of personnel is not greatly increased, but it is not nearly as well served as the fourth floor of Building 5. Building a reception area, interior of the fourth floor Building 5, and of course numerous partitions changes and carpentry work throughout all of Building 5.

I would like to point out one obvious advantage of having all of the people or nearly all of the people enter through the main entrance from Thompson Street into Building 5, 4th floor. If it becomes necessary to post a guard at this entrance , even on a 24-hour around the clock basis, he would be more adequately serve more people here than at any particular place. He would have surveillance of all time clocks, hand out, issue, and re-gain all of the keys issued to the customer service people, and probably on a 240hour basis, would be adequate for our needs for at least a limited period.

Loren B. Prentice

dec INTEROFFICE MEMORANDUM

DATE June 18, 1962

SUBJECT Summary of Roland Silver's Work To Date

TO K. Olsen FROM A. N. Blumenthal

Since March 1, Roland Silver has provided us with the following test programs:

1. Checkerboard Memory Test
2. Memory Address Test
3. Inchworm Test
4. Single Channel Sequence Break Test

Progress in getting these into active use has been slow for the following reasons:

(1) Our inability to provide him with a reliably operating computer when he needs it. The prototype has suffered all sorts of ailments in recent months.

(2) Until recently, it has been necessary for me to defer my part of the process because of other demands on my time. This includes editing the writeup and flow charts, and testing the programs by inducing troubles in a computer to see if they will detect each type of trouble as anticipated.

At present, the only program that is considered finalized is the Checkerboard Memory Test. Its writeup was edited and sent to Beverly Clohset for the final draft. She reorganized it in accordance with a standard format designed for utility programs and standard subroutines. It did not seem to follow a good train of thought for test programs, and so a new format for test program writeups has been devised. The writeup is now in the process of being rehashed to conform to it.

The Memory Address Test still needs a good shakedown on a computer. The writeup and flow charts are waiting to be edited and finalized.

The Inchworm Test has yet to be documented, although the program itself seems complete.

The Single Channel Sequence Break Test has moved slowly because a machine with this feature has not been available for its debugging. It was debugged rather painfully on one of the CRC machines that has type 20 sequence break, by patch-in routines to make the program think it was single channel. This was done at a time when the machine itself still had many bugs. It has not yet been documented, and has yet to be run on a machine with single channel sequence break.

It is estimated that another 40 hours of Silver's time will be required to complete his work on the Inchworm and Sequence Break Tests.

The per program cost of these averages out to be about $1,400.00. This, I expect, will come down as the aforementioned difficulties are corrected.

INTEROFFICE MEMORANDUM

DATE June 15, 1962

SUBJECT

TO Ken Olsen
Ben Gurley

FROM Bob Savell

Pricing Information for Display Type 30 - B

Price of 30 - A	10,300
Less price of modules not used in 30 - B	1,246
	9,054
Plus price of additional modules & parts	4,813
	13,867
Plus price of extra engineering time 1 week	1,000
Plus price of extra technician and drafting time 2 weeks	1,000
	15,867
	10,300
Base additional price for type 30 - B	5,567
Plus part of original development cost	2,000
Total additional price 30 - A price for 30 - B above	7,567

Pricing Information for iot Itek Instruction

Original Modules at list	886
1 - 4301	80
1 - 4603	89
One additonal IOT	100
Additonal connector	50
Additonal engineering 3 days	600
Additional drafting & checkout 4 days	320
	2,125
Extra pad	500
Total price	2,625

