RLB/AB/AH$_3$/SG/LP/SNM$_3$/WH$_2$

MARKETING

PROGRAM.

SIMULATOR

AUTOMATED WIRING DIAGRAMS

MANUALS

WRITE BROCHURE — PRINT SYSTEM BROCHURE

PROGRAMMING MANUAL

MAINT. MANUAL

HARDWARE

SYSTEM SPECS, OP CODES — DRAFT LOGIC DESIGN-CPU — FABRICATE — DEBUG CPU

FLOW CHARTS

PERIPHERAL EQUIP DESIGN

CGC REVIEW

CIRCUITS

MECHANICAL

CONSOLE MACH. UP — CONSOLE DESIGN

APRIL 1 8 15 22 29 MAY 6 13 [sic] 20 27 JUNE 3 10 17 24 JULY 1 8 15 22 29 AUG 5 12 19 26 SEPT 2 9 16 23 30 OCT 7 14 21 28 NOV 4

POP-6 SCHEDULE gb 3/25/63

RLB/AB/AH_3/SG/LP/SWM_3

MARKETING

PROGRAM.

SIMULATOR

AUTOMATED WIRING DIAGRAMS

MANUALS

WRITE BROCHURE — PRINT SYSTEM BROCHURE

PROGRAMMING MANUAL

MAINT. MANUAL

HARDWARE

SYSTEM SPECS, OP CODES — DRAFT LOGIC DESIGN-CPU — FABRICATE — DEBUG CPU

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PERIPHERAL EQUIP DESIGN

CGC REVIEW

CIRCUITS

MECHANICAL

CONSOLE MACH. UP — CONSOLE DESIGN

APRIL 1 8 15 22 29 MAY 6 13 [SJCC] 20 27 JUNE 3 10 17 24 JULY 1 8 15 22 29 AUG 5 12 19 26 SEPT 2 9 16 23 30 OCT 7 14 21 28 NOV 1

POP-6 SCHEDULE gb 3/25/63

digital EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS

BEA,

Here's another copy of PDP-6 Schedule. Stu Grove is ready to station brochure for SJCC.

gb

TRANSFER INSTRUCTIONS

① TRANSFER ON AC CONDITION (L BITS: AC=0, AC=-)
② DO NOT TRANSFER " " " (L BITS: AC=0, AC=-)

③ UNCONDITIONAL XFER TO Y

SKIP / SKIP + CHANGE

① SKIP ON MEMORY (L BITS: MEM=0, MEM=-)
② DONOT " " " (")

(12) ③ SKIP ON SELECTED "0" BIT, AND MODIFY SELECTED BIT (L BITS: = CLEAR ATT 1, COMP. T2
(13) ④ SKIP ON SELECTED BIT, AND MODIFY " " (")
(14) ⑤ MODIFY " " (")
↑ Right half

⑥ SKIP ON MEMORY MASKED BY C(0"+1) (L BITS C(AC) - C(Y) ∧ C(AC$_{J+1}$) = 0, =-)
⑦ NO SKIP " " " " (")

⑧ SKIP IF C(AC) = C(Y)
⑨ DONOT " " "

⑩ SKIP ON MEMORY COMPARED WITH OPERAND (L BITS: C(AC) - C(Y) = 0, =-)
⑪ ~~NO SKIP~~ " " " " OPERAND (")

TRANSFER (INDEX TYPE) INSTRUCTIONS + SKIP INDEX

① COPY OPERANDS TO Y AND TRANSFER
"Lcode" (a) C(AC$_{0,1,..j}$) → C(Y, Y+1, Y+j) for "0"=j
(b) (" ") ; C(PC) → C(Y+1+j); Y+2+j → C(PC
(jms) → (c) C(PC) → C(Y) Y+1 → C(PC)

② COPY OPERANDS FROM Y AND TRANSFER
"Lcode" (a) C(Y, Y+1, .. Y+j) → C(AC$_{0,1,..j}$) for "0"=j
(b) ( ) C(Y+1+j) → C(PC)
? → (c) C(Y) → C(PC) (same as jmp i)

③ TRANSFER AND SAVE PC IN AN OPERAND REGISTER
C(PC) → C(AC$_x$); Y → C(PC)

④ MODIFY AC, AND TRANSFER TO Y (L BITS: DECREMENT / INCREMENT BY 1 TRANSFER IF +/-)

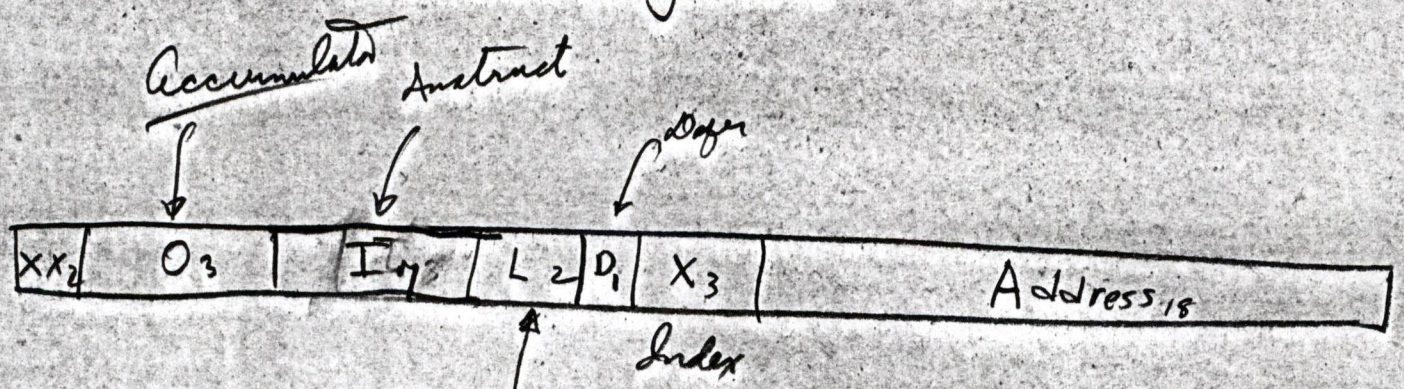
H.E.G.

3/26/63

SHIFTS / ROTATES

① SHIFT (L = RIGHT/LEFT ; SINGLE/DOUBLE)
② ROTATE (L = RIGHT/LEFT ; SINGLE/DOUBLE)

Word Layout



Mode
(Like law) 00 = Use Address portion immediately. Results → Ac
(Like lac) 01 = " " " as address Results → Ac
(Like dac) 10 = " " " " " Results → Address.
(Like exchange) 11 = Use " " " " Results → Address, and Ac

FLOATING POINT COMMANDS

Normalized / Un-normalized
① FLOATING POINT ADD
② " " SUBTRACT
③ " " MULTIPLY
④ " " DIVIDE
⑤ " " EXCHANGE
Ⓐ IMMEDIATE = LOAD & CONVERT AS INTEGER
Ⓑ " LOAD WITH C(Y) " "
Ⓒ " " " " FRACTION
Ⓓ DEPOSIT NUMBER " INTEGER

CHARACTER MANIPULATIONS

① XCH CHAR -C(Y)+C(X) specify CHARACTER, BITS 15-17 specify CHAR BYTE
② COMPARE CHAR WITH C(Ⓐ)
③ INCREMENT CHARACTER COUNT IN INDEX AND TRANSFER, TRANSFER IF CHAR. COUNT > 7)

I.C.T.

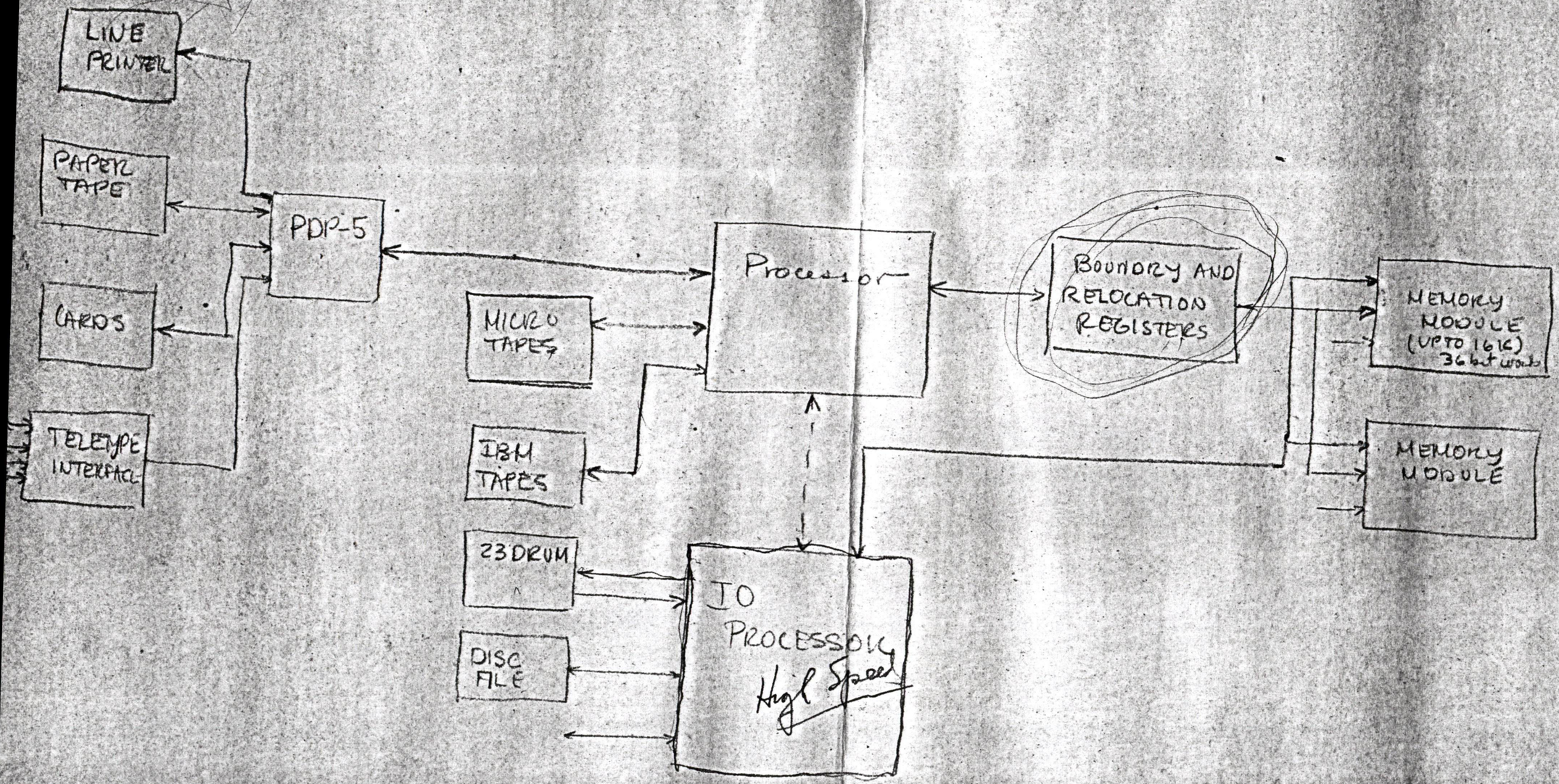
		IMMEDIATE → AC	RESULT → AC	RESULT → C(A)	RESULT → C(A), C(AC)
①	EXCHANGE	A → C(AC) (law)	C(A) → C(AC) lrc	C(AC) ⟷ C(A) bxc	C(AC) ⟷ C(A) (xch)
②	CLS	−A → C(AC) low−	−C(A) → C(AC) cls	−C(A) → C(A) comp Mem	− C(A) → C(A), C(AC)
③	+	A + C(AC) → C(AC) add im	C(A) + C(AC) → C(AC) add	C(A) + C(AC) → C(A) ++	−C(A) + C(AC) → C(A), C(AC)
④	−	−A + C(AC) → C(AC) sub im	−C(A) + C(AC) → C(AC) sub	−C(A) + C(AC) → C(A)	−C(A) + C(AC) → C(A), C(AC)
⑤	X (one word)	A × C(AC) → C(AC)	C(A) × C(AC) → C(AC) mul	C(A) × C(AC) → C(A)	C(A) × C(AC) → C(A), C(AC)
⑥	X (two word)	A × C(AC) → C(AC$_{K,K+1}$)	C(A) × C(AC) → C(AC$_{K,K+1}$)	C(A) × C(AC) → C(A, A+1)	C(A) × C(AC) → C(A, A+1) C(AC$_{K,K+1}$)
⑦	÷ one word	C(AC) ÷ A → C(AC$_K$	C(AC) ÷ C(A) → C(AC$_K$	C(AC) ÷ C(A) → C(A)	C(AC) ÷ C(A) → C(A), C(AC)
⑧	÷ two word	C(AC) ÷ A → C(AC	C(AC) ÷ C(A) → C(AC$_{K,K+1}$)	C(AC) ÷ C(A) → C(A, A+1)	C(AC) ÷ C(A) → C(A, A+1) C(AC$_{K,K+1}$)
⑨	AND	A ∧ C(AC) → C(AC)	C(A) ∧ C(AC) → C(AC)	C(A) ∧ C(AC) → C(A)	C(A) ∧ C(AC) → C(A, AC)
⑩	IOR	A ∨ C(AC) → C(AC)	C(A) ∨ C(AC) → C(AC)	C(A) ∨ C(AC) → C(A)	C(A) ∨ C(AC) → C(A, AC)
⑪	XOR	A ⊕ C(AC) → C(AC)	C(A) ⊕ C(AC) → C(AC)	C(A) ⊕ C(AC) → C(A)	C(A) ⊕ C(AC) → C(A, AC)
⑫	PLUS ONE	A + 1 → C(AC)	C(A) + 1 → C(AC)	C(A) + 1 → C(A)	C(A) + 1 → C(A, AC)
⑬	MINUS ONE	A − 1 → C(AC)	C(A) − 1 → C(AC)	C(A) − 1 → C(A)	C(A) − 1 → C(A, AC)
⑭	XCHR	A → C(AC)$_R$	C(A)$_R$ → C(AC)$_R$	C(AC)$_R$ → C(A)$_R$	C(AC)$_R$ ⟷ C(A)$_R$
⑮	XCHL	A → C(AC)$_L$, 0 → C(AC)$_R$	C(A)$_L$ → C(AC)$_L$	C(AC)$_L$ → C(A)$_L$	C(AC)$_L$ ⟷ C(A)$_L$
⑯	XCH REV	A → C(AC)$_L$, 0 → C(AC)$_R$	C(A)$_{L,R}$ → C(AC)$_{R,L}$	C(AC)$_{L,R}$ → C(A)$_{R,L}$	C(AC)$_{L,R}$ ⟷ C(A)$_{R,L}$
⑰	CLEAR	0 → C(AC)	0 → C(AC)	0 → C(A)	0 → C(AC, A)

PARTIAL TABLE OF INSTRUCTIONS WITH ADDRESS PART - PDP-6

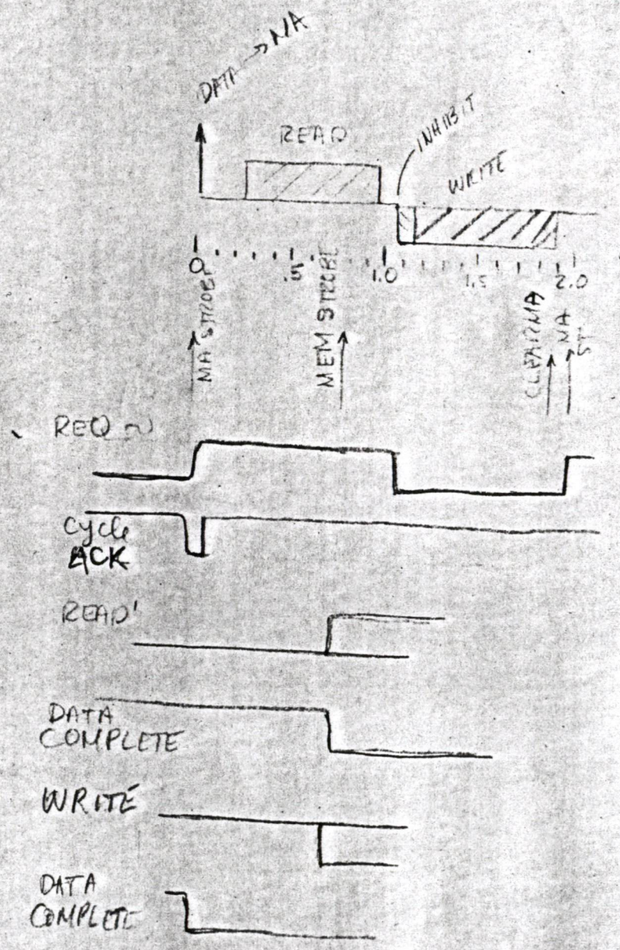
3/19/63

3/20

H.S.G.



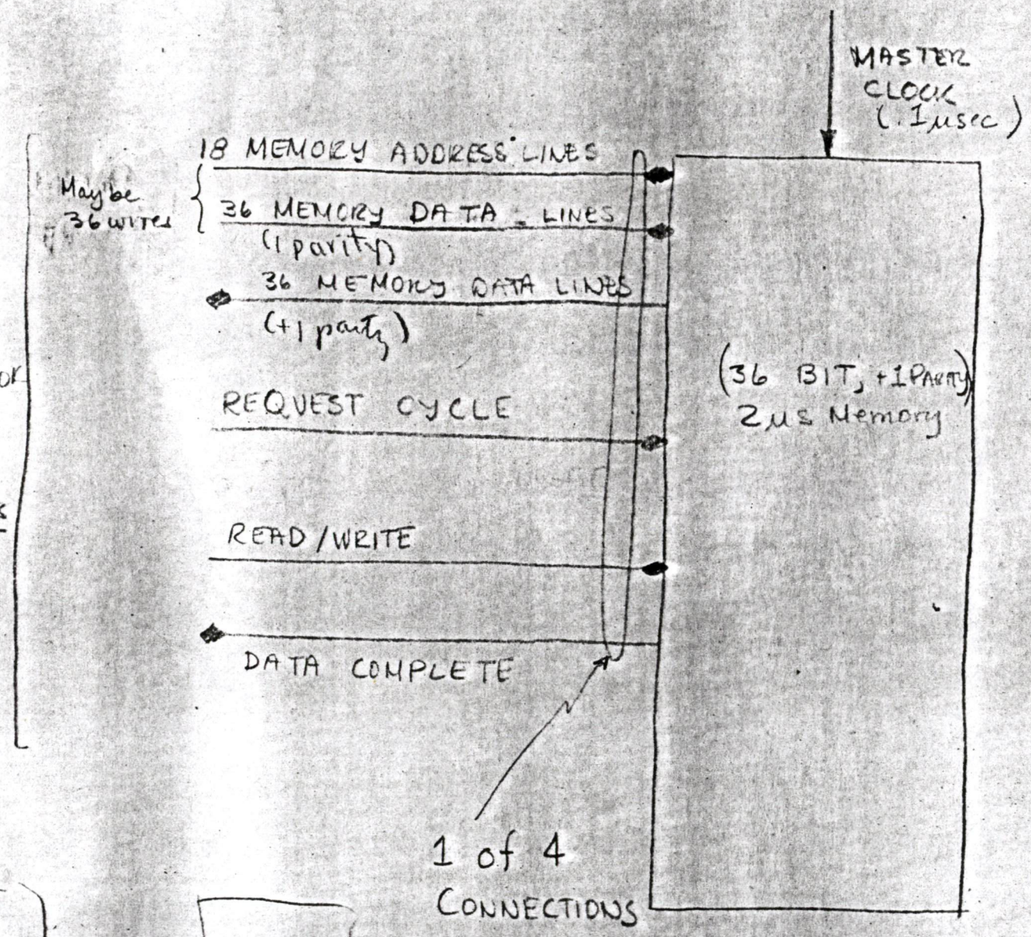
MARCH 28, 1963

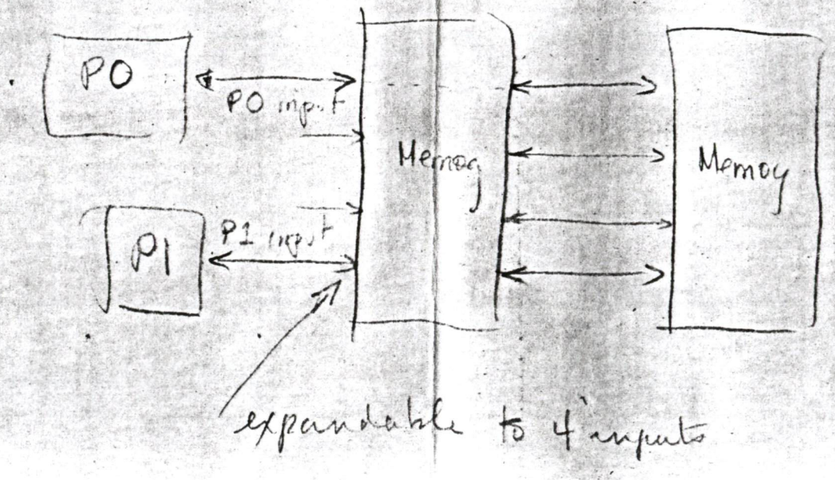


2 μs N

TO PROCESSOR

93 conductors





PDP-6A Memory System

3/26/63

W.T.C.

RLB/AB/AH3/SG/LP/SWM3

MARKETING

PROGRAM

Software Specs

SIMULATOR

AUTOMATED WIRING DIAGRAMS

MANUALS

WRITE BROCHURE

PRINT SYSTEM BROCHURE

PROGRAMMING MANUAL

MAINT. MANUAL

HARDWARE

SYSTEM SPECS, OP CODES

DRAFT LOGIC DESIGN-CPU

FABRICATE

DEBUG CPU

FLOW CHARTS

PERIPHERAL EQUIP DESIGN

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CIRCUITS

MECHANICAL

CONSOLE MACH. UP

CONSOLE DESIGN

APRIL 1 8 15 22 29 MAY 6 13 [SJCC] 20 27 JUNE 3 10 17 24 JULY 1 8 15 22 29 AUG 5 12 19 26 SEPT 2 9 16 23 30 OCT 7 14 21 28

PDP-6 SCHEDULE

3/21/62

March 28, 1963
J. Smith

Display Production

Responsibilities: Construction and Checkout of standard displays.

Machine No.	Job No.	Status	Customer
30H-1	5000-8128	Checkout	BBN
30D-4	5000-8129	Checkout	
30A-14	6000-9304	Checkout	
30A-15	6000-9305	Construction	
31B	5500-9051	Construction	

Sub Assembly Status

1 - 30A logic in stock
1 - 30D logic in stock
3 - 30A logics in process

Display Production Policy:

2 - 30A display to be in finished goods
1 - 30D display to be in finished goods

2 - 30A sub-assemblies to be in stock
2 - 30D sub-assemblies to be in stock

It is the inventory policy of display production to have available in finished goods (2) 30A and (1) 30D available for immediate shipment. In addition, sub-assemblies which include logic, resistor stacks, heat sink assemblies and component plates will be available in stock. Sub-assemblies for (2) 30A and (2) 30D will be stocked.

dec INTEROFFICE MEMORANDUM

DATE March 28, 1963

SUBJECT Boston Bar Association Discussions on Legal Problems of Doing Business Abroad

TO Harlan Anderson

FROM George O'Dea

Jack Barnard called this morning and said that the Boston Bar Association is holding a discussion on Saturday, April 13 at 9:15 a.m. in the Statler Hotel on the Legal Problems of Doing Business Abroad.

The conversations will deal mostly with the common market countries and while definitely law oriented would probably have some benefit from the business point of view to ourselves (at least Jack feels it would). I plan on attending, do you feel that you could make the conference also?

No!

George O'Dea

GO'D:ncs

March 28/63
J. Smith

Mag. Tape Production

Responsibilities: Construction and Checkout of standard Mag. Tape Units.

Machine No.	Job No.	Status	Customer
50-76	7000-9174	F.G.	
50-77	7000-9205	F.G.	
50-78	7000-9615	Construction	
(3) ITT Duplex 50 Units		Checkout	
52	EN 2398 (ITT Blue)	F.G.	
52	4000-8792	Checkout	

Sub-Assembly Status

1 - 50 Simplex logic assembly
1 - 52 Control logic assembly

Mag. Tape Production Policy:

3 - Tape unit type 50 simplex to be in finished goods.
1 - Mag. Tape Control Type 52 to be in finished goods.

3 - Tape unit 50 logic sub-assemblies in stock.
1 - Tape Control 52 logic sub-assembly in stock.

It is the inventory policy of Mag. Tape Production to have available in finished goods (3) tape units type 50 and (1) Tape Control Type 52. In addition sub-assemblies for (3) tape units and (1) tape control will be stocked.

PDP-1 COMPUTER PRODUCTION

In Checkout

Machine No.	Job No.	Customer
34	9000-5129	
35	9000-5863	NSA
36	9000-5864	CRC
39	9000-7435	
40	9000-7741	
41	9000-7742	

On Loan

22		Princeton
37	9000-5865	L.L.
33		Adams

In Process

Machine No.	Job No.	Production Start	Completion Date
42	9000-8126		
43	9000-8127	1/14/63	4/15/63
44	9000-9414	2/18/63	5/20/63
45	9000-9415	3/18/63	6/17/63
46		4/15/63	7/15/63

March 28/63
J. Smith

PDP-4 COMPUTER PRODUCTION

In Checkout

Machine No.	Job No.	Customer
8	8000-7718	
10	8000-8060	
11	8000-8061	
12	8000-8570	
13	8000-8571	
15	EN 2499	Foxboro
14	8000-8782	
16	8000-8783	

On Loan

5		Mass. Gen.

In Process

Machine No.	Job No.	Production Start	Completion Date
17	8000-9739		
18	8000-9740		
19			
20		4/15/63	6/10/63
21		4/29/63	6/24/63

March 28/63
J. Smith

March 28/63
J. Smith

PDP-1

As of the end of April, there will be eleven PDP-1's in various stages of construction not committed to customer orders. Of these eleven, two are out on loan, one to Princeton, the other to Lincoln Lab., leaving a total of nine. The last of these nine will be delivered to Checkout on 7/15/63. There are major components (readers, punches, and typewriters) on order for all these machines. Major components have not been ordered for machines with Production Start dates of later than the end of April.

If production is halted on PDP-1 computers, it would take approximately eight weeks from production start date to once again deliver computers to Checkout.

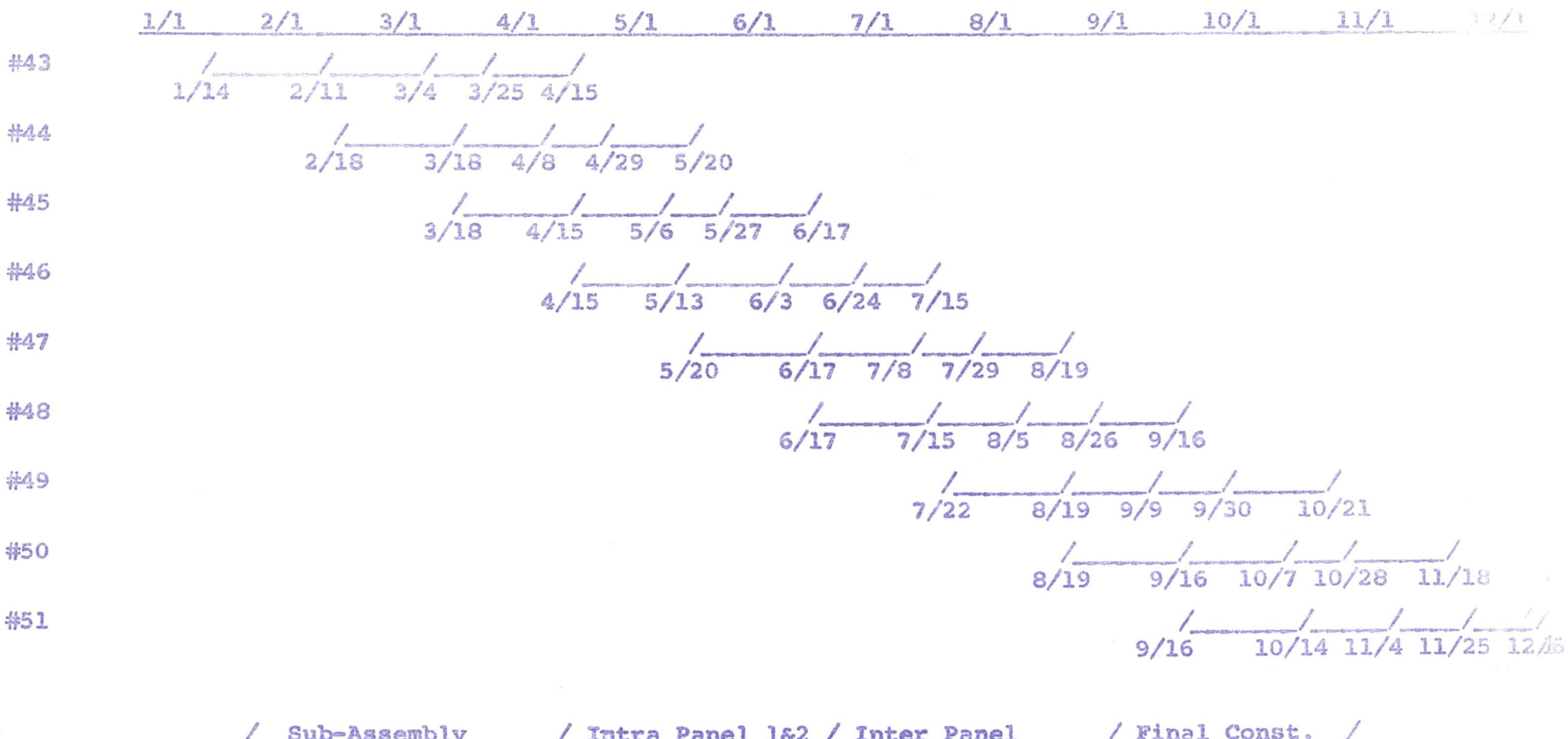
PDP-4

As of the end of April, there will be thirteen PDP-4's in various stages of construction not committed to customer orders. Of these thirteen, one is out on loan to Mass. Gen., leaving a total of twelve. The last of these twelve will be delivered to Checkout on 6/24/63. Major components are on order for all machines except the last four.

If production is halted on PDP-4 computers, it would take approximately six weeks from production start date to once again deliver computers to Checkout.

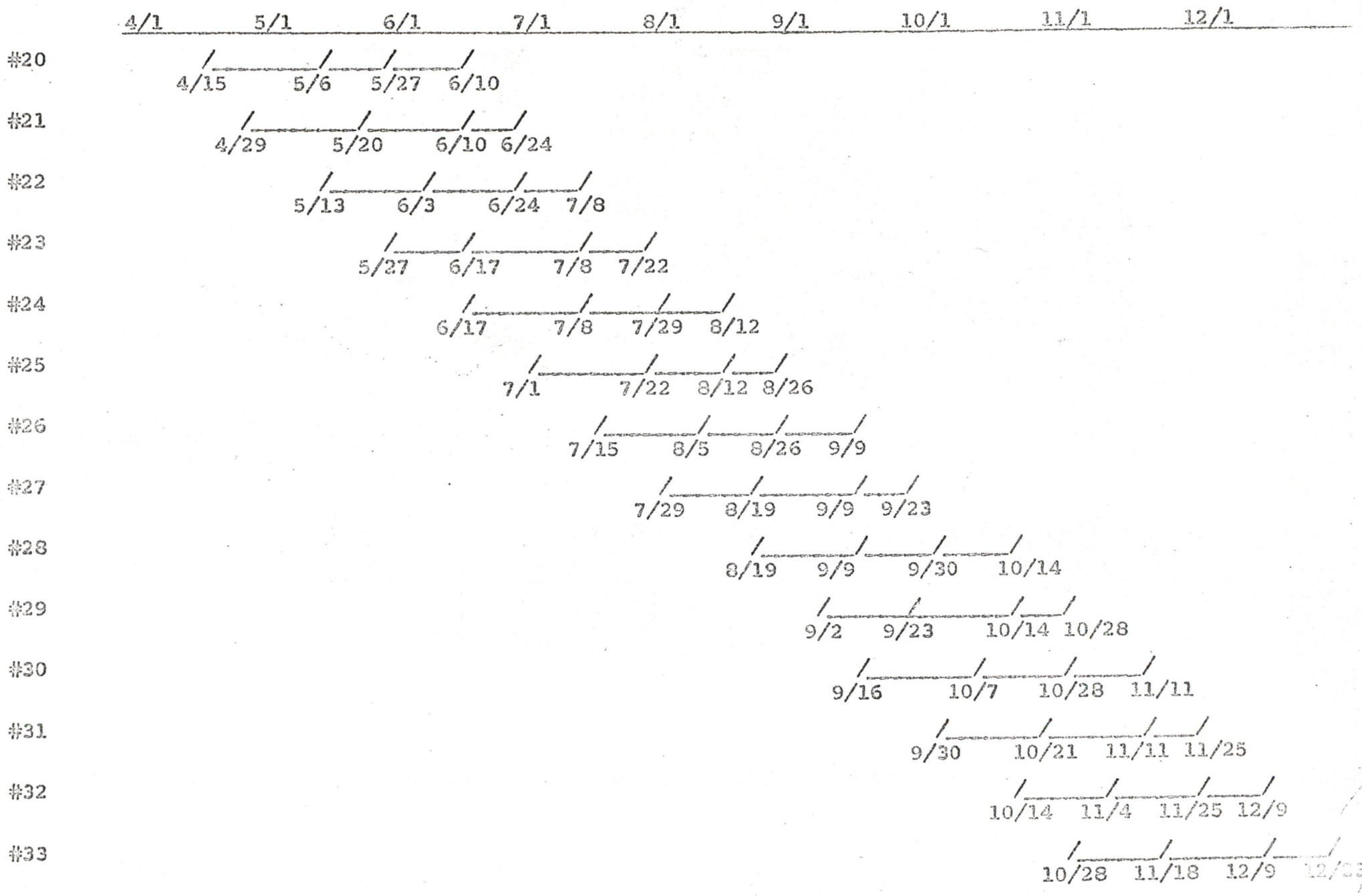
March 8, 1963

WORK SCHEDULE - PDP-1



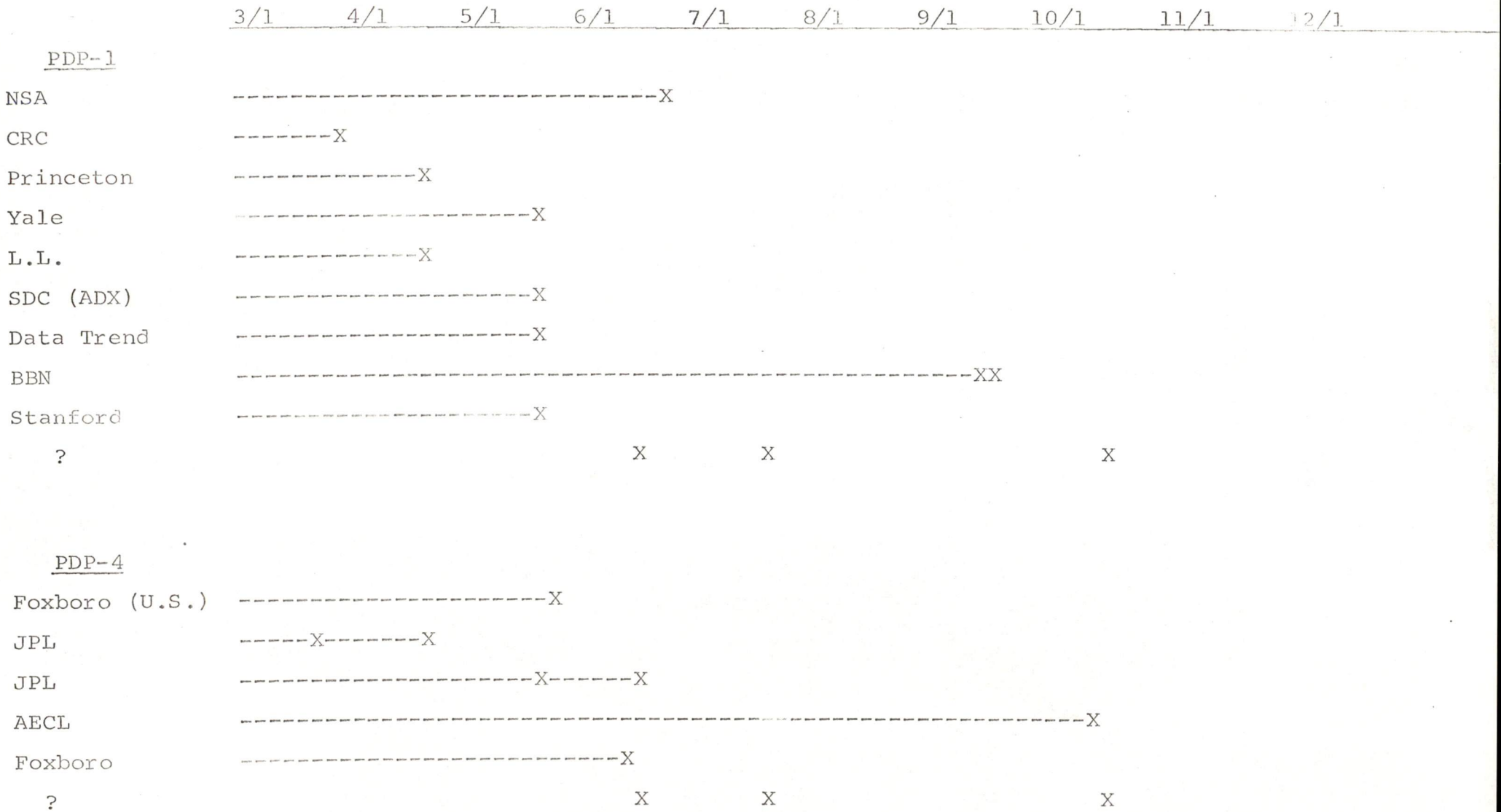
March 7, 1963

WORK SCHEDULE - PDP-4



April 2, 1963
J. Smith

Computer Delivery Probability



TO: M. Sandler

FROM: J. Smith

DATE: March 26, 1963

Changes ~~Changes~~ to Finished Goods as of 2/28/63

PDP-1

Machine No.	Job No.	$ Value	
22	EN 2239	26,254.04	Princeton
34	9000-5129	14,697.70	
35	9000-5863	15,325.07	
36	9000-5864	14,014.09	C.R.C.
37	9000-5865	15,791.26	L.L.
39	9000-7435	14,054.18	
40	9000-7741	14,110.11	
41	9000-7742	12,482.65	

Total Value in Process	70,669.71
Total Value on Loan	42,045.30
Total Value in Process (Sold)	14,014.09
Total	126,729.10

PDP-4

5	EN 2385	8,000.00	Mass. Gen.
8	8000-7718	6,908.08	
10	8000-7719	8,546.68	
11	8000-8061	7,838.77	
12	8000-8570	6,872.16	
13	8000-8571	3,865.72	
15	EN 2499	792.26	

Total Value in Process	25,911.41
Total Value on Loan	8,000.00
Total Value in Process (Sold)	792.26
Total	34,703.67

Total Value in Process (Both)	96,581.12
Total Value on Loan (Both)	50,045.30
Total Value Sold (Both)	14,806.35
Total (Both)	161,432.77

INTEROFFICE MEMORANDUM

DATE March 28, 1963

SUBJECT Computer for SDC

TO Nick Mazzarese
Harlan Anderson

FROM Gordon Bell

1. Field Expansion to 256 sequences is allowed. This includes everything except PA's.

2. Interested in cost and availability of 800 card/minute reader.

3. If Ben designs special interface will DEC build and assist in checkout of these?

4. Can the input mixer and output distributor in the 256 channel system for teletypes be increased to 8 lines (from 5). This would enable a general device (including new teletype) to be connected.

5. Can the regular input mixer be 8 sets of lines.

6. Can an extra typewriter be connected to look like a teletype? (Some slight logic modification is necessary)

dec INTEROFFICE MEMORANDUM

DATE March 28, 1963

SUBJECT

TO K. Olsen
H. Anderson
W. Hindle
R. Best
S. Olsen
N. Mazzarese
D. Morse
S. Grover
S. Lambert
R. Boisvert
R. Savell
All Sales Personnel

FROM R. F. Maxcy

Mr. Congleton

The price of the Automatic Multiply and Divide (Type 10) has been set at $5,150.

RFM/jr

LRL
NSA
Lincoln Lab
Princeton

MIT

Andy

dec INTEROFFICE MEMORANDUM

DATE 3-25-63

SUBJECT Computer for LRL

TO Gordon Bell

FROM Ken Larsen

Dear Gordon:

I have been talking with the people at LRL with respect to the features that they would like to see in a future machine. They are quite interested in obtaining an expanded version of a PDP-3 and they are most interested in giving their ideas to help us write specifications for a new machine.

I am attaching two sales call reports which cover my conversations with them. I hope they are clear to you.

George Michaels and Norm Handy extended the invitation to you to have you and the person who will be assigned the responsibility for programming to visit them. We can gain from their knowledge of computers and programming experience. They have what they consider to be a most efficient FORTRAN Compiler for the STRETCH, and would like to see its features incorporated in the FORTRAN supplied with a new computer.

Sincerely,

Ken

cc: Ken Olsen
Nick Mazzarese
Ted Johnson

SALES CALL REPORT

FIRM LRL

DIVISION

STREET Livermore, Calif.

CITY STATE

PHONE NUMBER HI 7-1100 AREA CODE 415

DATE 3-19-63

SALESMAN K. L.

OFFICE W. C. O.

NATURE OF CALL Phone

FOLLOW-UP DATE

CONTACTED George Michael x-7331

SUBJECT Computer to be purchased by LRL during Fiscal '64

REMARKS (CONTINUE ON BACK OF SHEET)

Name: "Peripheral Processing Unit."

Main Frame: * Floating Point Hardware
36 bit machine to have single precision
or 24 bit machine to have double precision

10 usec add (max)
25 usec mul (max)
2 to 5 usec memory cycle – 16K min size.

* Index Registers

I/O Gear – Console typewriter – Papertape punch – Papertape Read
Display + Lite Pen
Card Reader 800 cpm
Card Punch 250 cpm
Printer 120 col x 64 char. – 1000 lpm
4 Mag Tapes IBM Compatable

I/O Overlap – simultaneous Read from one tape write on one

PROMISED

Software – * Fortran + a good debugged assembly Prog

HOW TO LOCATE PLANT

* = Most important items – (Would like to have the Fortran programmer model his program after the LRL Fortran as written for "STRETCH")

SALES CALL REPORT

FIRM LRL

DIVISION

STREET

CITY Livermore STATE Calif

PHONE NUMBER AREA CODE

DATE 3-22-63

SALESMAN K.L.