dec INTEROFFICE MEMORANDUM

DATE June 14, 1962

SUBJECT

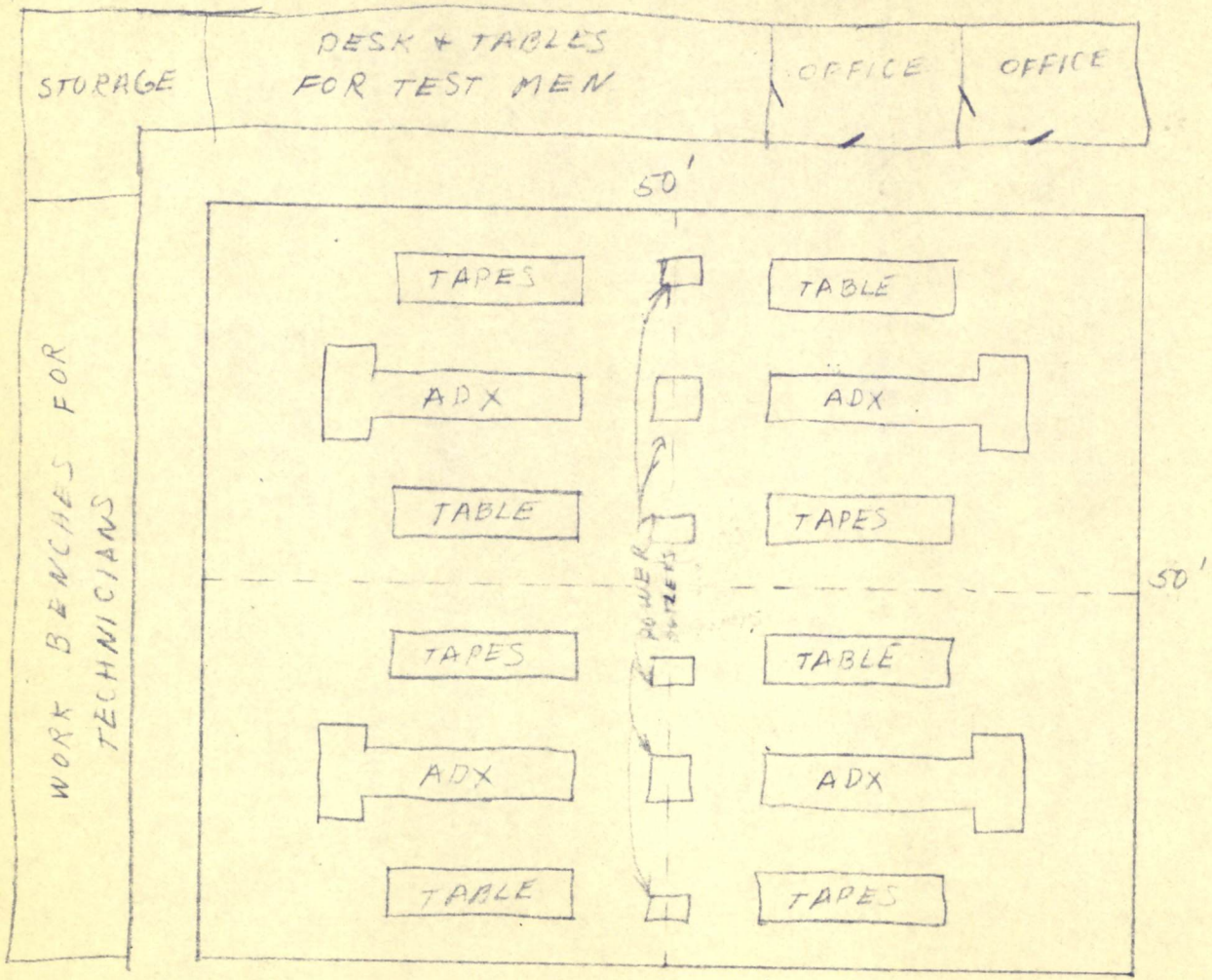
TO Ken Olsen

FROM Ed. Harwood

From the enclosed sketch you will see we need approximately 2500 sq. feet of test area. This figure is a little generous for the present time, but we have two duplex systems coming along and will probably need the entire 2500 feet.

As shown in the sketch, I would also like to have some office and work bench space in this area.

I think it would be more convenient if we had some power stands or posts along the center of the test area. These would supply power for the computers, scope and soldering irons.



COMPUTER ASSY

↓

1" = 10'

PROPOSED

ADX SYSTEM
CHECK OUT +
WORK AREA

EH

dec INTEROFFICE MEMORANDUM

DATE 13 JUNE 1962

SUBJECT WCO PROPOSAL

TO DEC MANAGEMENT FROM TED JOHNSON

The following items, arranged by priority, are requested for the facilities of the DEC West Coast Office:

1. Spare Soroban PDP-1 Typewriter - (Immediate)
2. Spare Digitronics ppt Reader and Spare Teletype Punch
3. PDP-1 Central Processor, 4K Memory, with #10 Option - (asap)
4. PDP-1 (16") Scope, Type #30
5. Type #51 Tape Control and Type #50 Magnetic Tape Transport

Explanation

Items 1 and 2 are required for servicing existing machines. Items 4 and 5 are adjustments to Item 3.

PDP-1 Central Processor

A. Sales value of demonstrations model, (with Item 4, Scope) - An office PDP-1 would have excellent sales value and it would offer convenient and interesting availability to potential customers and interested parties. A PDP-1 would be particularly valuable in demonstrating ease of programming and would enhance the awareness of market in services of local offices and facilitate office promotion.

B. Maintenance training of customer personnel - An office PDP-1 would offer additional training available to customer, with added confidence in our local services. This would save customer money and establish initial strong relations between local personnel and customers.

C. Availability to Customer Programmers - This service, with advance preparation of software, is usually more critical than hardware delivery. (A recent discussion with Douglas Aircraft personnel revealed they could stretch delivery 3 months if they had a computer available). Trips by the customer are expensive. The machine would also reduce the customer computer time load on prototype at DEC Maynard.

D. Improvement in Competence of Local DEC Personnel - In both hardware and program areas, the value here would be immeasurable. I can foresee increased benefits and savings in contributions by this office to the main effort, increase in confidence and morale, and in sales value gained by added knowledgeability.