OFFICE W.C.O.

NATURE OF CALL Visit

FOLLOW-UP DATE

CONTACTED George Micheal
Bob Wyman
Bud Wirshing
Norm Hardy
Ed LaFranchi

SUBJECT
Computers - See SCR dated 3-19-63

REMARKS (CONTINUE ON BACK OF SHEET)

We talked about the "Peripheral Processing Unit" and what they might expect for the money that they have bugeted (Approp (guess) $300 K). [redacted] there is somewhat of a disagreement between various groups at LRL about the device to be purchased; whether it should be a new computer or another processor for their CDC 6600 complex.

They are very willing to make suggestions regarding features that they would like to see in new computers - See 2nd Page

PROMISED

HOW TO LOCATE PLANT

SALES CALL REPORT 2nd Page

FIRM LRL - [redacted]

DIVISION

STREET

CITY Livermore STATE Calif.

PHONE NUMBER AREA CODE

DATE 3-22-63

SALESMAN K.C.

OFFICE W.C.O.

NATURE OF CALL Visit

FOLLOW-UP DATE

~~CONTACTED~~

George Micheal - feels very strongly about the facility to read mag tape backwards. He pointed out several time saving advantages for the tape sorting routines that are commonly used at LRL.

SUBJECT

REMARKS (CONTINUE ON BACK OF SHEET)

Norm Hardy - Has ideas for using registers as index Registers and Accumulators. If a machine had eight of these registers he could have 16 index registers that could index the full range of the address or each register could be broken up into a "count field" and a "modifying field" His feeling is that the modifying capability represents 2/3 of the index register's usefulness. By using an accumulator as an index register the Add immediate and Subtract immediate instructions become the Indexing instructions - See 3rd Page

PROMISED

HOW TO LOCATE PLANT

SALES CALL REPORT 3rd Page

FIRM LRL	DATE 3-22-63
DIVISION	SALESMAN K. L.
STREET	OFFICE W.C.O.
CITY Livermore STATE	NATURE OF CALL Visit
PHONE NUMBER AREA CODE	FOLLOW-UP DATE

CONTACTED

AC When used as an index Register

18 Bits	18 Bits
Count Fld.	Modify Fld.

Assume that 12 passes of a subroutine is desired and

SUBJECT

the address is to be modified by 1000 and incremented

REMARKS (CONTINUE ON BACK OF SHEET)

by 5 for each pass the register to be used should equal (Count Fld | Modify Fld.) 000012 001000. By performing a Subtract Immediate 777773 the result will be (Count | Modify) 000011 001005.

Following this sequence —

original	000012 001000
Sub Immed	000000 777773
→ resulting Mod.	000011 001005
Sub Immed.	000000 777773
→ resulting Mod -	000010 001012
Sub Immed	000000 777773
→ resulting Mod -	000007 001017

Sequence to be continued until Count field goes to zero or negative depending on the timing sequence of the test to be made —

~~PROMISED~~

~~HOW TO LOCATE PLANT~~

George Michael & Bud Winsking stressed the need for Fortran and the desire that it be similar to the LRL Fortran for "Stretch" —

H. Anderson

dec INTEROFFICE MEMORANDUM

DATE March 22, 1963

SUBJECT Engineering Programming Requirements

TO Computer Guidance Committee FROM Leonard M. Hantman

1. The purpose of this memorandum is to briefly define the engineering programming group, discuss its requirements, and discuss a method for implementing them.

2. The engineering programming group is defined as that group of programmers which will work directly with the engineers during the initial design, testing, debugging and demonstrating of prototype equipment. The group will produce programs which can, if desired, be incorporated into check-out and acceptance tests, and will produce the programs for such "in-house" functions as module testing, back panel wiring and other machine aided design problems. Some of the specific functions are given in para. 4D.

The group is to be distinguished from both the check-out group which will produce programs for the final check-out and acceptance tests as well as tests for existing equipment, and from Harrison Morse's group which will produce systems programs for the customer himself. It should be noted that the closest type of interaction between the three groups is both necessary and desirable.

3. Currently the areas which require programming from an engineering standpoint include the following: (The reader can probably add a few of his own.)

A. Incremental scope and allied generators
B. Microtape and allied controls
C. Module tester
D. Serial Drum
E. Data Channel, and allied tape drives
F. Back Panel wiring
G. Two new computers
H. New core memories

4. Since it is quite obvious that more personnel and greater responsibility for the production of engineering programming is required, it is suggested that the following steps be taken:

A. The immediate hiring of at least three (3) additional programmers with experience in programming in-out devices, and able to converse, at least basically, with engineers concerning the logical and programming design of equipment.

B. These programmers should be directly responsible to myself, and indirectly responsible to the head of the engineering department.

C. In the future, as specifications for new equipment are formulated they should be presented to the head of the engineering programming group, together with approximate dates for completion of the hardware and readiness for computer testing.

D. The responsibility for assignment of the equipment to a particular programmer and for the production of the items below should be my own. As usual the project engineer will have the overall responsibility for seeing that the equipment is tested and documented before delivery to the check-out group. The individual programmer will be required to do the following:

1. Write any programs necessary to initially test the equipment on line.

2. When the hardware is ready, to work directly with the responsible engineer in designing and running simple programs for immediate use in getting the equipment "on the air" and working out any design and or programming bugs in the larger tests. In effect he will "hold the engineer's hand" to get the equipment going and redesign the "programmers manual" as required.

3. Write all immediate demonstration programs for various shows and possible customer demonstrations. These will not include the systems type of programming for the customer, or large scale demonstrations required by the sales department.

4. Upon completion of on-line testing, the programs should be written for use by the check-out section if desired, and for the engineering group. All necessary machine language tapes will be kept in an up to date library.

5. A complete description of the equipment from a programming standpoint (i.e. an enlargement of the original specifications) including technical information, IOT commands, timing problems, and possible examples of simple instruction sequences should be made available to the Morse programming group and the check-out section. The Morse group should be able to make up any programs or subroutines necessary from a systems standpoint, from the information supplied. (It is quite probably that much of the original design specification came from that group, and as stated, close liason will always be necessary.) With the possible exception of some maintenance and diagnositc programs, all programs given to the customer should come from the Morse group.

5. Note that unless new personnel are hired almost immediately, programmers will have to be borrowed from the Morse group, which is probably overburdened already. The alternative would be the dropping of som eof the items listed in paragraph 4D, and the present state of insufficiency will continue.

6. Note also that there will be a demand for at least a part-time Flexowriter operator and/or additional Flexowriters in the engineering area. Eventually there should also be a PDP-4 in the area also.

7. For information purposes, I am now working on the programs necessary for the incremental scope, microtape, and module tester myself, and a commitment was made to produce the test programs for the serial drum. If the drum is ready on schedule , and as already suggested, the incremental scope and module tester are to be ready for the show in May, things will be hectic to say the least. Unless additional help is received, any more commitments on my part will be nigh onto impossible until early June 1963.

###

Harlan

COMPANY CONFIDENTIAL

DRAFT OF MICROTAPE LITERATURE FOR SHOW

by

TOM STOCKEBRAND

TO: Jerry Hamilton
Russ Doane
Roland Boisvert
Dick Best
Ken Olsen
Win Hindle
etc.

SUMMARY OF SIMPLE CONTROL

Uses accumulator as 1/0 buffer

Command A; rev, connect, write

Command B; unit (0 = no unit = deselect)

Start delay by program

Mark track read to Linc bit

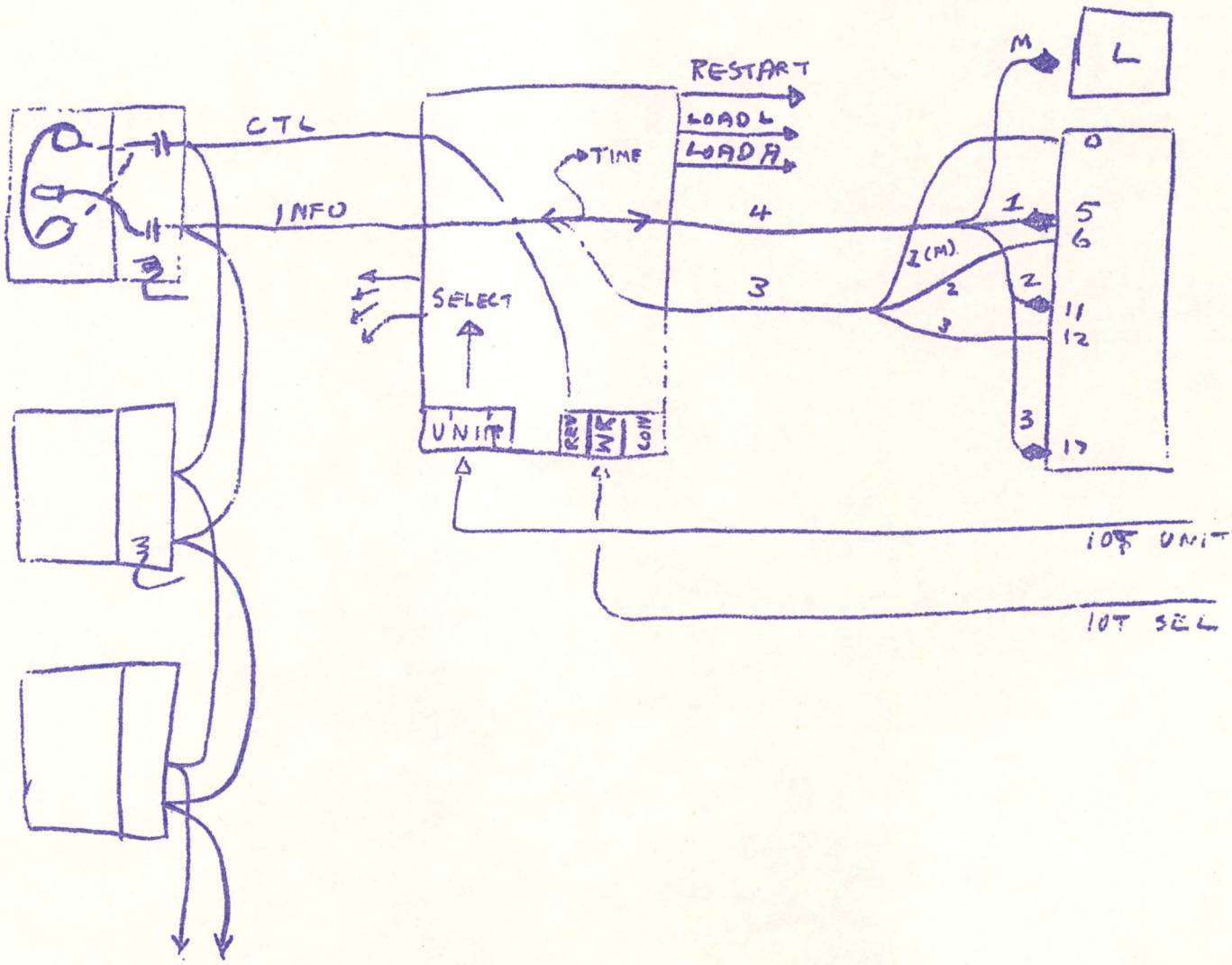
Info tracks 1,2,3 read to AC 5,11,17

Info track 1,2,3, written from AC 0,6,12

AC must be cleared each word

Linc must be cleared each line

Machine must halt 1) after loading or shifting buffer prior to each line written 2) after unloading (clearing) buffer prior to each line read.



MICROTAPE FOR PDP-4 COMPUTER

This simple tape system is an outgrowth of work at MIT Lincoln Lab on a large and on small tape system for a laboratory computer *. It records and reads on a tape which has been pre-marked with location and address information. This allows exact addressing and replacement of information on the tape without the need to re-write the entire tape. It also allows individual tapes to be labeled directly with with their own number. Channels are redundantly recorded; The Manchester or phase modulation scheme is used; The Transport mechanism is kept extremely simple and uses a guiding system which allows very long tape life.

The utility of this tape system lies in its emphasis on convenience and simplicity plus the normal advantage of tape - hi density storage. The small reels hold plenty of data for many uses -- 160,000 words of programming (20 bit words), 2½ hours of 10 cps 1% analog data (8 bit samples, 40 per second), the information on 5000 punched cards (6 bits per column), 500,000 teletype characters, etc.

The MICRO TAPE transport consists simply of two motors which drive tape back and forth past a 10 track head, switching to connect the head leads to a 5 channel bus, and switching to connect appropriate voltages to the motors depending on the commands, GO, REVERSE and SELECT. In addition, manual control switches are provided for manuvering the tape and for write lock out (this is somewhat redundant since, with fixed addressing, any block can be protected individually by a code in the addressing information for that block).

This transport (2 per mechanical assembly) is hooked to the computer through a TAPE CONTROL unit which can be, and is, as simple as 30 plug in units. More control complexity buys more freedom for the computer. (Automatic search by the hardware, more buffering -- for less frequent access etc.) Hardware complexity can be kept down by using the MARK track to its fullest advantage - a reasonably elaborate pattern recorded there will allow the elimination of Word Counter, for example: Two controls are offered. One is very simple the other is more costly and of more complexity. Each is set up to allow the programming of a search for a tape address followed by the transfer of a block information to or from the machine. The simpler control demands 100% of the computers time during searching and transfer while the second demands only a few instruction times each time a block is passed (every 60 milliseconds at 256 18-bit words per block) plus about 1/6 of the computers time during block transfer.

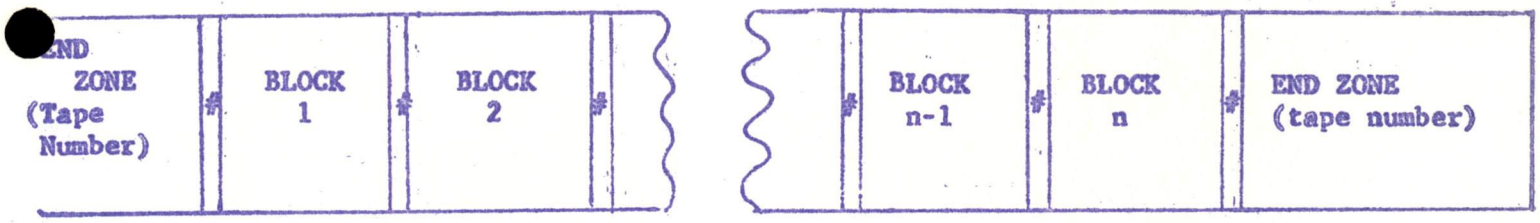
The data rate of this machine is about 360 microseconds per word in this model. It takes about .1 seconds or 3" of tape to start or stop. This type tape system involves hi ratios of search time to transfer time in many applications since the entire tape need not be rewritten to change data in one location. Tape speed is 40 ips. Three million bits are stored on the 3½" reels at 400 bits per inch. To traverse a reel takes about a minute. Future machines will go faster, have several speeds. The tape transport and reading scheme works bi-directionally though simplifications of control do result when transfering is done in one direction only. Searching is always bi-directional unless one is restricted to search always from one end of the tape.

* A computer integrated, tape system

W.J.C.C 1958

FORMAT

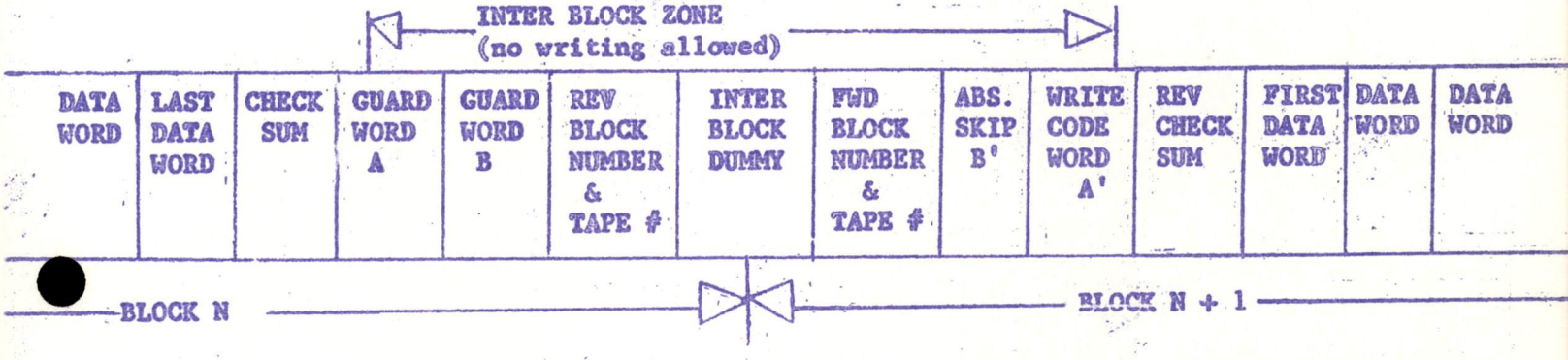
The format used on microtape can be outlined as follows:



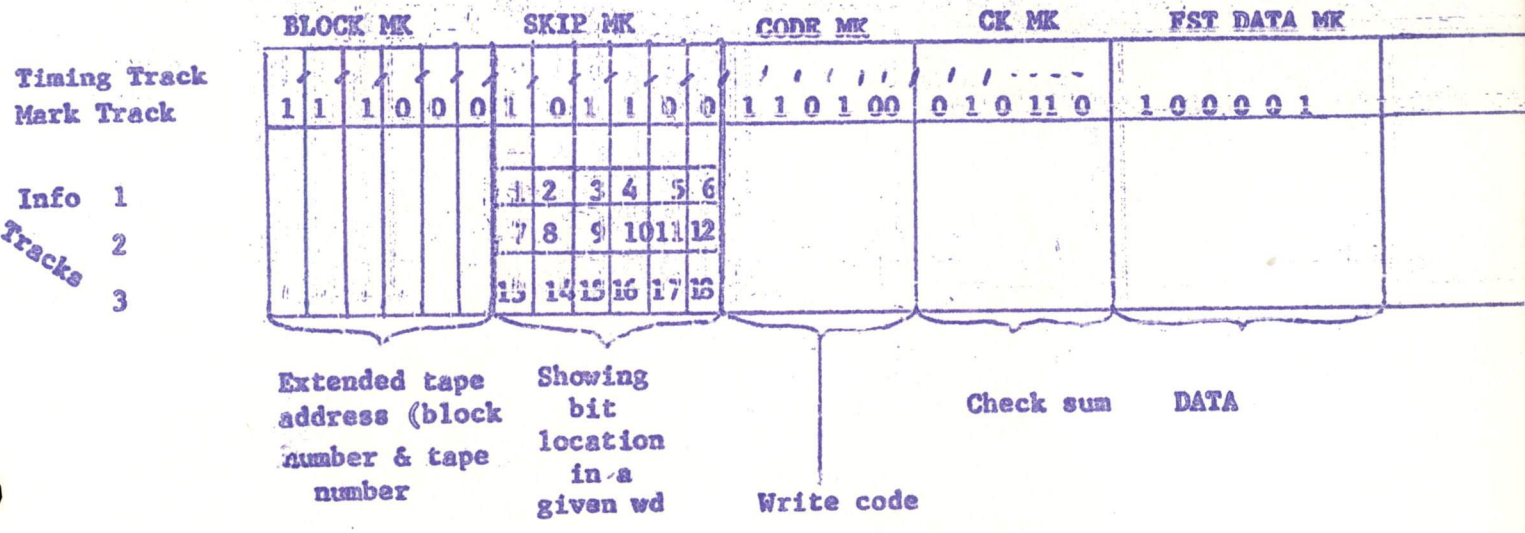
The 250' of tape is broken into end zones and blocks of information separated by "interblock zones" in which synchronizing and addressing information are located.

There are no "inter-recorded gaps". The interblock zones are about .096 inches long (depending on format details).

A closer look at the tape in the region one interblock zone is shown below



The tape is divided down its whole length into word-sized sections called slots. These slots are used to store data words, check sum words, address coding, end zone information and so on. This segmentation is done by marks in a serial coded mark track. If the tape has three information channels, six 3-bit lines (like characters) of tape are needed to store one word. Therefore, the mark track consits of a series of six-bit codes similar to that shown below. In the end zone, END MARKS are substituted for DATA MARKS and tape reel numbers are recorded as data.

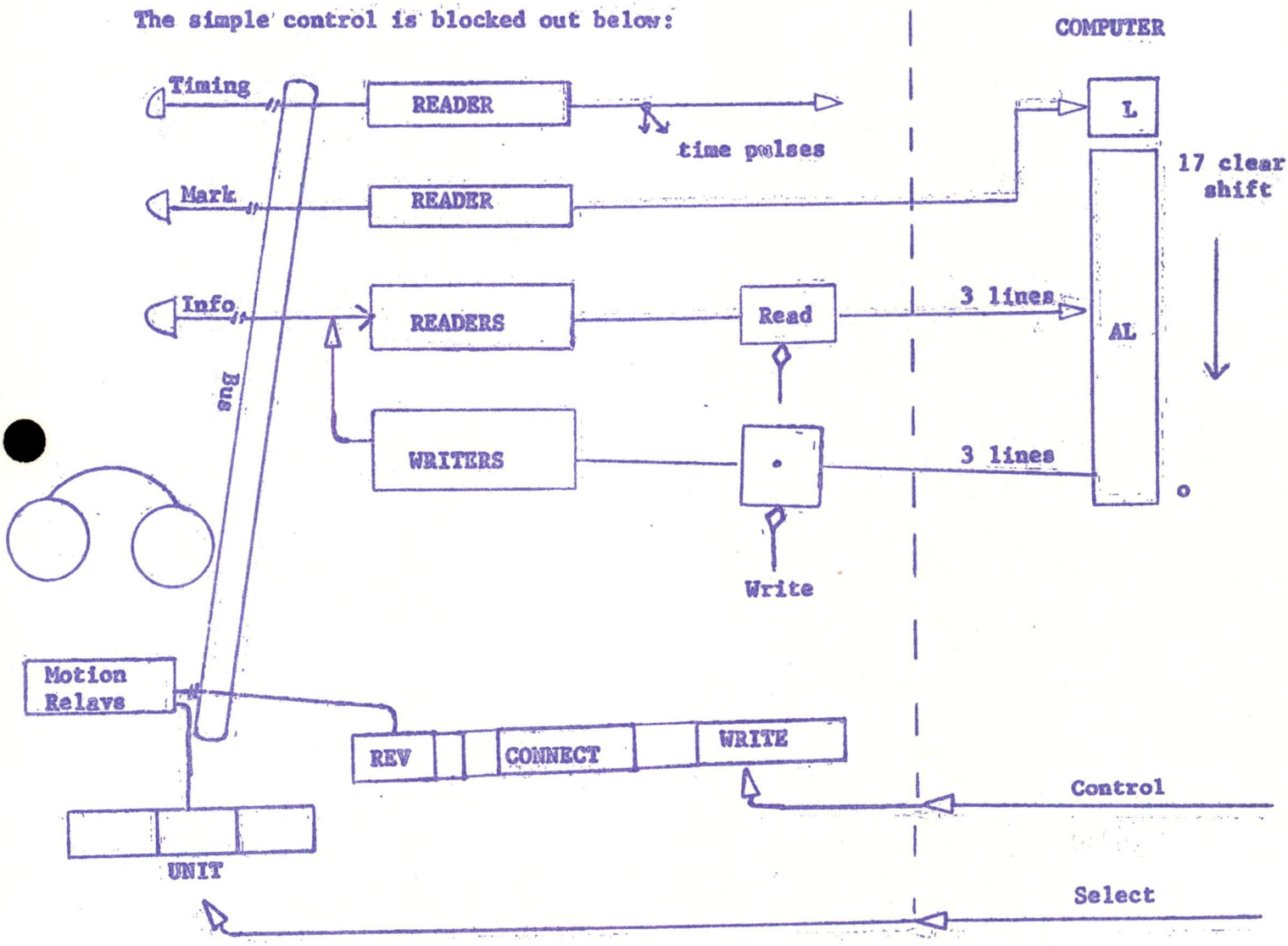


Using the tape ordinarily consists of a search for the block of interest followed by a transfer of the block of information desired. This can be done by reading the mark track bit-by-bit as (in the simplest control) until the right patterns are found, then seeking the correct address, or a hardware mark detector can be employed (as in the bigger control) to ease the programming burden.

SIMPLE CONTROL TYPE 550

The control for this tape system is as simple as it can be made. It requires programming 100% of the computer's time during both search and transfer operations. It uses the accumulator itself as the input-output buffer and requires that the program cause the computer to halt -- to be restarted by pulses from the tape system -- in order to accomplish its synchronization. The following is an introduction to the control and how it operates followed by a description of the reading and writing system.

The simple control is blocked out below:



It accepts a 3 bit command to CONNECT transfer pulses to machine, READ or WRITE, and go FORWARD or REVERSE. A second command describes which unit (of 7) is to be selected. If unit 0 is selected, all motion ceases. The expectation is that select and start information is given along with a disconnect. After the unit is up to speed a CONNECTION is made. From now on the action is that the program should stop to be restarted by pulses from the tape system whenever data is inserted into the accumulator. Eventually a select zero and disconnect are given and the unti is stopped.

The system uses the Manchester Recording Scheme. Figure 1 shows the important characteristics of this system and illustrates a section of the circuitry needed to write on the tape. Written on the tape in the first place is a timing track which consists of a series of equally spaced flux reversal which are written closely enough together so that the voltage read back by the head is an approximate sine-wave. It is used like a series of spocket holes to establish accurate position information on the tape. As the tape sweeps past the head the sine-wave of voltage generated by the head which is reading the timing track is amplified and sqaured by the timing track reader whose output is illustrated on the third line of the figure, this sqaure wave is turned into pulses called, arbitrarily, TP0 & TP1. These pulses are used to alternately load and complement the write register to produce the correct flux on the tape. In this system a 1 written on the tape consists of a flux reversal in a particular direction while a zero is a flux reversal in the oppposite direction. The current shown in the figure might represent first a "1" and then a "0" as labeled. If a second 1 were to have been written then the current would be as shown in the dotted lines in line 5. When later during the read process the flux produced by this current is moved past the head, it produces voltage bumps as shown in line 8. This, when amplified and squared, can be strobed by the TP1 produced at that time to find out whether a 1 or a 0 was written. The machinery for writing is shown in fig. 2.

FIG 1. WAVEFORMS

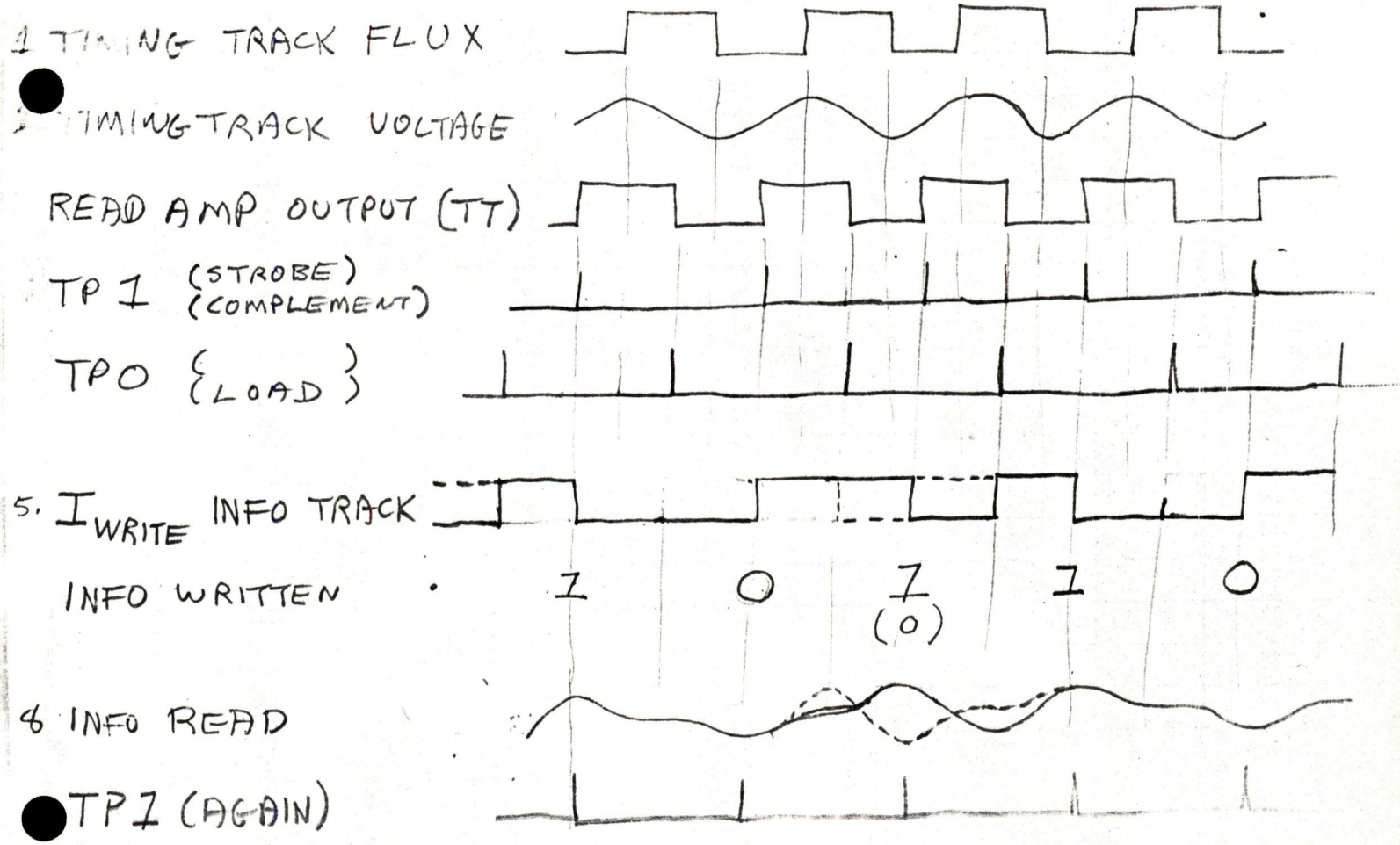


FIG 2 WRITE MACHINERY

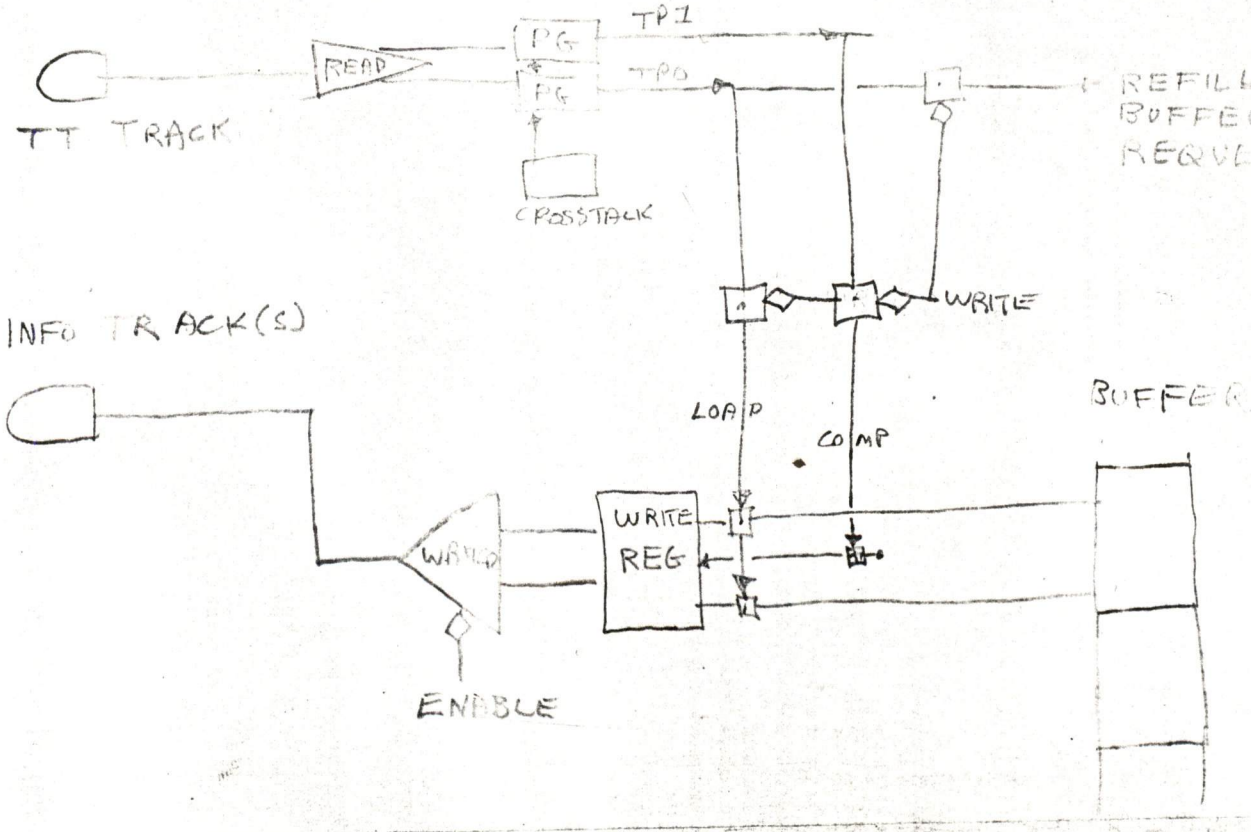
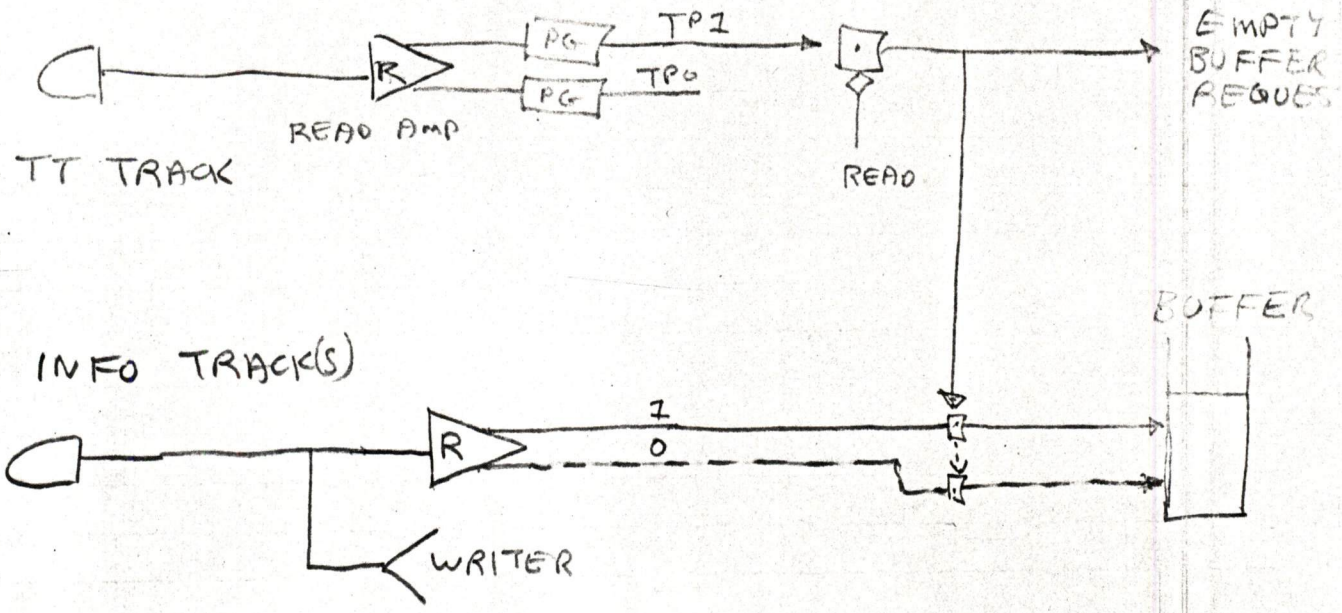


FIG 3 READ MACHINERY



INTEROFFICE MEMORANDUM

DATE March 21, 1963

SUBJECT ENGINEERING BULLETINS

TO TP Lists A, C & D

FROM Jack Atwood

The attached sheets are preliminary product information bulletins on new modules and accessories. They are based on the write-ups submitted to the Sales Department through Don White.

The bulletins have not been prepared in final catalog form either because the products are not for sale or because complete details, product photographs or finished diagrams are not readily available.

As additional information on these or other products becomes available, additional bulletins will be issued in this same preliminary form. We hope this procedure will permit a rapid feedback of information to Sales and Engineering.

Any information you think should be added to these bulletins may be given directly to Jennifer Johnsen, who is handling the project.

dec INTEROFFICE MEMORANDUM

DATE March 21, 1963

SUBJECT Upcoming DEC Visit to AEC

TO N. Mazzarese
S. Olsen
H. Anderson

FROM Pete Bonner

Miss Alice Hodnett (Ext. 271) of the AEC is expecting your visit on Monday, March 25, at 2:00 P. M. to discuss the quantity purchase of computing systems by AEC.

The following address is where Miss Hodnett is located:

Atomic Energy Commission
376 Hudson Street
New York 14, New York

Harlan Anderson

DATE: March 20, 1963

ENGINEERING CHANGE NOTICE/PRODUCTION RELEASE NOTICE PROCEDURE

FROM: Donald White

Engineering changes and production releases are handled in a very similar manner. The PR requires a tester, data sheet and circuit description (plus engineering time). Otherwise, the procedure is the same for both.

Changes and releases officially start with the issuing of "paperwork". Five or six copies of the notice are made by the engineering secretary; the larger number is made when a new etched board is required. These copies are distributed as follows:

1. Original (yellow) accompanies model and is initialed as various steps are completed.
2. One copy (yellow) is made, accompanies layout to silk screening.
3. One copy (yellow) to Sales.
4. One copy (white) to Quality Control.
5. One copy (white) for Drafting - filing.
6. One copy (white) retained by Engineering Secretary and inserted in Change Notice Book.

The secretary assigns the serial number, the rest of the information should be provided by the person issuing the notice. The easiest way to do this is to fill out a notice longhand. Remember, you must check a box to have the work done.

A marked-up print or a sketch is supplied by the originator and accompanies the typed original. On all marked-up prints, red pencil denotes deletion and green pencil gives additions. From the secretary the notice now automatically goes to Don White for approval. No further action takes place until the notice is approved. If there are suggestions or changes these will either be done correcting the drawing (in the event of an obvious error) or made in consultation with the originator. If a radical change is necessary, the entire circuit can be redrawn without reissuing the paperwork. The paperwork now goes back to the secretary, who distributes the other copies and sends the original (and one copy is a new board is required) to Drafting for circuit schematic changes and new etched board layout if needed.

The Drafting Department performs the necessary work, usually without consulting the originator. If layout is critical, a note to this effect should appear on the paperwork. Drafting will then contact the originator of the notice. When the layout and circuit schematic have been checked by Drafting, the schematic is signed by the engineer for a production release, or by Don White for an engineering change. The layout and extra copy go to silk screening, and the original paperwork and a print of the schematic goes on to George Gerelds.

George keeps a record of the PR and EC's in circulation in the engineering department and should be advised when paperwork is obsoleted or sent on to Quality Control. The Model Shop then builds or modifies the model. The model is tested at -20° C, room temperature and +55° C by Model Shop personnel. When a tester has not been made, it is designed by the originator, built by the Model Shop and checked out by the originator.

The test data sheet is also designed by the originator, and sent to Jim Cudmore in Quality Control. There the data sheet is reviewed, typed, and then presented to Don White for his approval and initials. Only when his approval is received are the final sheets made. As a result, two precautions are suggested for people initiating production releases:

1. Design your tester before you receive the model. Have it built, if possible.
2. Make three zerox copies of your rough data sheet. These rough data sheets can then be used for the temperature tests.

When a tester and data sheet are designed, a test procedure sheet should be made up. The purpose of this sheet is to explain to the technician how to test the module. Forms (sepias) are available from Don White. Two prints of the completed sheet are sent to Quality Control (Jim Cudmore), and the original is filed with the circuit schematic and tester schematic in Drafting. It is the responsibility of any person changing the tests to update the tester schematic test data sheet and test procedure sheets.

Modules are ready to send to Quality Control when the heat test is satisfactory. Modules with previously determined specs should pass at all three temperatures unless approved by Dick Best, Don White, or the originator. New modules for which no specs are set will be determined by Dick Best, Don White, or the originator of the production release. All modules then go to George Gerelds who sends them to Quality Control.

Quality Control will refuse to accept any module lacking paperwork, tester or temperature test. This ruling may be circumvented in extreme cases, but it is hardly worth the effort. All modules are given a visual inspection before passing the module on to Production. This inspection includes a comparison with the circuit schematic to check component values.

The modules then go to Production (Cy Kendrick) for parts list. Upon completion of parts list, which will include a count of component values, the paperwork is sent directly to the Engineering Secretary.

At the time the paperwork is issued, a card is placed on a board in Engineering. This card remains up until the form is completely signed and returned to the Secretary. (If the Secretary receives an incomplete form, she will pass it back to the originator for action.) The card is then taken down, and the signed original replaces the white copy in the PR and EC book. A card file by module number is also kept, giving the serial number of all changes under a given module number.

If a production release gets as far as Engineering and requires change, the proper method is to obsolete the old release and issue a new release. Simply mark up the schematic attached to the old release, attach it to the new release and mark:

"Obsolete. See PR # _____." on the old release. The Secretary will insert the number.

"Supercedes PR# _____." on the new release. You can call out the old number on the rough draft.

Never throw away the original notice. Follow the above method of obsoleting releases until the module is signed off by production. Then changes are made by engineering change notices.

In situations where changes are urgent, call Jim Cudmore. Quality Control will consult with Maynard Sandler or Cy Kendrick and determine the best way to make the change on modules in Production.

Quality Control also follows the first production lot. They test the first lot, and review the test specifications which are set by Engineering. They are responsible for keeping the various test specification books up to date.