E. Loan Machine Status - Opportunity to have a local machine which could "bail out" customer rushing to meet schedules while we might face some lags from our end. This kind of delivery and service back-up is an important ingredient to the success of an operation like DEC.

F. Programming and Applications Development - The West Coast users have, in general, a different set of problems than users closer to Maynard. For one example, the West Coast has negligible Algol orientation. The applications tend more to data reduction and possibly test equipment uses. The available machine would provide an opportunity to expand in important applications areas, such as PDP-1 simulation, G-15 & LGP-30 simulation, fortran development, manual preparation, etc. It is worthwhile to think of the advantages of assigning some necessary task to this location where work could be controlled and assigned more clearly.

G. Leasing Status of Machine - Available time, as above, to customers and encouragement of development programs which could lead to computer sales. The dollar intake would help to offset our investment and management of the service would expand familiarity of DEC Personnel with practical problems of the market.

H. Check-out and Possible Partial Assembly by Local Personnel - Delivery of an unchecked-out computer would partially relieve ordinary investment in the machine and would be most desirable from a training standpoint. We would appreciate the opportunity to assume the responsibility of final assembly and check-out of this computer.

I. Opportunity to Work Out Problems of Special Equipment - Engineers considering computer or having been committed to it could check-out equipment interface problems. This could also make it possible to undertake systems service locally, such as fabrication of teletype and phone-line equipment at JPL.

It would be a great time advantage, both for the customer and DEC personnel, if ppt readers, typewriters, etc. could be exchanged and checked out on the office computer.

Having a computer here would not detract from but rather add to the effectiveness of the sales effort. Your decision as to the feasibility of this proposal is important to the facility planning for the coming year.