DIGITAL EQUIPMENT CORPORATION

PRODUCTION RELEASE

ENGINEERING CHANGE NOTICE

No. _____

Charge to EN _____

Unit Name & No.:

Parts Added:

Parts Deleted:

Stock Disposition:

Change Description:

Reason for Change:

Originator: _____ Date: _____ Approved: _____ Date: _____

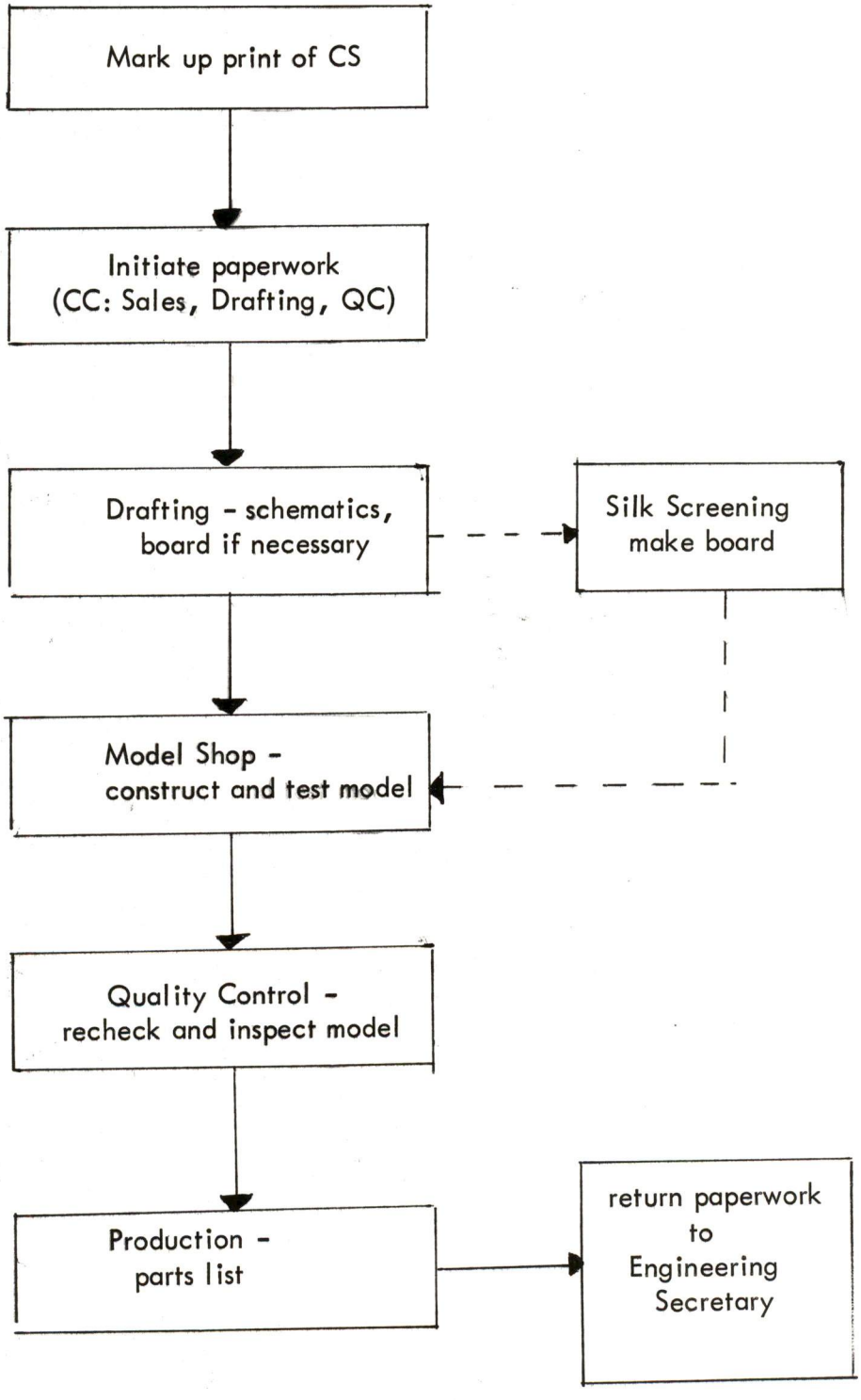
Action Required		New No., Action Taken, Date, Etc.	By
Circuit Schematic			
Etched Board			
Etched Board Model			
Model for Eng. Test			
Parts List			
Temperature Check			
Test Data Sheet			
Tester			
Quality Control			
Circuit Description			

Circuit Schematic -	Signed by Drafting Department upon completion of schematic.
Etched Board -	Signed by Drafting when layout complete and checked.
Etched Board Model -	Signed by Model Shop when board has been received.
Model for Eng. Test -	Engineering Change: Signed by Model Shop when board works at room temperature. Production Release: Same as above, but may be signed by originator.
Parts List -	Signed by production when parts list is complete.
Temperature Check -	Signed by Model Shop or originator when data has been taken and approved at -20°C and +55°C.
Test Data Sheet -	Signed by originator when he sends rough draft to Quality Control.
Tester -	Signed by originator when tester is checked out.
Quality Control -	Signed by Quality Control when model has been inspected and is satisfactory.
Circuit Description -	Signed by originator when form describing module and showing logic diagram is completed and sent to Sales.

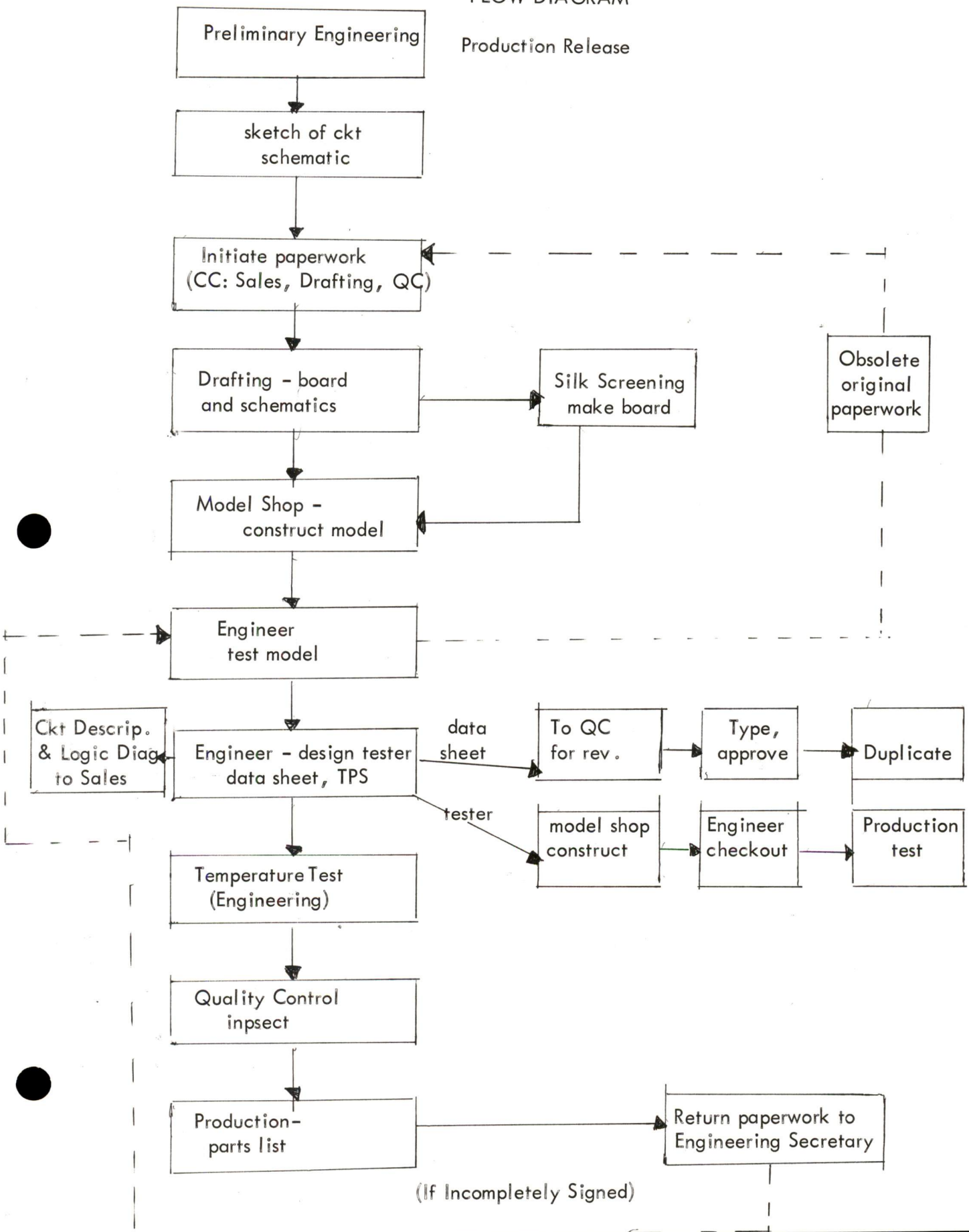
Notes:	Circuit Description	Logic Diagram	Quality Control	Tester	Test Data Sheet	Temperature Check	Parts List	Model for Eng. Test	Etched Board Model	Etched Board	Circuit Schematic	
When this release obsoletes a prior one, the notation should be added: "Obsoletes PR # _____". Otherwise no special notes are necessar y	X	X	X	X	X	X	X	X	X	X	X	Production Release
All spaces such as parts added, etc., should be filled out. See text.			X			X	X	X	X	X	X	Engineering Change (with board change)
Same as for EC with board change.			X			X	X	X			X	Engineering Change (no board change)
Change description: "Place circuit on inactive list."			X				X				X	Obsolete Module

FLOW DIAGRAM

Engineering Change



FLOW DIAGRAM



H. Anderson

H.39

dec INTEROFFICE MEMORANDUM

DATE March 20, 1963

SUBJECT Contractual and Blanket Order Agreements

TO Works Committee FROM Henry Crouse

Contract buying and blanket ordering, the two variations of long term buying agreements are proposed herein.

The primary intent of these procurement tools are to take full advantage of a vendor's operational efficiencies gained by planned production techniques, applied to non-inventory as well as inventory materials.

These approaches to material procurement insures; lowest possible material cost, availability of material for a specified time, shortest possible lead time, reduction of inventory levels by sharing actual materials with vendor, and effective control over large purchases.

Buyers are able to concentrate on negotiating, analysis of quality performance, service, and potential new vendors, rather than restricted by clerical functions.

I BLANKET ORDER PURCHASES

APPLICATION:

Materials of the expense element catagory are to be purchased within the scope of this system when consistency of use is indicated, ie. fasteners, hardware, metal parts, wire, etc.

OPERATION:

A Purchase Order is issued on the first of each month to the approved vendor.

A copy of the following "Blanket Order Agreement" shall be included with the Purchase Order:

1. Only items that appear on attached list are authorized to be procured against this order. All others will be returned to seller at seller's expense.

2. Only approved Digital Equipment Corporation personnel as indicated may request releases against this Purchase Order.

3. Seller to invoice on a monthly basis, invoices to list purchase order number and release number assigned.

4. This agreement may be cancelled upon thirty (30) days written notice by either party.

5. Any substitution of material listed will require prior approval.

6. Approved Digital Equipment Corporation personnel are as follows:_____.

II CONTRACT PURCHASES

APPLICATION:

All materials with an expected life of at least six months and adequate volume/to gain either availability or cost advantages shall be examined in light of applying the Contractual Purchasing System. Only those materials with a proven record of acceptance, specifically quality, shall warrant consideration.

OPERATION:

The Inventory Control Section after usage analysis establishes the quantity of material to be ordered. The Purchasing Department then negotiates with a vendor stipulating unusual terms and conditions so that they are definite to the point of making any misunderstanding impossible. Since only written provisions are binding to both parties, a Contractual Order will have an acknowledgement copy signed by the vendor and any revisions of the order signed by the vendor.

The Purchase Order will state:

1. Price of material and any provisions applying to pricing, such as:

   A. Price based on market price at date of shipment

with reference to method of determining the "Market Price". A maximum price level shall be determined and noted on the face of the purchase order.

B. Sliding scale agreement with a fixed maximum price so that decreasing price structure may be applied.

C. If seller wished to retain a provision that he may increase prices, a thirty day or more period of notification to Digital Equipment Corporation prior to the effective increase for acceptance or termination by Digital Equipment Corporation. This clause should read, "Digital Equipment Corporation shall have the right to cancel this contract at any time in the event that such price revisions are not satisfactory to Digital Equipment Corporation with no cancellation cost."

2. Quantity of material ordered with specific notes to acceptable under or overshipments against individual releases. Maximum limits shall be established and noted on the face of the order. Excessive shipments against releases shall be returned to vendor. The total quantity of the order shall not be exceded unless specifically agreed upon causing a revision of the order. Material shall not be accepted from the vendor unless a definite release is issued.

3. The time period the order will be effective -- "This order will be completed over an approximate twelve month period, beginning_____."

4. Description of material shall be clear to the point no misunderstanding is possible. Specific instructions such as Vendor Specifications, Part Number, Prints, Test Reports, Standards, Certifications and Digital Equipment Corporation's Specifications shall accompany the Blanket Order.

5. The total dollars invoiced are not to exceed_____dollars.

6. Protective Clauses:

A. Termination: The following clause shall be included; "In the event only a partial of this order is filled due to the termination at the convenience of Digital Equipment Corporation, the price will revert to the increment price of that quantity received per your quotation dated_____." The exact price schedule shall be included on the Blanket Order.

B. The vendor shall give notice of material availability change thirty days prior to the effective date of change.

C. Digital Equipment Corporation shall have cancellation privileges for nonperformance except where nonperformance is due to acts beyond the vendors control, ie. Acts of God, etc.

7. Warranties of material shall be specifically stated if not covered by general terms and conditions.

8. Cancellation due to any cause shall be discussed with the vendor. Appropriate steps to terminate the contract are:

A. Notification to vendor of pending termination.

B. Discussion of liabilities.

C. Agreement to conditions of termination.

D. Termination in writing acknowledged by vendor.

MECHANICS OF THE SYSTEM:

An order is issued to the vendor and individual releases are issued against the order. The releases shall be numbered so that each shipment can be identified. The Inventory Control Section initiates a requisition and a release is issued to the vendor by the Purchasing Department.

FORMAT:

A standard Digital Equipment Corporation purchase order form #DF178 revised shall be used, unless the total dollar value or unique characteristics of the material warrant a specific "contract". A "contract" shall contain all the general terms and conditions of a standard purchase order, the special negotiated terms and conditions, and concur by application with the policy established herein.

Henry J. Crouse

INTEROFFICE MEMORANDUM

DATE March 19, 1963

SUBJECT

TO K. Olsen
cc: H. Anderson
S. Olsen
H. Morse
G. Bell
N. Mazzarese

FROM Arthur H. Hall III

On Friday the 15th of March a delegation from DEC accompanied a group from Foxboro, Natick to the Fitchburg Paper Company to discuss the timing and implementation of a business option for a process control system.

Persons present at the meeting:

Fitchburg:

Mr. G. Wallace 3rd.	President
Mr. R. T. Marquart	Asst. Treasurer
Mr. A. Hollander	Asst. to the President
Mr. H. Simpson	Head of Tab Room

Ernst & Ernst (Auditors to Fitchburg)

Mr. Spikker
Mr. Haynes

Foxboro:

Mr. R. Sonnenfeldt	General Manager
Mr. R. Fine	Manager of Operations
Mr. D. MacAvin	Head of Programming

DEC:

Mr. H. Anderson	Vice President
Mr. H. Morse	Programming
Mr. A. Hall	Computer Design Engineer

Preliminary conversations between Foxboro-DEC and Fitchburg, mostly through Mr. Hollander, had given us the impression that Fitchburg wished to time share data processing and process control, both to be operational at about the same time.

Foxboro-DEC had their reservations about this approach, preferring to deal directly with the process control problems and then later implement the data processing with Fitchburg having responsibility for this part of the system and programming.

Mr. Wallace and Mr. Spikker shared our attitude toward the data processing and preferred to add this part of the system up to a year after the process control is operational. Their first concern is to get three of their paper-making machines on full measurement (and later, control).

It seems, however, that before Fitchburg will make a definite commitment on the entire system they would like to have an estimate from Foxboro-DEC on the general manner in which we would handle data processing requirements. They would also like to know what equipment will be necessary, what percent of computer time will be used and what the possibilities of expansion are. Toward this end the following notes were made on present and proposed Fitchburg data processing load.

At present they have employed; the Director (Mr. Simpson) three girls full-time, one man full-time, and one man and one girl part-time. In the future they expect to release one of the full-time girls and employ the half-time man on a full-time basis.

Equipment

1. 2 key punches
2. a 1001
3. a key punch verifier
4. 2 402 printers
5. 1 083 sorter
6. 1 078 collator
7. 1 552 interpreter
8. 1 604 calculator
9. 1 519 summary punch

This equipment runs 8 hrs/day and 5 days/week. There is a peak load of 10 additional hours per week for a period of 4 - 5 weeks during January.

They expect in the future to reduce equipment charges by eliminating or reducing the capacity of one 402, eliminating a key punch, reducing the capacity of a 604 and eliminating the mark sensing feature of the 519.

The work presently being accomplished by the Tab Room is as follows:

Payroll

Check processing
Time keeping
There are 3 different pay categories and 3 different divisions (350 weekly, 100 monthly, 70 special)

Accounts Receivable
350-400 accounts active

Accounts Payable
1000 accounts

Sales Analysis Reporting
2000 cards/month (weekly, semi-monthly & monthly)

Personnel Records
A 100 character record per person (not including payroll)

Inventory Accounting
Raw material 2000 cards monthly
Finished products 5000 cards monthly

Stores Inventory
4,500 items now (2000 transactions/month)
6,000 to 7,000 items later

Sales Analysis
Cost Accounting
Sales Cost
Material Cost
Budgets
Expenses
Etc.

Plant Accounting (starts before end of May
Depreciation

Foxboro-DEC left the meeting with the feeling that we and Fitchburg were much more in agreement in objectives and methods than we had suspected.

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INTEROFFICE MEMORANDUM

H.S.C.

DATE March 19, 1963

SUBJECT Software for Type 57 Control & software for the Data Control 131 & Tape Control 510 combined.

TO
K. Olsen
H. Anderson
G. Bell
B. Beckman
J. Atwood
J. Shields
S. Lambert
D. Morse
A. Kotok
T. Stockebrand
L. Hantman

FROM Roland Boisvert

There has been no definite decision as to the amount of software provided and what this software will be on either tape control. I would like to call a meeting, therefore, Thursday morning at 10:00 in Harlan Anderson's office to discuss this. The purpose of the meeting is to consider a proposal for providing all new IO gear with software in appropriate customer usage format, DECAL, MACRO, FORTRAN, etc.

Alternative A.

In brief, I propose that the basic programming manual be written by the responsible engineer at which time it is turned over to Dit Morse's group for conversion of all basic subroutines to customer usage language. That Dit's group rewrite the program manual so that it contains conversion instructions, along with DEC Library specified conversion program appropriate for different customer usage, FRAP - DECAL, MACRO, etc.

Alternative B.

That all future diagnostic programming be done by the engineering program group and these programs be listed and distributed as a function of present Program Library.

dec INTEROFFICE MEMORANDUM

H.E.G.

DATE March 19, 1963

SUBJECT IBM Discount

TO K. Olsen
H. Anderson
G. Bell
A. Hall
All Sales Personnel

FROM N. Mazzarese

It has come to my attention that IBM is no longer offering a 60% Educational discount. They now offer only 20%. This, of course, will be a great help to us in selling the PDP-4 to educational institutions, especially against the 1620.

NM/jr

copy to KHO, HEA, SCO, W Hindle, H. Horse

dec INTEROFFICE MEMORANDUM

DATE March 15, 1963

SUBJECT Conference at Massachusetts General Hospital

TO Nick Mazzarese FROM Gerry Moore

Purpose of Conference: To discuss problems in computer program at M. G. H.

Conferees: Dr. Frank Ervin, M.G.H.
Dr. Sol Aronow, M.G.H.
Dr. John Myhill, M.G.H.
Mr. Stephen Lorch, M.G.H.
Mr. Vincent Foxworthy, M. G. H.
Mr. Gerald T. Moore, DEC

The time is rapidly approaching when M.G.H. must decide whether they will retain the PDP-4 beyond the one year free loan period. If they wish to retain the computer they must soon begin the preparation of a grant request to N.I.H. Naturally, the proposal to N.I.H. must substantiate the need for the computer at M.G.H. Since I feel so much of our success in the bio-medical field will depend upon the success of this pilot installation, I believe it is extremely important to take stock at this time to evaluate problems that exist with respect to the M.G.H. installation.

So far computer usage at M.G.H. has not been sufficient to easily justify the PDP-4 in an N.I.H. proposal. Frank Ervin has said that, had they purchased the machine, they would have to admit that at this point they are losing money.

The reason for this is largely because they have not learned to effectively use the computer. With the exception of Vincent Foxworthy, there is no one at the hospital that has a good knowledge of programming, and the PDP-4. Foxworthy will very likely be leaving shortly for a higher paid position with IBM. Dr. John Myhill is learning programming, but he is just a beginner. His research keeps him busy and he cannot afford to become tied up very heavily in programming problems.

Dr. Myhill's position is typical of many at the hospital. The researchers who would be using the computer will require a high degree of program versatility in their work. They will be constantly modifying programs or writing new ones. And yet, they cannot afford to take time from the main effort of their research work to get involved in long programming jobs. Programming must be extremely simple for them. Hence, Fortran is a most important tool. They are very anxious to obtain Fortran from us. Dr. Myhill, in learning to do some PDP-4 programming, wrote an excercise program which takes a group of scrambled numbers in successive storage registers and reorders the numbers in ascending order. The program, together with

teletype input and output routines and decimal-to-octal-to-decimal conversions, required about three pages of Flexo typescript. Dr. Myhill had some previous Fortran programming experience and said that he could have written the same program in Fortran language with seven statements.