Ted G. Johnson

TGJ:jj

cc: Ken Olsen ✓
Harlan Anderson ✓
Ben Gurley
Stan Olsen

dec INTEROFFICE MEMORANDUM

DATE June 12, 1962

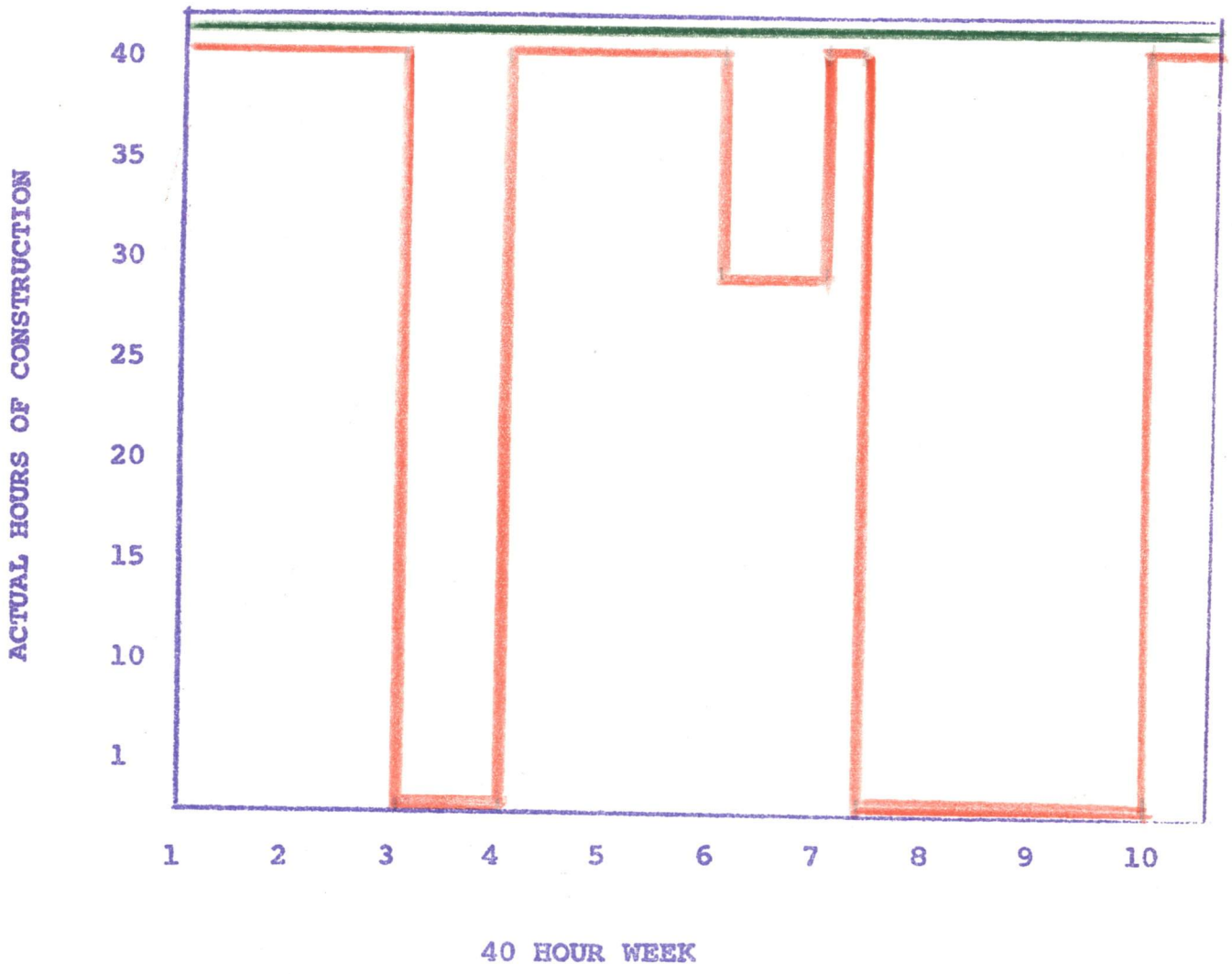
SUBJECT INTERRUPTION IN THE MANUFACTURING PROCESS

TO K. Olsen
H. Anderson
M. Sandler
B. Gurley

FROM Jack Smith

Although our present schedule for delivery of Computers to Checkout is progressing satisfactorily, three weeks ago I felt it necessary to investigate the length of time it took to process a Computer from start to finish. I found that the complete process time up to the beginning of Checkout was approximately 9 weeks. This length of time is satisfactory at the present time because we do have the lead time. In the future such a long lead time may not be practical to our operation. This fact coupled with the fact that the cycle time should be reduced to shorten work in process time induced me to plot some rather interesting graphs.

I started with the assumption that once a Computer is started it should be worked on without interruption until completion. At all times some operation of the Manufacturing Process should be undergoing construction. Any interruption in the process increases work in process time and of course endangers the delivery date. I felt quite sure that the interruptions of the process were of a similar nature for each system. To find the areas of interruption, I used the attached graph plotting actual working hours of contruction per week against a standard work week.


ACTUAL HOURS OF CONSTRUCTION
40
35
30
25
20
15
10
1
1
2
3
4
5
6
7
8
9
10
40 HOUR WEEK

The ideal plot of course would be a straight line across the graph denoting the utilization of 40 hours of process time per week, green plot. In almost all cases, I plotted seven systems, there seemed to be the same areas of interruption. These interruption areas are denoted by the red plot. There were of course minor interruptions but I have only denoted the major areas. The interruption between the third and fourth week was investigated and I found that it was due to an insufficient number of inspection people to ring out machines. In each case a machine would have to wait until inspection people were available. A second inspection team is now being trained to increase this capability.

The second interruption area was found to be between the sixth and seventh weeks during final construction. This was being caused by the shortage of operation control circuits. The problem was lack of a set procedure for ordering these special circuits. A procedure has been written and put into operation.

Our third and most drastic interruption area was found to be at the very end of the process. This was due to non-availability of Readers, Punches and Typewriters. I have since taken over responsibility of this area and have set up procedures to eliminate the problem.

These interruption areas have of course been suspected for some time. A graph of this type brings them out somewhat more drastically and can also point out hidden areas of interruption.

It can be readily seen that the elimination of these interruption areas of the Manufacturing Process will greatly reduce the work in process time. Similar investigations are being plotted for Mag. Tape and Display construction.

COMPANY CONFIDENTIAL

dec INTEROFFICE MEMORANDUM

COMPANY CONFIDENTIAL

DATE June 11, 1962

SUBJECT Huston Fearless Building

TO Kenneth H. Olsen

FROM Loren Prentice

The plant consists of an L shaped brick building, the street side of the building is approximately 200 x 60 feet. The wing is approximately 160 x 60 feet, (wing has four floors). There is a boiler house on the south side of the wing, at the extreme distance from the street, and a new extension has been added between the wing and the boiler house, and a new area for offices, shipping and receiving. This area is judged to be approximately 40 x 80 feet, three stories high. This is on the northern end of the larger building and faces the street.

The main buildings were probably built prior to World War I, are brick and wood beam construction. The first floors are concrete, the other floors, or at least those that were visable were three inch pine plank. The new section at the north en d of the building, three stories high, is brick faced on the street side and is made of cinder block. The new sections of the building were probably built about 1945. The windows in the old building are wood and appear to be in reasonably good condition and have recently been painted. Windows in the new section are steel sash. There is a new section between the wing on the west side of the building and the old boiler house. This appears to be used for shops.

The boiler house has three boilers, two old , about 1928 to 1934, originally coal fired - now converted to oil, estimated 125 to 150 horsepower fire tube boilers. A new boiler approximately 1940 to 1950 is oil fired water tube, 150 to 200 horsepower. The main electrical power is brought in at the convergence of the two sections of the main building. Three transformers not over 2,000 amp a 220 v 3 PH.

The headroom in the main building on the first floor is approximately 12 feet. The first floors are concrete. The second and third floors appear to have nearly the same headroom but the fourth floor perhaps only 8 feet. The plant is served by a railroad siding, originally for at least bringing in coal for the boiler.

The plot area at the plant is small, somewhere in the vicinity of 3 to 5 acres and parking would be critical here. I believe that it would be difficult to get in more than 80 to 100 cars. This would require filling in a sump and removing the cooling tower which was apparently needed by the boilers at one time, (probably not needed now as the boilers are probably now only used for heating. Floor area is estimated at 1,000,800 square feet.

The main drawbacks to the plant site and area is that there is lack of expansion space around the plant and too large a floor space. The receiving and shipping area is rather small and somewhat difficult. I believe a large tractor trailer truck would hang well out into the street when it is being loaded and unloaded. Electric power into the plant appears to be inadequate even for present use.

This is very sketchy as we did not enter any section of the plant and only drove into the rear side to observe what we could through windows. We do not have a clear picture of the extent of the plant site, as there is no way to clearly define its boundaries.

CC: Harlan Anderson
Dick Mills
Ken FitzGerald

INTEROFFICE MEMORANDUM

DATE June 7, 1962

SUBJECT Report on trip to Germany, May, 1962.

TO Ken Olsen

FROM Jon Fadiman

c.c.: Harlan Anderson
Dick Mills
Stan Olsen
Dick Best

I spent the first five and one-half days, (May 3 - May 10) installing the Automatic Core Tester, Model 2113C (EN 2164) at Standard Elektrik Lorenz AG, 42 Hellmuth Hirth Strasse, Stuttgart, Germany. The department is MS/LPR, telephone number 89521, Building 58. I spent time with the following people there: Mr. Reiner (ext. 2792), who is the person most responsible for ordering the Core Tester from us. He is in charge of the section that is doing the work on Memory Cores and Planes and is the most knowledgeable person there. One of the engineers who works for him is Mr. Irmisch (ext. 3106) who is going to do much of the work on core testing. The Engineer who built the Automatic Core Handler and who is most knowledgeable about memory core testing equipment is Mr. Schneider (ext. 3927). The other people concerned with our equipment are the Quality Control group. The head of this is Mr. Vogt (ext. 2302). Under him are Mr. Templ (ext. 2728) and Mr. Poshar, (ext. 2676). Mr. Templ is the person to whom we should address all future correspondence and parts for the Memory Core Tester. He and Mr. Poshar will be responsible for the maintenance of the Core Tester.

Installation of a system in Germany takes considerably longer than the installation of a similar system in the United States. The main reason for this is that the Germans must carefully check every specification that we write down that our system will meet. Thus, there is a great deal of demonstration work to be done and many measurements to be taken. Any errors or inconsistencies in the machine or in the drawings will be quickly noticed. In general, the installation went reasonably smoothly and the machine is satisfactory except for the drift with temperature of the -10 volt Reference Level Power Supply, Model 1562. We have already sent them a new plug-in-unit which will take care of this problem. They also found out that our current drivers drift approximately 10 ma upwards after setting them to a given value. This problem has been traced to the coarse amplitude control potentiometer and new potentiometers of a lower resistance value will be sent to Standard Elektrik within two weeks. At that time, the machine will be entirely satisfactory and they will pay us for the complete machine. I had to go back to Standard Elektrik for an extra day at the very end of my trip because there was a pulse missing in the pulse train and I could not convince them over the telephone that it was correct that this pulse was missing. However, when I demonstrated it to them in person, they realized that all was in order in the machine. I expect that Standard Elektrik will be happy with our system, and I only hope that the Handler which they have built themselves will not cause them too much trouble. They are a clever group of people with very exact methods and rigorous standards. However, they do not have much experience in the Core Testing business or in the Digital field. By the way, it should be noted that

all work was done in a mixture of German and English and that it is absolutely essential to know something of the language of the country in which we are installing a system. While it is true that many of the Engineers at SEL spoke English, others spoke no English and most of the conversations were in German. (WWB-BF-TEIS).

My next stop (May 11) was at Siemens & Halske, Balanstrasse 73, Munich 8. Telephone number is 4590800. I spoke there mostly with Mr. Gis who is the person responsible for core testing and plane testing. Also at the meeting were Dr. Magner, Mr. Reinil, Mr. Maier, and Mr. Bier. Siemens definitely wishes to purchase an Automatic Core Tester and an Automatic Plane Tester from us. However, our prices are high for them in Germany, and furthermore they are apprehensive about the fact that we do not have any permanent servicing organization in Europe. In spite of this, I think that the chances of selling at least one and probably two systems to Siemens are very good and should materialize in about 6 months. A DEC office in Germany would make this certain. Again the conversation was a mixture of German and English. Although Mr. Gis and I spoke good French, the other people spoke none, and therefore the other languages were necessary. We must send more cataloges to Mr. Gis and make sure that he is kept informed of all future developments in the Core Tester and Memory Tester field.