Steve Lorch has been teaching a course in PDP-4 programming at M.G.H. for several weeks. Nearly 50 attended his first session. Attendance has gradually dropped off to the point where only 3 or 4 attend. He attributes this to the difficulty of programming the PDP-4 in machine, or assembler, language. He believes he would have maintained much more interest if he had had Fortran available. Myhill and Lorch think that without Fortran 2, 3 or 4 people at M.G.H. will be interested in using the PDP-4. With Fortran perhaps 20 or 30 people will be interested in using it.

Dr. Frank Ervin says that the largest seller of computers in the bio-medical field has been CDC with the 160A. He attributes this to the availability of Fortran for the 160A.

Dr. Sol Aranow says that even he might consider programming the PDP-4 when Fortran becomes available.

The reason I have mentioned the remarks of all these people is not simply to provide an argument in favor of writing a Fortran compiler for PDP-4. I realize, of course, that we are presently doing just that. I merely mention these cases to demonstrate the importance of maintaining a high priority on Fortran and of releasing any useful section of Fortran as soon as possible.

Other software problems exist at M.G.H. which can be solved prior to the availability of Fortran. Some subroutines which are required now are: exponential routine, natural logarithm routine, and arc tangent routine; all with double precision and floating point. It is my intention to start, with your permission, on Monday, March 18, spending a major portion of my time at M.G.H. I will plan to help them write the routines that they need and will arrange consultations for them with our programmers as required.

Irrespective of any help I can give them or any help Fortran will be to them, M.G.H. will still have a software problem. When Foxworthy leaves, they will have no one who is very knowledgable in programming. Ervin and Aronow suggested three possibilities to correct this situation:

1. DEC could assign a programmer to work full time at M.G.H. at DEC's expense for the next few weeks.

2. M.G.H. could hire a programmer, perhaps with DEC's help.

3. M.G.H. could retain Foxworthy if DEC would subsidize his salary. This would cost DEC about $100. per month.

M.G.H. is going to need someone on their staff who can program and who will be responsible for the proper care and feeding of the computer. I would like to urge upon them the second alternate above. I believe that their software problems will be licked with a greater consequent usage of the computer:

If I spend time helping them with their routines (with backup from our programming staff);

If Fortran is available to them soon; and

If they can be induced to hire a programmer whose sole responsibility is the PDP-4.

Their problems are not entirely in the field of software. Much of the work they have in mind to do requires extensive use of multiply and divide subroutines. Since they do not have the Extended Arithmetic Unit, computing time builds up fast. This factor is, of course, particularly important in real time applications. Consequently, they would like to have the Extended Arithmetic Unit. I suggest that we install this unit in the computer as soon as can be arranged.

Frank Ervin also sees the need coming for tape storage. He says that the X-ray diffraction work, for example, will require storage of large quantities of data. In this respect, I suggest that for now we indicate a willingness to lend a DEC Tape Unit to them for trial. We should tell them that we will make a firm commitment as soon as we know what deliveries we can promise on DEC TAPES. I would like to point out that such a loan would likely be for only about two months. DEC TAPES probably will not be delivered until September and M.G.H.'s free year's lease terminates in November.

dec INTEROFFICE MEMORANDUM

DATE March 14, 1963

SUBJECT Digitronic Reader Heads

TO Bob Beckman
Nick Mazzarese

FROM Bob Hughes

We have a lot of trouble with Digitronic readers because the 1N2175 photo-diodes in the head were very temperature sensitive and had poor signal to noise ratio. When Texas Instruments brought out the LS-400 (they also made the 1N2175) Digitronics switched over to this device and found that it was so good (the signal to noise ratio is one order of magnitude better than the 1N2175) that they found they could get rid of the plastic lens that they had used in the old heads. They agreed to replace any of the units that we were having trouble with, and we replaced a certain number of heads (I don't know how many) but I notice we are having a high incidence of trouble with readers in the field. There is a lot of lens readjustment and there are service calls for tape readers which result in no trouble being found.

I suggest that we should seriously consider replacing the heads in all of the machines in the field.

cc: H. Anderson
S. Olsen
D. Best
H. Crouse
E. Harwood
A. Blumenthal
L. Prentice
B. Savell

H. Anderson

INTEROFFICE MEMORANDUM

DATE March 14, 1963

SUBJECT Muffin fans

TO Bob Beckman
Nick Mazzarese

FROM Bob Hughes

We have made some life tests on muffin fans operating in an oven at 55° C and found that at 4000 hours one fan stopped and the other fan suffered speed loss. When the fan stops, there is a rapid temperature rise in the winding and it will burn out. When we oiled these fans, they worked as good as new again.

I suggest that we oil these fans when we do preventative maintenance on our computers and that we encourage customers to oil them if they don't have a maintenance contract with us. All the fans that we use are mounted in such a way that the fan must be taken off of its mount to oil it.

dec INTEROFFICE MEMORANDUM

SUBJECT: SDC Automatic Communications Control PDP-1 for Q32 Computer

DATE: 14 March 1963

TO: N. Mazzarese
H. Anderson
H. Morse

FROM: Ted G. Johnson, WCO

I. Systems Diagram and Description (see Fig. 1)

The PDP-1 will be used to control communication to and from the Q32 Computer to a large number of In-Out devices (starting at 50 or 100, skeptical but hopeful for further expansion).

Communication/data flow will actually take place between the Q32 Intermediate Core, which now acts as their In/Out Interface, and the PDP-1 (connected in turn to the I/O devices). Flow between the Q32 In-Core and PDP-1 can be considered as data. The control and data processing program will be stored in PDP-1 core.

The Q32 is a 48 bit word machine. The In-Core has 16K 48-bit words and will communicate with the Q32 CP and Main Memory during only a small (.01%) of Q32 time. Memory cycle time is 2.5 micro-seconds (Nice).

Present thinking is to consider transfers between In-Core and PDP-1 as 6-bit (character) or 18-bit parallel transfers. In so doing, the In-Core will basically be (to the PDP-1) a character store, and the PDP-1 interconnection will have to select 6-bit or 18-bit "bites". They would like to have the In-Core addressable, i.e., treated as extended memory to the PDP-1.

The registers in the In-Core System are:

50 bit Memory Buffer (48 + 2 parity bits, one for each half word)

15 bit Memory Address Register (14 bits + 1 parity)

The Q32 is basically a pulse machine, and its pulses are just about our 10 mc. pulse (40 ns., -3½v, less than 1 v. O.S.)

The 2.5 usec. R/W cycle has 16 evenly spaced pulses throughout the cycle. I believe TP_0 is start cycle, TP_6 is start of Read, TP_{12} is start of Write. Both halves of word have associated odd parity and both must be satisfied during parity check in the cycle.

Apparently the actual core size seen by PDP-1 will be 8K, based on a 4K PDP-1. If there is need for expansion, both will be increased.

In the 6 bit (character) mode, which will presumably take up most of the data transfers and storage, each 48 bit word will have 8 "bites", filling a full Q32 word.

In the 18 bit (PDP-1 word size) mode, 18 bits will be placed in each half-word, filling 36 bits of the 48. This requirement for transfers and storage could be more extensive than seen to date if they work very much with Light Guns, Displays and Magnetic Tape.

Functions to be performed on incoming I/O data by PDP-1:

I/O to PDP
1. Interrupt PDP-1
2. Transfer to PDP-1
3. Compare (examine) characters to see if they are any of 8 special action characters or are one of 6 deletable characters (Carriage Return, Line Feed, etc.)
4. Convert to standard code (Hollerith) for any of two or three codes.
5. Interrupt from Q32
6. Initiate Output Transfer on Interrupt to PDP-1 from Q32 In-Core.

Q32 to PDP
7. Convert
8. Transfer
9. Interrupt (signal) Q32 by PDP-1.

Types of I/O (Generally arranged by levels of priority):

1. Dataphone (block transfers)
2. TTY
3. Typ
4. Light Gun
5. Initiate (new user signalling entry)
6. Outputs

As seen to date, they will not want to interrupt within one level of priorities (i.e., Dataphone won't interrupt Dataphone). (I don't see this, assume design objective is not to allow TTY to interrupt Dataphone but allow all processing of all channels).

The Q32 In-Core will be divided into Channel locations, possibly 160 characters (20 words) per channel.

A major problem will be working with IBM on modifications of Q32 Control function and possibly gating of Memory Adders and Memory Buffer.

As I see this, each cycle that will mean a transfer between In-Core and PDP-1 MB will take place between PDP-1 MB and Q32 In-Core MB. All 48 bits (or possibly half-word-24 bits) will be held in the In-Core MB and logic-interface will select the appropriate bite. For example, to transfer a character from PDP-1 to Q32, the Q32 will read out a word to its MB when told by PDP-1 adders (MA-extended), and the bite select logic extension of the Memory Adders (PDP-1) will jam transfer into the Q32 word in one of 8 bite locations. This scheme, followed through, would seem to allow for consideration of Q32 core as PDP core with only logic considerations involved, if timing can be worked out.

It would appear that the PDP-1 could be slaved to the Q32 cycle very neatly, although this didn't occur to me at the time of our discussion.

They will want a rough quote and estimated delivery on:

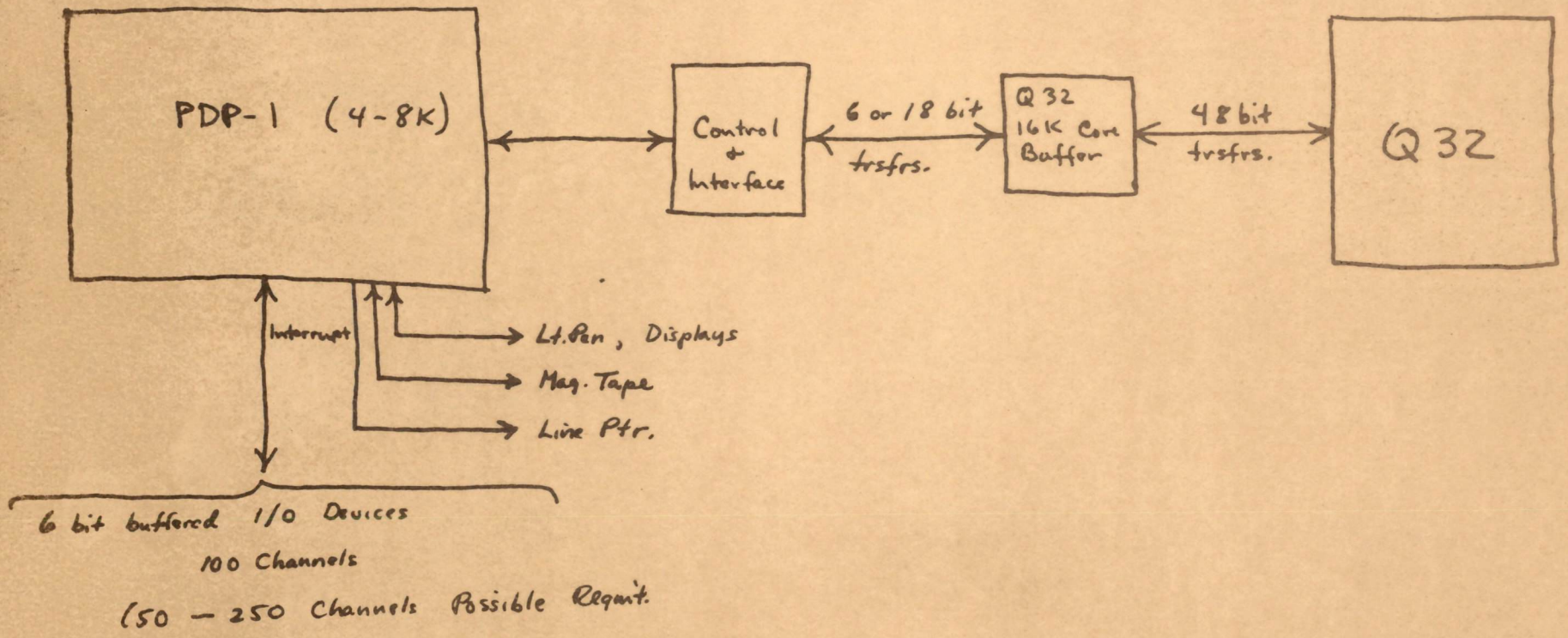
1. 4K CP
2. 100 Channels of I/O Line Unit (character buffered) devices.
3. Q32 In-Core Control (Expansion of Memory Addressing System and Logical Interconnection between Memory Systems).

Also, by item, they want quotes on:

1. IBM 729IV Tape Units
2. Line Printers (Holly and/or Analex)
3. Card Reader
4. Card Punch
5. Displays and Light Pen (not indicated, but presume possible interest).

Seems a shame that we couldn't do the drum-display work too, and combine this effort. We could have a Q32 smothered with PDP-1 Interface Equipment.

Ted Johnson



SDC PDP-1 (Q32 Peripheral Interface Computer)

INTEROFFICE MEMORANDUM

DATE March 14, 1963

SUBJECT Revisions of Twelve Month Forecast

TO Ken Olsen
Harlan Anderson

FROM George O'Dea
Dick Mills

I realize that one of your complaints about the present form of the Twelve Month Forecast is the fact that, at best, it only describes the conditions under a given set of circumstances.

Within the accuracy of any forecast of economic conditions, it can be altered in a matter of hours to approximate the consequences of any other chosen set of circumstances.

As an example, the attached copy of the Forecast issued 3/5 has been revised to indicate the probable cash strains of Failing to realize the Fiscal '64 portion of the Sales Budget by 10%. The answer is we'll need to borrow $600K rather than the $200K originally Forecast.

How accurate is this answer? In terms of cash balance it could be off a quarter of a million dollars at most – probably it will not miss that badly – well within our present line of credit at the Shawmut – not to mention AR&D.

Why such confidence in face of the fact that previous forecasts have gone so much out of line?

Firstly, the biggest cash distorting factor this year has been inventory input. Maynard responded beautifully to last Autumn's Inventory pressure. These input figures are just plain better than they used to be.

Why then figure a possible quarter of a million dollar cash variance? Strictly because of expenses. We're really guessing when we talk S, G&A, and Co. Sponsored Engineering. Were it not for Internal Revenue automatically cutting any P&L error in half, we'd need to double the range of cash variance.

Dick and Bob Dill are presently working on a Budgeting System which should chop this variance into a more reasonable package. Until they're set, the Forecast of expenses is just a hope.

One last bogey man is the possible conflict between the new computers being developed – and the old ones on inventory. The basic forecast of 3/5 paid lip service to this hazard by cutting $55K out of computer margins during the period 7/1/'63 thru 1/31/'64. If this proves inadequate then we're that much worse off.

George O'Dea

GO'D:ncs

H.A.

INTEROFFICE MEMORANDUM

DATE March 13, 1963

SUBJECT Trip Report - Chicago Area
February 18 to 22, 1963

TO H. Anderson
G. Bell
S. Olsen
N. Mazzarese

FROM John Koudela, Jr.

This trip involved direct and indirect computer sales efforts, computer market information collection, and checks on the employment availability of certain personnel.

The schedule for the week turned-out as follows:

Mon. 18	A.M.	None
	P.M.	Harold Rymer William Powers Dearborn Observatory Astronomy Department Northwestern University Evanston, Illinois
Tue. 19	A.M.	Warren Cordell Charles Curry A.C. Nielson Co. Chicago, Illinois
	P.M.	Herman Nelson Research and Development Department American Oil Co. Whiting, Indiana
Wed. 20	A.M.	Ben Zeidman Donald Hodges Physics Division Argonne Labs Lemont, Illinois
	P.M.	Henry Thacher Reactor Engineering Division Argonne Labs Lemont, Illinois
Thu. 21	A.M.	None
	P.M.	Kenneth Andresen Computing Center Armour Research Foundation Illinois Institute of Technology Chicago, Illinois

Fri. 22 A.M. Al Friedman
Robert Zieman
Autonetics Industrial Products
Chicago, Illinois

P.M. Gilbert Krulee
Dept. of Industrial Engineering
The Technical Institute
Northwestern University
Evanston, Illinois

Dearborn Observatory - Northwestern

1. Greater than 50 percent probability of getting an order for a large PDP-4 Computer System.

2. Have a signed AF Contract with definitely budgeted funds for complex system to perform Astro-graphic Analysis.

3. The data gathering system will consist of 12, sky-scanning, 35 mm cameras and will be located at an Air Force Base in Arizona. Each night, 7 days a week, for a 12-hour period, each camera will produce 20 inches of film consisting of 150 fields or frames. This film will be flown each day to the Dearborn Observatory where it will be processed and analyzed. The analysis will be performed by a film reader with an appropriate control and high-speed buffer, interfaced with a PDP-4 system. Analysis must take place in real time, that is, 23 seconds per field.

4. The contract allows a 2 1/2 to 3 year development period. It is necessary for us, therefore, to lease the PDP-4 system for a 3-year period at not more than approximately 85,000 dollars per year including complete maintenance (this is the budgeted amount for the computer system - not including the cameras, film reader, and film reader control-buffer-interface).

5. The PDP-4 Computer System is to consist of the following:

PDP-4B, with 16K Memory	$105,000
Additional 16K Memory	60,000
Extended Arith Unit	9,150
Real Time Option	8,000
Card Reader	14,900
Mag Tape Transport (1)	18,000
Mag Tape Control (57)	16,800
Typewriter	7,000
Paper Tape Punch	5,000
DEC-Tape (pair) and Control (semi-auto w/auto search)	18,000
Total Purchase Price	$261,850
Price with 15% discount	$222,572.50
Chandler's monthly rate 30.75 per thousand based on 6 3/4% simple interest	8,051.89
Maintenance .05/12 of total	1,091.05
Total monthly lease	$ 9,142.94
Total yearly lease	$109,715.28
Total yearly lease with 15% discount	$ 95,221.92

6. Northwestern will design the film reader and its control or let us do it if we so desire.

7. Obstacles to the Sale

a) The total yearly lease computed in item 5 above exceeds their budgeted amount by about 24,700 dollars. The solutions to this obstacle are mostly in their hands. My only suggestion to them was to write an educational discount justification letter to Andy. They assured me that such a letter would be forthcoming. Merely as an aid to evaluating a possible discount, it is interesting to note that a 15% discount would reduce the total yearly lease, including maintenance to 95,221.92 dollars which perhaps would be sufficiently close to their budgeted $85,000. On the other hand, since this deal is tied to an Air Force contract, can an educational discount be involved at all?

b) The ensuing 4-hour discussion did not reveal any signs of competition on this job. I suspect, however, that they are indeed looking at other computers. I feel, also, that to date, we are highly favored.

8. The important sales strategy to pursue with this prospect is as follows:

a) low-cost mass storage of star catalogs with DEC-tape.

b) the application, if any, of our knowledge of and the similarities between Northwestern's proposed system and PEPR and Fredkin's film readers.

c) the other strong interest for a PDP-4 at the Technical Institute of Northwestern (described later) whereby quantity discount and program interchange factors come into play.

9. To do: I have fairly detailed specks for their system. These should be evaluated to:

a) make certain the PDP-4 rather than the PDP-1 can do the job and how well in terms of time,

b) find out to what extent the ideas in PEPR and Fredkin's film readers would be helpful and relate this information to Northwestern,

c) determine whether or not we should propose to supply the film reader and control, just the control, or just the computer system, and

d) prepare and submit a firm price and technical proposal to Northwestern.

A. C. Nielson

1. This company collects, prepares, and distributes primary data (statistically speaking) covering the radio and TV fields. Secondarily, they conduct special surveys and analyze the data therefrom concerning consumer products and services. They are an outstanding leader in their field.

2. They have the following computers:

(1) Honeywell 800
(2) Honeywell 400
(1) Univac II
(1) IBM 1410

3. They are not currently a prospect for additional computer equipment.

4. The best possibility of their becoming a prospect to DEC is if they decide on on-line control and data collection of their TV auto-meter sampling system. This is a system used for establishing TV program ratings. It is interesting to note that one of their better competitors in this area (American Research Bureau - Arbitron, Beltsville, Maryland and N.Y.C.) has been using an on-line rating system for about two years.

5. To do: follow-up quarterly with Chuck Curry, Vice President of Engineering. He has complete PDP-1 and PDP-4 information and has, in a sense, left the door open to be kept abreast of future equipment developments at DEC.

American Oil

1. The R and D Department of American Oil is not currently a prospect for a computer.

2. They are in the process of replacing an IBM 704 for an IBM 7094. Dr. Nelson, in charge of this central computing facility, is respected by all other departments for his knowledge of computers. He can and does, therefore, influence the choice of computers anywhere at the American Oil Research Center at Whiting.

3. To do: follow-up quarterly. Dr. Nelson has complete PDP-1 and PDP-4 information and should be kept abreast of future equipment developments at DEC.

Argonne - Low Energy Physics

1. This Argonne Group is actively in the process of acquiring a computer for physics research including multi-dimensional analysis and data reduction.

2. They are a prospect in the sense that funds are available and budgeted and a small- to medium-sized computer will definitely be obtained.

3. The required equipment configuration is as follows:

   Computer with 4K core
   Paper Tape Reader and Punch Typewriter
   Cal-Comp Plotter (29.5 inch)
   Program Interrupt Capability (not specified exactly)
   Direct Data Input (e.g., through AC or IO in our case)
   Card Punch (nominal speed)
   Card Reader (nominal speed)
   Mag Tape Control Unit (200 cpi, 15KC)
   (2) Mag Tape Transports (Potter O.K.)
   Additional 12K Core Memory
   Floating Point Hardware or Software
   150 lpm Printer

4. Operating FORTRAN must be available at time of delivery.

5. Lease is mandatory; can only commit money one-year-at-a-time.

6. Gave them the following price estimates based on a 3-year lease period and including complete maintenance:

PDP-1 System	$9,557 per month
PDP-4 System	$8,680 per month

7. Their computer evaluation to date has been based on a long, confidential internal memo prepared by the Applied Math Division (Bill Miller's group). Four computers are compared in this memo and are considered to be in the price and capability range for the job. DEC computers are not included. The low-energy physics group had not heard of our computers, but we know the Applied Math group has. We were probably not included in the comparison because of our higher lease price and lack of a reasonable 1-year lease plan.