The next three days, May 14, 15, and 16, were spent at Philips Co. in Eindhoven, Holland. They have done a considerable amount of work on our Memory Tester to bring it up to the standards that they require and incidentally that we promised them. They have installed a dual bus system (a separate bus for positive and negative pulses) which we have already found to be a good idea and which we have incorporated in our newer Memory Testers. They re-positioned the sense switches so as to obtain a shorter lead length between the sense inputs, sense switches, and the sense amplifier. This is also something that we have done on later machines. They have rewired the X and Y lines between the output plug panel and the X and Y switches so as to achieve uniform lead length. This is also something that we have done upon their suggestion. Their one final complaint is that the current drivers drift after setting them to a given value. Their drift is between 2 and 8 ma out of 500. We made careful measurements and traced this difficulty to local heating in the coarse amplitude control potentiometer which is a value of 2,500 ohms. We are replacing this with a potentiometer of 250 ohms which will decrease this drift by a factor of approximately 10. This will be satisfactory. These parts are due in to DEC on June 1, and we will send out replacement potentiometers to Philips. As soon as these potentiometers are installed in the drivers (Philips will do this) and the current drivers no longer have the measured drift, they will pay us the remainder of what they owe us on this Memory Tester. However, they will subtract the amount for the work they have done. So far this totals $2,300. and will probably be about $2,500. when the job is finished. This is an entirely fair and rather low price for the R&D work which Philips has done on our Tester and there should certainly be no complaint on our part about accepting this charge.

We made some careful measurements on the Memory Tester, the results of which I will summarize below:

1. The dual bus give a much better wave form, particularly on the negative driver, and the linearity is better. For a 64 x 64 plane we are able to achieve a rise time of 0.2 microseconds with essentially no overshoot or droop and a good linear wave form. The fastest rise time we could achieve through the plane was 0.1 microsecond, which resulted in an overshoot of about 5%. At this rise time the output pulse from a single core driven by all 64 x 64 switches was 50 millivolts and the spread of the output pulse was 2.5 millivolts. Thus, this is an error of ±2.5% which is the very best we can achieve in our present machine. This same spread was measured at a rise time of 0.2 microseconds. The total indecision read at the MBR flip-flop output with the slicer control was 3.0 millivolts.

2. We then drove a full stack 64 x 64 x 53 planes. The half drive current was 275 milliamps. The rise time is supposed to be 0.2 microseconds. The best rise time we could achieve was 0.4 microseconds and in this case, the overshoot and bite were both equal to approximately 5% of the pulse amplitude.

The final decision from Mr. Sonnemans, the Purchasing Agent, was that Philips will accept the Tester and pay what they owe us as soon as the drift is fixed by the changing of the potentiometers.

I then spent about three hours discussing Memory Exercisers with Mr. Braicks and Mr. Vrolyk. Philips is just starting to make full memories and is interested in purchasing a Memory Exerciser which would be somewhat of a combination of the ME2207 and ME2211. I will send more information and prices on our Exercisers to Mr. Braicks. I think the chances of sale of an Exerciser might materialize about six months from now, provided that we maintain close liaison with Mr. Braicks. Language is no problem here; Engineers at Philips speak English, although German is necessary for purchases in stores, all phone calls, etc.

My final stop was at the Stemag Corporation (Steatit-Magnesia AG), on May 17. Their main factory is located at Porz, which is a town next to Koln, telephone number 3441. However, the Core work is now being done in the nearby town of Siegburg. The address is Wilhelm - Ostwaldastrasse, 17, Siegburg, Germany. The person in charge of all Core work and Core Testing and later Plane Testing work is Mr. Günter Hüwe. Telephone number here is 2451. Mr. Hüwe is interested in the almost immediate purchase of a Ramsey Core Handler, Model CH60. After that, he will probably purchase an Automatic Core Tester, Model 2113. At present he has a very old Reese Current Driver system which does not work very well and works in conjunction with some logic which he himself built up. He would definitely like an Automatic Core Tester as soon as the money can be budgeted. A large order is expected soon from another company in Germany for Cores and when this comes in we should receive the order for the Automatic Core Tester. Much further in the future will be an order for an Automatic Memory Plane Tester 1516. Mr. Hüwe is much impressed with our equipment, has seen it in operation at General Ceramics,

and will definitely put through purchase orders as soon as the volume of business at Stemag will justify the expense.

After leaving Stemag, I drove back to SEL in Stuttgart in order to clear up some confusion about one of the Core Tester programs. All this was taken care of satisfactorily on May 18, and SEL is now happy with our Core Tester.