8. Although a 1-year lease plan appears to be desired, the memo gave lease prices for periods longer than 1 year:

   a) IBM 1620 (has already been eliminated)
   b) CDC 160A ($7,700 per month for 40 months)
   c) ASI 210 ($8,100 per month for 40 months)
   d) SDS-920 ($7,500 per month for 33 months)

   All prices include maintenance.

9. To do: To be considered, we should, as soon as possible, submit a firm price quote for a PDP-4 system with the shortest practical lease ~~price~~. period. I concluded that in spite of the restrictions noted above, there is some chance of doing a "sales job" here and hence the possibility of a sale. To be stressed, of course, is the fact that our lease price ~~dollars~~ allows for 24-hour per day, 7 days per week usage.

Estimated Price Quote

Item	PDP-1	PDP-4
Computer w/16K		
P. T. Reader, Punch Typewriter	$160,000	$117,000
Cal-Comp 29 1/2"	~ 12,000	~ 12,000
RTO		8,000
AU		9,150
Card Punch & Control (100)	~ 20,500	~ 20,500
Card Reader & Control (200)	14,900	14,900
MTCU	7,000 (54)	7,500 (51)
(2) MTT (6% discount on ea.)	33,840	33,840
300 lpm w/buffer	~ 28,000	~ 28,000
Totals	$276,240	$250,890
3 year lease w/o maintenance $30.43 per thou	8,405.98	7,634.58
maintenance .05/12 per month	1,151.00	1,045.38
Total monthly	$9,556.98	$8,679.96

Advantages: 24 hr/day, 7 days/wk usage

At end of 36 months, buy entire system for 9%: PDP-1 $24,861.60; PDP-4 $22,580.10

10. Saw ASI - 210 now in physics department. Met and talked with Don Hodges and two ASI field engineers. A mag tape control unit and one tape transport (Potter 906 - II - 1) was being installed. Recently finished was a rather major machine modification to take greater advantage of the 210's 2 us memory cycle time. Almost all instruction times have been reduced. Add, for example, now takes 6 us total. The ASI field engineers indicated that this modification would be standard on all future 210's. Hodges and others stressed the fact that they were extremely pleased with the ASI 210.

Argonne - Reactor Engineering

1. This was primarily a market survey call rather than a sales call. Dr. Thacher is highly informed in the areas of computers, programming, and mathematics. His suggestions and opinions should be carefully considered.

2. Argonne has apparently given up with IBM. They have given an order to CDC for (1) 3600 and (3) 160A computers. The 3600 and one of the 160's will be housed in a new building soon to be built (these will be under the jurisdiction of the Applied Math Division). This 160A will perform I/O support for the 3600. Another 160A will replace an LGP-30, which has been operating for 4 1/2 years, in the Reactor Engineering Division. The other 160A will be in the Physics Division. All three 160A's will have a fair amount of on-line I/O gear.

3. Dr. Thacher confirmed the fact that Argonne personnel using the ASI-210 are extremely happy with it and with the service they are getting from ASI.

4. Much of Thacher's work is in the area of numerical analysis. He, therefore, tends to rank computers according to their arithmetic capabilities. His ranking criteria in order of importance is:

   a) extent of arithmetic instructions.
   b) word length
   c) speed
   d) I/O capability
   e) price

   Of the machines we discussed, his ranking was as follows:

   a) SDS-920
   b) ASI-210
   c) PDP-1
   d) PDP-4
   e) CDC-160A

5. An ALGOL 60 type of compiler called ACT-III has been written for the LGP-30. Considering the limitations of the LGP-30 and the merits of the ACT-III compiler, this was quite a feat. More surprising was the fact that ACT-III was written entirely by Professor Tom Curts and four of his students at Dartmouth. Perhaps one or more of these four students would be interested in becoming DEC programmers.

6. Dr. Thacher suggested that no group of scientific programmers should be without the following publications:

   a) Hastings, Digital Approximations (DEC has this in its library)
   b) Mathematical Tables, Volume 5
      Chebyshev Series for Mathematical Functions
      National Physical Laboratory
      London: Her Majesty's Stationery Office, 1962
      By C. W. Clenshaw
      (DEC does not have this, but should)

c) Approximations to Common Mathematical Functions
(Rice, Hart, Witzgall, Mesztonyi, Thacher, Lawson and Fraser)
to be published December 1963. (See paragraph 7)

7. The forthcoming book by Rice, Hart, et al will completely replace Hastings' book. The approximation functions will be particularly useful to PDP-1 and PDP-4 users because they will decrease the running time of double-precision fixed and floating point subroutines by a factor of three. In addition, accuracy, in most cases, will be improved. I strongly recommend that our programming group write subroutines for each function presented in this book for both the PDP-1 and PDP-4 (in double precision floating point). It is possible to get a jump on this project almost immediately by contacting Professor John Hart, Computer Sciences Department, The University of Western Ontario, London, Ontario, Canada. Hart has many of the functions and their coefficients ready now.

Armour Research Foundation - I.I. T.

1. This facility is not currently a prospect for additional computer equipment. They have one Univac II and one IBM 7090.

2. Since ARF is well respected in the computer field, many prospective buyers rely on them for equipment evaluations and recommendations.

3. Mr. Andresen has great technical competence in the computer field and appears to be one of the key figures at the ARF Computing Center. He truly wanted to be well-informed about DEC products to the extent that we spent 6 hours in technical discussion. I think the visit was most worthwhile.

4. To do: Keep Mr. Andresen well informed about future equipment, software and price information.

Autonetics

1. The purpose of this call was to extract market information from another small computer manufacturer's sales office and to check on the availability of certain personnel for possible employment with DEC.

2. Personnel contacted and their backgrounds are as follows:

B. Allan Friedman - Midwest Regional Sales Manager for Autonetics Industrial Products (Recomp II and III sales). He has a B.S. degree in mathematics; 2 years as Technical Sales Representative with Electro Data Division of Burroughs (old name for computer division); 3 Years as Applications Analyst for the LGP-30 with Royal McBee; and 1 year in his present position. As Sales Manager, he supervises 5 Sales Reps, 3 programmers, and 5 field Engineers (one of whom is Midwest Service Manager). Having known him for 6 years, I judge him to be a highly intelligent, conservative, but decisive soft-sell type who would most capably advance the philosophy and goals of DEC.

Mr. Friedman indicated that Autonetics does not appear to be interested in expanding their commercial computer efforts. Apparently, they are not developing a new computer. Therefore, he is interested in investigating employment with another computer manufacturer. DEC's lack of commission plan does not disturb him in the least. He would prefer to stay in Chicago.

Mr. Friedman may be contacted as follows:

Office
Suite 1506
1 East Wacker Drive
Chicago 1, Illinois
321-0230

Home
104 Tuttle Avenue
Clarendon Hills, Illinois
325-2439

Robert Zieman - Midwest Service Manager for Autonetics Industrial Products (maintains Recomp's II and III). He is a high school graduate with 2 years electronic technician education at DeVry in Chicago; 3 years as Field Engineer for LGP-30 (Royal McBee) and 3 years as Field Engineer and Service Manager for Recomp. As Manager, he supervises 4 field engineers. I have known Mr. Zieman for about 6 years and recommend him highly for a position as Field Engineer for PDPs in the midwest.

Mr. Zieman may be contacted at the same office address as Friedman or through Friedman at his home.

Industrial Engineering - Northwestern

1. About a 25% chance of getting a PDP-1 or PDP-4 order. Probability depends greatly on whether or not DEC offers an educational discount and how much and whether or not the Astronomy Department orders a PDP.

2. Industrial Engineering is in the Technical Center. The Center has (1) 709 (has had it for 1 1/2 years now and it's on 2 shifts) and (1) LGP-30 (shared by the Industrial and Electrical Engineering Departments).

3. More departments within the Technical Center are now interested in the small-to medium-sized computers (e.g., civil engineering, physics, chemistry, etc.) and those departments using the LGP-30 feel it has now become inadequate.

4. A committee has been formed to investigate all of the small computer requirements of the Technical Center. Professor Krulee is chairman.

5. Professor Krulee visited OAL and BBN about 6 months ago and is particularly interested in a PDP-1 or PDP-4 with a drum and time-shared typewriters. He feels that this approach may satisfy all interested departments with a single computer. Later, remote paper tape readers and punches would become of interest.

6. Secondarily, Professor Krulee is interested in on-line A to D to A converters and display devices.

7. Professor Krulee said he would get together with Astronomy personnel to discuss PDP's.

8. To do: Prepare and submit a straight price and technical proposal for a PDP-1 and PDP-4 time-shared system (to indicate comparative prices) with drum and four to six typewriters. Sell the proposal by personal visit and get them to write an educational discount justification letter to Andy. Chances are they will wait and see what Astronomy does (and Astronomy is obligated to the Air Force to move quickly).

9. The two interests at Northwestern are naturals for us that competition such as SDS would find difficult to do at this time. I believe that if we can afford to offer some education discounts, we can place a strong foot in the midwest computer market door via Northwestern University.

INTEROFFICE MEMORANDUM

DATE March 13, 1963

SUBJECT DECAL/BBN/DEC

TO K. Olsen
H. Anderson
N. Mazzarese
D. Morse

FROM Gordon Bell

I talked with Tom Marril and Dick McQuillan regarding the finale of DECAL. They might provide:

1. Clean symbolic tape of DECAL
2. Programming Manual
3. Technical Manual

There exists:

1. A tape, DECAL BBN which does everything -- without a clean symbolic tape.
2. A first draft of programming manual.
3. Two chapters of maintenance manual on 1.
4. A brand new DECAL program written by BBN-LA which is better, with a clean symbolic but not complete.
5. A new linking loader.

The current pessimistic estimate of time:

40 days McQuillan

10 days Dave Park

30 hours computer time

technical typist

$7900

We would be buying:

1. 2nd draft programming manual.
2. Completed draft of technical manual.
3. Program features to be added present new BBN-LA tape.

BBN, formerly the magnanimous BBN, has been receiving government support for DECAL and as such hasn't needed our support. Their funds have run out, and they would like to finish the jobs.

They would not handle the job for a fixed fee, with fixed delivery date. (But then everyone knows that research just can't be subjected to delivery dates, money, etc.

DIGITAL EQUIPT CORP ATTN H E ANDERSON VICE PRES MAYNARD MASS

ESC978 REF OUR REQUEST FOR QUOTATION DATED 2-28-63.
CLOSING DATE FOR SUBMISSION FOXXX OF PROPOSALS HAS BEEN
EXTENDED TO 3-13-63

E V JOHNSON PURCHASING SYSTEM DEVELOPMENT CORP

912A

RWU 001

5/'

INTEROFFICE MEMORANDUM

DATE March 12, 1963

SUBJECT Talk on PDP-4

TO Gordon Bell
cc. Harlan Anderson

FROM Elsa Newman

Time is running very short for including your talk on the PDP-4 in the 1962 DECUS PROCEEDINGS. The abstract you gave me in May, when you spoke at ITEK is quoted below:

PROCESS CONTROL APPLICATIONS OF PDP-4

Summary: The PDP-4 is designed to operate as a module for a large majority of process control applications. In terms of these applications the interface capabilities allow PDP-4 to be connected to the process, or to Input/Output equipments, with a minimum amount of extra hardware in a relatively straight forward manner.

The PDP-4 configuration, in terms of the above design constraints is described as well as the specific interface terminals, their polarities, timing and operation with the program. The terminals include Device Selection, Information Collection, Information Distribution, Program Interrupt, Data Interrupt and Real-Time Clock.

The command structure of the processor, the memory and the console are also described.

Do you think you could whip up two or three pages that would represent a brief talk.

I do not have anything from Dit Morse on his presentation in October 1962 on "A brief description of the PDP-4 Assembler and DDT-4".

It would be helpful in encouraging PDP-4 user participation if we could have one issue of DECUSCOPE devoted entirely to the "little brother". I'd like to make it the May or June issue.

- -

Please reply to this memo by checking items below. Tear off and send to me.

YES	NO	
		1. I will send you 3 or 4 pages before March 20.
		2. Dit Morse will send a few pages on PDP-4 Programming System before March 20.
		3. We will think about a "Little Brother-PDP-4" issue.

INTEROFFICE MEMORANDUM

DATE March 12, 1963

SUBJECT Installation of PDP-1C-33 and Display at Raytheon, Wayland

TO H. Anderson ✓
N. Mazzarese
B. Beckman
R. Reed
K. Fitzgerald
R. Savell
S. Olsen
G. Bell
E. Harwood
J. Smith
D. Chin
H. Millman
D. Pinkney

FROM Jack Shields

The PDP-1C-33 was delivered and installed at Raytheon, Wayland on February 28, 1963. After initial checks and power turn on, an attempt to read in Main Dec I (instruction test) failed. Application of negative margins on the reader feed hole amplifier corrected the read in problem. A quick check of the computer with appropriate diagnostic tests was successful and power was turned off.

Arrived at Raytheon at approximately 8:50 A.M. on March 1, 1963 to perform acceptance test on PDP-1C-33. The reader feed hole amplifier gain was decreased in order that programs would read in properly when the computer was first turned on.

The acceptance tests ran perfectly with two exceptions:

1. Checkerboard program failed once after operating for approximately 20 minutes. Checkerboard program was then retested and margins were applied in appropriate areas of the computer to see if the failure could be induced. The margins had no apparent effects so the test for checkerboard program was rerun - this time with success.

2. The same type failure and results as the afore-mentioned failure occured while running Mul-Div test.

The problems which occured were noted and the computer was accepted by Raytheon.

The software and installation kit were complete and helped make the installation proceed smoothly.

On March 4, 1963 arrived at Raytheon to investigate computer problems observed by Ralph Zaorski. Investigation found two flip flops which would fail intermittently. The flip flops were located in the accumulator, and program flag logic. I believe that these flip flops were the cause of the acceptance test failure.

The display was installed at Raytheon on March 8, 1963, and would not operate when turned on. The cause of this trouble was traced to a bent 50 pin plug (female) on the display logic. The plug is the one which makes the connection between the display and the I/O cable. It was "repaired" with a pair of vice grips, however, I feel we should try to determine if this happened at DEC or in shipment. The light pen was also inoperative. This is the third defective light pen/amplifier combination in the last four displays installed in the field.

INTEROFFICE MEMORANDUM

R.F.G.

DATE March 12, 1963

SUBJECT

TO K. Olsen
H. Anderson
W. Hindle
R. Best
S. Olsen
N. Mazzarese
D. Morse
S. Grover
S. Lambert
R. Boisvert
R. Savell
All Sales Personnel

FROM R. F. Maxcy

Price of The Holly H-207 300 line per minute 120 column printer and control with single line buffer has been set at $28,900.

dec INTEROFFICE MEMORANDUM

H.S.G.

DATE March 11, 1963

SUBJECT PDP - ? and PEPR

TO Harlan Anderson FROM George Rice

The general feeling among most Physics Departments in many Universities is that PEPR will work some day. Even if it doesn't succeed at its proposed function it might still prove to be a valuable tool for future nuclear research. In other words if PEPR fails to read high resolution bubble chamber films it may still far out perform anything now available for spark chamber film reading.

One Doctor of Physics told me that the potential for PEPR is around twenty systems and that the majority of them would prepfer to purchase a complete system. This means all of the electronics should be performed by DEC and the optics probably left to the individual experimenter.

At the present time the PDP-1 and PEPR run at about the same speed. Anything which runs slower than the PDP-1 would make the PEPR system computer limited. However, the PDP-1 is becoming less appealing to researchers for general purpose scientific computing. Anyone who desires a PEPR system would probably favor the PDP-1 because of the availability of program support from MIT. The danger lies ahead that some University may obtain a more competitive computer for general purpose laboratory work than want to expand to a PEPR system without changing the computer. If this happens and the University takes upon itself to reprogram the PEPR programs in another machine's language, then the PDP-1 may lose all its appeal. The PDP-4 may be a promising solution to this problem, but only as promising as its potential to run with a faster cycle time. The present PDP-4 probably would make the PEPR system computer limited. If the PDP-4 can be speeded up it might very well perform the PEPR control better than the PDP-1. The PDP-4 certainly is a more appealing computer to many a person because of its simple interface and the availability of Fortran. One of the first problems for the PDP-4 would be to have someone reprogram the PEPR control in its language. It should be simpler to go from PDP-1 to PDP-4 than it is to any other computer. Of course, if the PDP-4 cannot be run faster, then it may never move into this market.

Another danger to the success of the PEPR system is the fact that some laboratories are planning research with the 7094 and special equipment. This method may prove to be the better way to read bubble chamber films. However, the 7094 makes this a much more expensive approach. Many Universities are not in a position to afford computers of this size. When the CDC 3600 becomes available things may change considerably. The CDC 3600 instead of a 7094 will cause considerable speed up in this other approach and at the same time reduce the cost significantly. The possibility that DEC could come up with a PDP-? in the 200K range might cause one of two changes to occur. One, the PDP-? might replace the CDC-3600 in its application and cause even more significant cost savings. It seems unlikely that a PDP-? could replace the CDC 3600. The second possibility may be that the PEPR and PDP-? may go together. However, the cost factor in favor of a PDP-1/PEPR vs CDC-3600/special system would be reduced. In order to take advantage of the lower cost for PDP-1/PEPR someone might try SDS/PEPR or some other similar approach. If this ever happened then someone might try a xxx/yyy and DEC would lose all this business.

INTEROFFICE MEMORANDUM

COMPANY CONFIDENTIAL

DATE 3/11/63

SUBJECT Computer Sales Forecast

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

FROM N. Mazzarese

PDP-1	Quantity	Value	Probability	When
CRC	1	97K	100%	0-3
BBN	1	600,000	50%	0-3
Lincoln Labs.	1	200K	75%	0-3
Princeton	1	250K 100 move	100% 95%	0-3 3-6
Stanford	1	280K	75%	0-3
PDP-4				
Foxboro (Fitchburg)	1	160K	98%	0-3
Foxboro (Westinghouse)	1	120K	50%	0-3
JPL	3	250K	90%	0-3
AECL	1	200K	75%	0-3
Worcester Foundation	1	80K	50%	3-6
Bell Labs.	1	80K	50%	3-6

Less than 50% 0-6 Months

		Type of Machine
Univ. of Rochester	200K	PDP-1
Systems Development Corp. (Info. International)	300K	ADX
Sylvania	Rental	PDP-1
Litton Systems	80K	PDP-4
Michigan Univ.	120K	PDP-1
Maryland Univ.	120K	PDP-1
Raytheon Co.	120K	PDP-1
Rutgers Univ.	250K	PDP-1
V. P. I.	50K	PDP-4
Foxboro	90K	PDP-4
Data Trends	250K	ADX

NM/jb

Revision on Monday, April

dec INTEROFFICE MEMORANDUM

DATE March 8, 1963

SUBJECT BBN, DEC, PDP-1, and PDP-6

TO Kenneth H. Olsen
cc: ✓Harlan E. Anderson
Nick Mazzarese
Gerry Moore

FROM Gordon Bell
Gerry Moore

Gerry Moore and I have just talked with Shelley Boilland, and find:

1. R.R., IBM, and 3C are intended in supplying the hospital system.
2. Shelley is visiting 3C's next week in Los Angeles.
3. J. Weisner is visiting BBN in regard to Time Sharing on March 26th.
4. BBN likes to work with DEC.
5. BBN is irritated with DEC policy because:
   a. Uncertain about time sharing
   b. They want a partner to exploit the 4000 bed hospital system (700 potential buyers)
   c. Appear disinterested, and hence feel we are trying to write off engineering on the first unit
6. They would like for PDP-1 system:
   a. lower cost teletypes
   b. DEC to do large bulk storage and not write off engineering on first unit
   c. More general enthusiasm by top management
7. The possibilities for a relationship with BBN include:
   a. BBN acts as software developers
   b. BBN acts as a marketing agent (over which we have no control)

8. DEC might:

   a. Enter negotiations with BBN for joint development (BBN do software)

   b. Sell PDP-6 to BBN, (and in turn hire BBN to do some hardware development)

   c. Be more interested and awed by BBN's achievements (WOW,------just Wait.....till you see DECAL).....

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dec INTEROFFICE MEMORANDUM

DATE March 8, 1963

SUBJECT Upcoming deadlines for technical conference papers

TO R. Best
J. Fadiman
G. Bell
H. Morse
T. Stockebrand
R. Doane
R. Savell
A. Blumenthal

FROM Stu Grover

CC K. Olsen
H. Anderson
S. Olsen

I would simply like to remind you that deadlines for two conferences of interest are approaching, should anyone have organized thoughts that could be put on paper, contribute to the state of the art, and advance the fame of DEC. The conferences are:

WESCON	Aug. 20-23	San Francisco	Submission D/L 15 April
ACM	Aug. 27-30	Denver	Submission D/L 15 April

I have the essential information on these meetings and will be pleased to provide any writing, editing, or preparation services requested.

dec INTEROFFICE MEMORANDUM

DATE March 7, 1963

SUBJECT Re: Your Memo February 22 Concerning Computer Standards & LRL Troubles

TO Ken Olsen FROM Arthur Hall

✓H. Anderson
G. Bell

LRL

The trouble in the LRL system (according to Bob Savell) was noise generated by an IBM 650 and transmitted along the AC power line. Scope readings taken at the PDP-1 with the scope plugged into the line attached to the 650 showed 10V peak-to-peak noise at 10 mc. After the 650 had been isolated from other systems with a 1-1 power transformer, the noise could be seen only when the scope was plugged into the IBM side of the power system.