The next item of business concerns the possibility of hiring a European Engineer to open a Sales and Service Office in Europe. I have spoken to three people who might be interested in such a job. The best man is Mr. Gunter Hüwe. He is an "Diplome Ingenieur". This means the equivalent of an American Masters Degree. He is about 30 years old and getting married in the next few months. He obtained his Degree in 1955 and has been working first as a Commercial Engineer , working in vacuum tube digital circuitry with customers, and then as head of the Core Development Department at Stemag with transistor circuits and magnetic cores. He is an experienced man with excellent background in Digital techniques. His main interest is in the Digital field and not in the core chemistry and this is one reason he would like to leave Stemag. He is a rather sophisticated man with a good knowledge of European electronics, and has many contacts throughout Europe, most of them of course in Germany, but also in other countries. His English is very good and he knows some French which he would perfect before coming to work for us. His recommendation is to open an office somewhere in the South of Germany, maybe in the Stuttgart or Munich area. His salary of course, would have to be commeasurate with his experience and also with the fact that he at present holds a responsible job. However, his interest is very definite and I am sure that he would be able to do an excellent job for us if we made him a good offer. His home address is as follows:

Porz-Wahn/Koln
Frankfurterstrasse, 97
Germany

The next man I spoke to is at present at Standard Elektrik. His name is Mr. Arndt Irmisch. His home address is Stuttgart-rot, Bockingerstrasse 30, Germany. He is also a Diplome-Ingenieur, with about three years working experience. At present he is working 40% for SEL and 60% on his own. He would like to devote this 60% to working for us to open an office, etc. Later if this became a full time jib, he would quit SEL and work full time for us. He has experience in the Core Testing, Memory Testing field and a good knowledge of Digital techniques. His English is fairly good and he speaks some French which he would definitely have to perfect before coming to work for us. He seems like a very intelligent man but is definitely much younger, much less experienced, and much less sophisticated than Mr. Hüwe. Of course, he also would come to us for considerably less salary, I suspect.

The third most likely candidate, is at present working for Philips. His name is Mr. A. F. Van der Gaag. His home address is Lupinelaan 31, Son, Netherlands. He is not a Diplome- Ingenieur, but is a graduate of a trade school which is approximately equivalent to a BS Degree here in the United States. He is a very intelligent man and particularly clever in the construction of Digital test equipment. He also has a fair knowledge of Memory Systems. He speaks fluent German and English, and good French. However, he does not have as much technical background or experience as the other people and he has not travelled widely, so he does not have the contacts in the European electronics world which the other two people already have.

Another possibility of course, is Mr. Béla Csonth. He is the Engineer responsible for the use and maintenance of our Memory Tester at Philips. He is a Diplome-Ingenieur with a considerable amount of experience. However, his interest in coming to us is more in the future, probably not until a year from now, and there have been no definite discussions concerning this between myself and Mr. Csonth. He is a very intelligent Engineer, extremely capable, whom we will definitely keep in contact with. Someday he may decide to come to the United States to live and might be interested in employment here. He speaks fluent French, German, and English. His home address is Montgomerylaan 587, Eindhoven, Netherlands.

This completes the report on this two and one-half week trip to Europe.

# # # #

bbb

dec INTEROFFICE MEMORANDUM

DATE June 7, 1962

SUBJECT EMPLOYMENT ADVERTISING

TO Ken Olsen Stan Olsen FROM Jack Atwood
Bob Lassen Alex Stephens

I propose that our employment advertising for the months of June, July and August conform to the following ground rules:

1. We advertise selected openings only, except in the case of electronic assemblers.

2. We use only those papers which have proven pulling power.

3. We undertake the regular use of spot radio.

4. We advertise in each medium only the openings we expect to fill from the area the medium serves.

5. We budget approximately $1000 a month for this advertising - $600 for newspapers and $400 for radio.

6. We budget an additional 50 per cent or $500 a month for additional advertising of this type but charge it to public relations rather than recruiting.

I feel this program will help us turn up the specialists we need and will keep our name before the specialists we ~~will~~ hope to recruit in the future, without producing a large influx of general applicants in whom we are not presently interested.

To take this program up point by point:

1. Selected Openings - This would include such urgent openings as secretaries, clerk-typists, apprentice machinist, tool crib attendant, and junior accountant. Electronic assemblers would be covered by separate and distinct advertisements.

2. Selected Media - By keeping close track of interviews and hires during the first five months of 1962, we have a very accurate record of which newspapers are producing for us. This record is calculated on the basis of "advertising weeks", i.e. the use of one medium for one week. (Four weeks' use of one medium or one week's use of four media, for example, equals four advertising weeks.)

   We have also kept track of the number of interviews and hires with respect to overall advertising effort, and this shows how directly they are related.

Month	Advertising Weeks	Interviews	Hires
January	61	177	17
February	54	139	17
March	53	164	12
April	29	128	11
May	16	70	3

The standing of the various media with respect to pulling power is as follows:

Medium	Interviews Per Ad Wk	Hires Per AdWk	Hires Per Interview
Boston Globe	First	First	Fifth
Beacon Pubs.	Fourth	Second	First
Enterprise Pubs.	Sixth	Third	Third
LowellmSun	Second	Fourth	Sixth
Worcester T&G	Third	Sixth	Eighth
Station WKOX	Eleventh	Fifth	Second
Waltham News Trib	Thirteenth	Seventh	Fourth
Leominster Enter.	Tenth	Eighth	Seventh
Minute Man Pubs.	Eighth	Ninth	Ninth

The Fitchburg Sentinel and Framingham News pulled well, but apparently not the kind of people we wanted. The Chronotype Publications, Boston Herald, Suburban Free Press, Station WSRO, and Station WFGM did not begin to do the job they should, although I feel our radio efforts were too short-lived to be really effective.

3. Spot Radio - Consistent spot advertising on radio should be helpful in getting assembly workers. Many of these girls don't have or take time to sit down with the newspaper, but they do have the radio on while they are working. If they hear our message often enough, it is bound to register. I am strongly in favor of getting back on the air week after week for electronic assemblers. The newspapers aren't doing the job; radio might.

4. Zoned Advertising - Openings to be advertised in different areas should be selected according to what we can expect to get from those areas. Assembly girls, clerk-typists and others in lower pay brackets obviously have to come from nearby because of transportation costs. They are naturals for the Beacon and Enterprise and the local radio outlets. Machinists and secretarial are most likely to be found in the Worcester and Lowell areas. Engineering, executive secretarial, and other true specialists are Globe checkers.

5. Monthly Budget - At the present level of hiring, an investment of $1000 a month is about the minimum we should consider. This will let us put decent sized ads in the papers we badly need to use to get the people we have approval to hire. I suggest we allocate this sum as follows:

Beacon Publications	4 wks. @ $48.00	$192.00
Enterprise Publications	4 wks. @ $19.20	76.80
Lowell Sunday Sun	2 wks. @ $56.00	112.00
Boston Sunday Globe	1 wk. @ $280.00	280.00
Total Newspaper		$660.80
Station WKOX (Framingham)	2 wks. @ $102.00	$204.00
Station WSRO (Marlboro)	2 wks. @ $60.00	120.00
Total Radio		$324.00
Total Newspaper and Radio		$984.80

6. Public Relations - Admitted that our employment advertising got out of hand cost-wise during the early part of the year, it put us on the map as far as the general public was concerned. We all got very strong feedback from people all around Greater Boston who judged from our advertising that Digital was not only in business but doing very nicely. This has been helpful to us not only in our in-plant recruiting but at the various schools and employment agencies as well. In addition, it has done us no harm as far as our vendor relations are concerned.

Therefore I feel very strongly that we are doing more than just an immediate recruiting job. We are building the good name of Digital through this type of advertising. And we are building employee morale in a way that no amount of internal information pieces could do.

I propose that, we invest an additional $500 a month as follows to keep our reputation growing in the Boston and Worcester areas and that this be charged to public relations:

Boston Globe	1 wk. @ $280.00	$280.00
Worcester Sunday T&G	2 wks. @ $96.00	192.00
Total Public Relations Cost		$472.00
Total Monthly Program		$1456.80

NOTE: The program as outlined here is based on the use of 8-inch by 2-column advertisements and one-minute spot announcements. Anything less would not do the Company justice.

NOTE: We were interested to find that between mid-April, when we stopped advertising in the Globe, and the end of May, the Globe produced 38 interviews. None of these figures, of course, include the written applications and resumes which have been submitted by mail.

dec INTEROFFICE MEMORANDUM

DATE June 14, 1962

SUBJECT 252C Tubular Ceramic Sprague Capacitors

TO Kenneth H. Olsen

FROM Henry J. Crouse

The prices on the 252C tubular ceramic Sprague capacitors are as follows:

	1000	10,000	100,000K
5%	$0.29/ea	$0.28/ea	$0.22/ea
10%	0.25/ea	0.24/ea	_____
20%	0.21/ea	0.20/ea	_____

Electro-Motive DM-15 capacitors, 5%, are priced with a $0.04 to $0.10 range.

Bob Hughes gave a circuit to Sprague to design on their small packages, we will receive the sample the week of the 25th.

Jack Driscoll will be in Thursday to discuss "cordwood" packaging.

dec INTEROFFICE MEMORANDUM

DATE June 1, 1962

SUBJECT

TO Ken Olsen

FROM Ed Harwood

Regarding our conversation concerning some of the staff people, I have two suggestions which might be worth considering at this time:

1. Any staff member in the employ of DEC on June 1st of any year and who has been employed by DEC for 3 years or more as of June 1st of the current year will be eligible for 3 weeks vacation with pay.

2. Any staff member in the employ of DEC for 3 years or more will have his company insurance paid in full by DEC.