Computer Standards

AC power color code standards had been distributed to all engineers and technicians shortly prior to your memo. Drawings and models are being changed to reflect the new code.

Factors which will affect the efficiency with which we can manufacture and service future computers are;

Drawing System

The numbering system used for PDP-4 is an improvement over PDP-1, however, it is inadequate to handle computer revisions in a non-confusing manner.

Briefly, the trouble comes when all computers must be given the same modification some time after a number of individual computers have been changed uniquely. In view of the fact that virtually no two computers in the field are identical (nor are they likely to be in the future if we retain our flexibility) the most efficient solution to the problem would seem to be in a separate set of sepias for each computer with the drawing numbers distinguished by inclusion of the serial number of the computer. The cost of the large number of drawings initially required would be swallowed later by the savings in man hours now spent by Customer Relations, Checkout, and Production in trying to figure out the correct configuration of any given computer.

Notice of computer modifications initiated and completed are now circulated in a haphazard manner or not at all. No one ever seems to know which modifications

are in any given machine at any given time. As some mods depend on prior mods, this can be confusing to Customer Relations (and to Production).

There is some opinion that some of our mechanical prints and layouts are unnecessarily elaborate and expensive. The extent to which the mechanical configuration must be represented on drawings should be decided before the computer is launched.

Methods

The exact purpose and limitations of a computer should be formally defined before drawings, etc. are started. This will allow other personnel to start defining programs, manuals, acceptance tests and environmental limits before the computer is finished.

The method used to account for labor and parts costs and the EN #'s assigned to various phases of development should be carefully thought out before further work is done. This is an excellent opportunity to find out exactly what our development and production costs are for each phase of work and to see how they change with time and increased production. The means to do this well are available if it is organized properly. If the costing system is integrated with the Job Analysis System (for detailed labor accounting) it will be possible to check quite precisely how our original development and production labor estimates compare to the actual costs.

INTER-OFFICE MEMORANDUM

March 7, 1963

SUBJECT

TO K. Olsen

FROM Arthur Hall

cc: H. Anderson, R. Best, D. White, A. Blumenthal, R. Hughes, J. Cudmore, E. Harwood, N. Mazzarese

The Foxboro Company has requested that DEC raise their temperature guarantee for the PDP-4 above the present level of 105 degrees F. Their declared motive is the competition from people using the SDS-910 computer which has a guarantee of 120 degrees F. In view of the (apparent)fact that Foxboro has for the past week been talking with SDS about replacing our computer with the 910, we should quickly decide whether or not we wish to undertake the tests necessary to determine how much we can raise our temperature guarantee.

Following are some pertinent facts:

Our module models are tested to 55 degrees C (131F) but only for brief periods of time. We have, thus, a reasonable assuracne that the modules made after the models will operate at 131F but we do not know for how long.

Tests made by Al Blumenthal some time ago on a PDP-1 memory suggest that the temperature at which the memory stack's reliability becomes suspect is in the range of 105 to 115F. Stacks have improved since the tests were made. Also the cores are not interrogated as frequently in the PDP-4 as they are in the PDP-1. Therefore, while we know that a reasonable memory stack temperature guarantee is better than 105F, we do not know how much better.

Heat tests accomplished on the PDP-4 now at Foxboro, Natick demonstrated that the computer could operate for at least short periods of time at around 115 degrees with short heat excursions higher. For one short period the temperature at parts of the memory was an estimated 120-125F. The only failure noted was that a 1973 went into oscillation and had to be removed. At no time was a stack failure noted.

We do not know if SDS guarantee of 120F is for steady-state operation or for only a limited period of time. If (or when) we arrive at a new guarantee, should it be for steady-state operation or for a limited period of time?

Tests to determine a reasonable upper temperature guarantee should involve running at least three computers at the proposed temperature limit for at least three consecutive 24-hour periods. Detailed temperature measurements shoud be made at all crucial circuit points. Margins should be run before, during the first part, during the last

part and after the heat test. The memory sense amplifiers should be properly adjusted before the test and the degree of re-adjustment after the test should be recorded. A computer test program such as contest should be run during the tests.

dec INTEROFFICE MEMORANDUM

DATE March 7, 1963

SUBJECT March DECUSCOPE

TO Jack Atwood

FROM Elsa Newman

cc. Bob Beckman
~~Ken~~ Olsen
Harlan Anderson

1. I am very sorry that I was unable to prevent the retyping of what I considered a "good" paste-up of the March issue of DECUSCOPE. Helene had agreed that she would accept a paste-up of the issue since we were following your "procedures" for the larger publication: DECUS Proceedings, 1962 and time is running out!

2. Although I have been persuaded by Bob Beckman that he has what he considers reasons for changing his mind after approving my paste-up, (which you or Helene found wanting) I still maintain the paste-up could have been photographed and DECUSCOPE completed by Friday. Our primary concern should be to get a readable copy of useful information to the user as soon as possible each month.

3. It is especially distressing that you insist on a piecemeal and time consuming procedure whose function adds little to the value of DECUSCOPE to its users.

4. Please return my paste-up which was submitted to Helene on March 4th. I would appreciate it, also, if you would let me know when I may expect to receive copies of DECUSCOPE for mailing to users.

INTEROFFICE MEMORANDUM

DATE March 6, 1963

SUBJECT PDP-6 Personnel Organization

TO Ken Olsen
✓Harlan Anderson

FROM Gordon Bell

Attached is the first page of a memo regarding PDP-4 dated May 22, 1962. If the memo had been vaguely perused and some consultation given me, PDP-4 might have gone more smoothly.

PDP-6 is a somewhat larger machine, and unless the project is started on a more business-like basis, it too could suffer from some of the same problems -- and loss of revenue might result.

GB/ll

May 22, 1962

SUBJ Status of PDP-4 Project/Request for Review

TO: Ben Gurley
Ken Olsen
Harlan Anderson
Stan Olsen
Richard Mills
Dick Best

FROM: Gordon Bell

Introduction:

I would like to review the PDP-4 project relative to production, sales, and engineering. The goal is to form a plan which can be carried out within the framework of DEC organizational policies (regarding growth, management, etc.). The most important factor in the formation of a plan is assumptions regarding sales for a certain production rate, (or production, assuming a certain sales rate). Therefore, I would like to discuss the sales-production schedule for the coming fiscal year in order that a profit and loss statement and general forecast plan can be made.

Prototype/Programming Status:

wow!

At this time, the PDP-4 prototype is ready to be turned over to the computation group of DEC for general internal use. The Anelex Line Printer is to be connected by June 15, and a Magnetic Tape System and Card Reader must be connected prior to June 15. A Card Reader/Magnetic Tape/Printer, PDP-4 should enable most of DEC's computational problems to be solved including addressing, payroll, and inventory control. A second DEC machine will be available July 7, for operation with the module testing operation. At this time, module testing with machine, though relatively straightforward, requires a large amount of peripheral equipment, design, and programming effort.

The MIT summer people, will devote time to module testing, DECAL modification, (PDP-1), PDP-4 software, and DEC computation problems.

Production Status:

actually WCO

The second PDP-4 will be ready for checkout in 2 weeks. The schedule is:

	From Production	Module Delivery	Customer Delivery
Foxboro-Nabisco	June 7		July 31*
DEC-Modules	June 21		July 1
Corning	July 5		Sept. 15

*Final delivery, actual delivery is July 1 to Special Systems Group for integration of system.

dec INTEROFFICE MEMORANDUM

DATE March 6, 1963

SUBJECT DECUSCOPE Production

TO Bob Beckman
Elsa Newman

FROM Jack Atwood

CC Ken Olsen
Harlan Anderson
Helene Shebak

We would like once more to propose a simple, three-step procedure for producing DECUSCOPE.

Step 1: We will type the copy justified to the proper column width and provide Xerox "proofs" for preliminary page layouts.

Step 2: We will retype any portions requiring changes or additions and provide supplementary Xerox "proofs" for final page layouts.

Step 3: We will do the mechanical (paste-up), photograph it for printing, and provide a "salt-print" of the photographic negatives for final approval before printing.

This procedure would allow the editor to concentrate her efforts in the areas of news gathering and writing rather than concerning herself with the routine production operations. However, she would have an opportunity to do both initial and final "make-up" and to review the publication just as it is to be printed before it actually goes to press.

This would also allow Tech Pubs to handle the job in a reasonably normal and orderly manner, to keep production costs to a minimum and to preserve the widely recognized sanity and good humor of our personnel.

DATE: March 6, 1963

TO: Personnel Committee FROM: J. Smith

During the past few months, quite a few of us have become concerned over the lack of personnel available to be promoted to supervisory positions. Along this same line of thought, it is my feeling that we should try and give our present supervisory personnel some type of training. What I intend to do is periodically distribute to my group leaders, some ideas which I feel will develop better supervisors. It is my intention to have the material reviewed by the Personnel Committee prior to distribution. What I hope the eventual outcome will be is a handbook or guide for new supervisors. My first subject is one of attitudes which I more or less consider my pet subject.

SUPERVISORY ATTITUDES, THERE EFFECT

J. Smith

The attitude of the supervisor exerts a substantial impact upon the productive efforts of his personnel. The attitude of the organization or group depends, to a very large degree, upon the one managing it, on whether his general attitude is such that he provides effective leadership which inspires cooperation and prevents conflict.

The more specific knowledge we have of attitudes, their effects and causes, including our own, the less we shall have to grapple with gripes. Attitudes are extremely basic since all employees feel before they think before they perform. Feelings or emotions are what attitudes are largely made up from. Supervisors must be sensitive from the very first minute of the work day to the attitudes of their workers and skilled in cultivating in them the proper feelings. If they are able to accomplish this, they will be better able to promote the correct thinking and adequate performance of their personnel.

An attitude is a readiness to react in a characteristic way to a particular person or situation. In other words, the individual has a preconceived viewpoint which will affect the way he sees the situation. For example, we tend to interpret favorably the actions of people we like, and unfavorably, similar actions of people we don't like.

Let us now look at some very good answers to some very important questions on attitudes:

I. <u>What is the impact of Attitudes on Personal Behavior and Production?</u>

1. Attitudes may cause us to act impulsively instead of thinking through a situation.

   If logic determines <u>what</u> we do, our attitude frequently determines <u>how</u> we do it. In other words, we might mentally accept a course of action, such as delegating responsibility, but our attitudes toward some of the individuals reporting to us may prevent us from carrying out this plan wholeheartedly.

2. We may appear to behave illogically because we react differently toward similar employee conduct since their frames of reference are usually based on results.

For example, an employee who tries something new and fails may be criticized for not following rules, while another who tries and succeeds may be praised for initiative.

3. Different underlying attitudes may cause behavior which appears inconsistent to others. Example: an individual who has one attitude toward his own actions and another toward similar actions of others is likely to talk and act inconsistently. In these cases where there is more than one attitude affecting the behavior, the expressed attitude often is not the true one.

II. How Can We Work With Attitudes?

1. In general it can be said that the most successful ways of working with attitudes will include recognition of the various basic sources of attitudes. That is, (1) a recognition that attitudes are caused and that these causes should be dealt with; (2) a recognition that since attitudes are based on experience, new conditions or experiences should be provided to effect changes; (3) a recognition that satisfaction of employee motives will usually help maintain or develop favorable attitudes.

2. Set up the over-all job conditions to provide favorable job experiences. These conditions might include such things as desirable work conditions, leadership that provides participation rather than domination, a friendly working climate, and fair treatment.

   In these job conditions another requirement is that the supervisor's own attitude must be favorable toward his people and toward the company. Action based on these suggestions would help meet the requirements mentioned above for working with attitudes. That is, it would deal with causes, provide favorable new conditions and experiences, and work toward the satisfaction of motives.

3. Since attitudes usually have an emotional content, they can often be changed through appeals to emotions: kindnesses, remarks, or other indications of friendliness. People tend to react unfavorably to things they don't understand. This doesn't mean that we can rely entirely on an informational approach, however, since the individual may express a justification for his attitude rather

than the real reason. In such an instance, additional information may merely force him to change his reasons rather than his attitude.

4. Changing an individual's role . . . This often results in a change in attitude because our motives are changed by being in a different situation, for example, when the employee becomes a supervisor or is given different work or more responsibility. Incidently, the provision of increased participation provides a change in role as well as means of satisfying motives. Transferring an employee is another way to change a role and may effect a change in attitude where other, more available methods have failed.

   The individual will tend to conform to the attitude of the group, and the new job conditions may provide favorable new experiences and satisfy motives.

5. Motivating attitude changes by pointing out the lack of rewards offered with the old attitude - for example, if an employee had an unfriendly attitude toward other employees the supervisor might point out how this attitude would interfere with his job progress.

6. Individual discussions are usually effective in changing attitudes. They permit clearing up misunderstandings, facilitate release of frustration reactions, and thus help the supervisor find the cause of the attitude.

III. How Can Changes In Attitude Be Brought About?

The following specific steps are suggested as possible means of working toward changes in attitudes:

1. Encourage friendly, open discussion.

2. Respect the sincerity and good faith behind the attitude. (The individual believes his attitude is justified.)

3. Avoid making a frontal attack on the attitude . . . or making value judgements. Saying: "You have the wrong attitude" will merely entrench it.

4. Supply facts and information as appropriate.

5. Lead the employee to see how a different attitude would satisfy his wants better.

6. Changing attitudes, with group-help . . . All of the foregoing suggestions for ways to change attitudes or to minimize their effect have assumed that the supervisor will work with the individual. Actually, the supervisor often faces problems of group attitudes and therefore he must decide whether it is better to work with the group or with each member.

   If he elects to work with members of the group individually, he has some advantages. He can adapt his approach to the motives of each individual.

   On the other hand, there are advantages to a group approach. The various reasons for an attitude held by individuals of a group may vary considerably and when expressed may not appear reasonable to the group. Again, group decision-making to change attitudes will be stronger than individual decisions because the entire group will support one another in making the change and in maintaining it.

   Frequently the supervisor will find that the compromise approach of having individual discussion (pre-conditioning) with one or two of the natural leaders of the group prior to a group discussion will be helpful in effecting a favorable change in group attitudes.

Conclusions:

1. We often speak of an employee's "having" a certain type of attitude, as though the attitude were a tangible and separate thing, in much the same sense that he might have a Chevrolet rather than a Ford.

   This way of speaking about it has led us to try to change "his" attitude by persuasion, sweet reasonableness, or attack.

   If we reflect upon the problem which faces the average employee of making sense out of his complex environment, we see that we should not think of him as "having" an attitude but rather as having organized his work and the world in a certain way.

DATE March 5, 1963

SUBJECT

TO K. Olsen
H. Anderson
S. Olsen
G. Bell
M. Sandler
E. Harwood
R. Melanson
W. Hindle
T. Stockebrand

FROM Steve Lambert

Last year I wrote a series of programs that accepted data in punched card format. This data was transcribed into a list describing the wire routine of the PDP-4. However, by the time data had been accumulated, the PDP-4 had been modified in many areas. The programs were not at a stage to accept modification data. As a result, much of the data is now obsolete.

Two technicians were involved in preparing data for key-punch operators. After a short training session the technicians worked fast and efficiently in writing down data on special forms. They followed a code sheet with only a few questions. One of the problems they had was writing distinctly so the key-punch operator could read the wire list forms. This resulted in approximately 20% error. The key-punch operators induced another 5% error by not following proper format.

Most of the errors could have been deleted if more time had been spent on documenting format and coding. However, this operation was to evaluate the potential use of wire lists and personnel involved. It was observed that for every eight hours that a technician would spend preparing data, a key-punch operator required one hour. I spent two days writing the programs that rearranged the data, and two weeks trying to get the peripheral equipment working. The efforts seemed in vain as we did not get to use the wire list data in production.

Attached to this memo is the coding sheets and card format list used last year. For every master card there are n run $ cards where n is the number of pins that satisfy a logic line.

Recently I have seen and stressed the need for wire listing. Our Drafting Department has been bogged down by drawings and checking wiring drawings. The production personnel constantly ask for clearification of wiring drawings. When so many wires are drawn in such a small area they cause illusions. When modifications are made to a system, one can expect that one month later the paper work will settle down. Using a computer to make modifications should be a matter of minutes providing the proper programming has been accomplished and the correct in-out devices are used.

The following is what I would like to see as a Drafting Room System.

Engineer: The engineer generates logic sketches labeled with proper logic names. He gives the sketch to a technician-draftsman. He receives back a block schematic generated partially by the computer ie: the computer utilizing a display produces a film that is developed and enlarged. Corrections are generated and approved by the engineer.

Technician - Draftsman: The engineer's sketches are transcribed onto IBM cards. The draftsman using rectangular coordinate notation would specify the position of logic on the block schematic to be. The engineer or technician would specify the module locations to be fed into the computer.

Computer: The computer should have a card reader, display, mag tape system and line printer. The card reader is the only input device (DEC tape could be used providing a good off-line station is available). The display is used to output block schematics. A camera would be placed in front of the display and operated by the computer. The line printer gives wire list data for production and checkout technicians. The mag tape system would store all data for future use such as modification, reproduction, etc.

Production: Production would receive an ordered wire list ie: grounds, resistors, capacitors, diodes, inter-module wiring, inter-panel wiring, etc. All cable schedules would be included as part of the wire list.

Checkout: Checkout would receive a wire list in a different format than Production. A copy of the block schematic would be included.

Many discussions have evolved about the amount of work and how the computer should be incorporated into the system. The main thing to remember is that the system must have a compatable back-up in case _____.

Wire Listing
PDP-4
8/29/62
S. Lambert

Master Card

1) Logic name: is a logic expression as read from the block schematic drawings. (38 characters maximum)

(column 38 - 43)

2) Source pin: is the pin location where the logic name originates. (6 characters maximum)

(column 46 - 64)

3) Drawing No.: is the Block Schematic number where the logic name appears. (17 characters maximum)

(column 71 - 75)

4) Name Code: is an arbitrary numeric value assigned to the logic name. (5 characters maximum)

5) Column 68 is used to denote master card.

Run Card

(column 1 - 8)

1) Pin #1: is the location pin of the previous run card i.e.: Pin #2 of the first run card is duplicated as Pin #1 of the next card. (8 characters maximum)

(column 13 - 20)

2) Pin #2: is the pin location that Pin #1 connects to. Pin #2 may also be the source point of a wire run. If so, pin #1 will be left blank. (8 characters maximum)

(column 23 - 28)

3) Color or value: If the card is used for wiring then the color of the wire connecting to Pin #2 is stated. If a component, resister capacitor or diode, is connected to Pin #2, then the value of the component is stated. (6 characters maximum)

Wire	Capacitor	Diode	Resistor
Black or Blk	.001	100	82
Brown or Brn	.01	150	100
Red or Red	.05	200	47
Orange or Org	.1	400	150
Yellow or Yel	0.3		220
Green or Gre			1k
Violet or Vio			1.5k
Blue or Blu			3.3k
Grey or Gry			10k
White or Wht			68k

column (31 - 33)

4) Wire or component: when a wire connects to Pin #2 then the type of wire is described. The type of component is described if one connects to pin #2. (3 characters maximum)

Wire	Component
Bus	res
Str	cap
twp	dio
cab	

5) Module type or special: column (36 - 41) when pin #2 is a module, the module type is printed. If pin #2 is a special case (ground, -15, connector, chocklate block, taper pin block or stand off) then the abbreviated name is used. (6 characters maximum)

Module	Special
xxxxxx	Gnd.
	-15
	Taper
	Block
	Stand
	Plug

(column 43)

6) End of run: when pin #2 is the end of an interpanel wire run, an asterisk is marked in column 43. Likewise column 43 is marked if pin #2 is a plug connection or taper pin. (1 alpha character)

7) Color or value code: (column 53) is a number corresponding to the color or value stated in columns 23 to 28. (1 numeric character)

Color	res	dio	cap	
Blk	82	D001	.001	0
Brn	100	D003	.01	1
Red	147	D662	.05	2
Orn	150	D664	.1	3
Yel	220		6.3	4
Gre	1k			5
Vio	1.5k			6
Blu	3.3k			7
Gry	10k			8
Wht	68k			9

8) Wire or (column 56)
component code: is a number corresponding to the wire or component stated in columns 31 to 33. (1 numeric character)

Wire or Component

Bus -	0
Strand -	1
Twist -	2
Cable -	3
Resistor -	4
Capacitor -	5
Diode -	6

(column 59)
9) Special: if a special case is used in columns 36 to 41, then a corresponding number is marked in this column. (1 numeric character)

Special

Ground -	0
-15 volts -	1
taper pin Block -	2
chocklate Block -	3
Stand off -	4
Plug -	5
F.F. other side	6

(column 62)
10) Pos or neg: if the level or pulse is negative a 3 is marked in this column. A zero is marked if it is positive. (1 numeric character)

(column 65)
11) Level or pulse: a zero represents a level. A one represents a pulse. (1 numeric character)

(column 71 - 75)
12) Name code: is the Logic name code copied from the master card.

(column 78 - 80)
13) Card sequence: is a numeric code that describes where the run card fits under the master card, (1,2,3,4, etc.).

WIRE LISTING PDP-4

RUN CARD

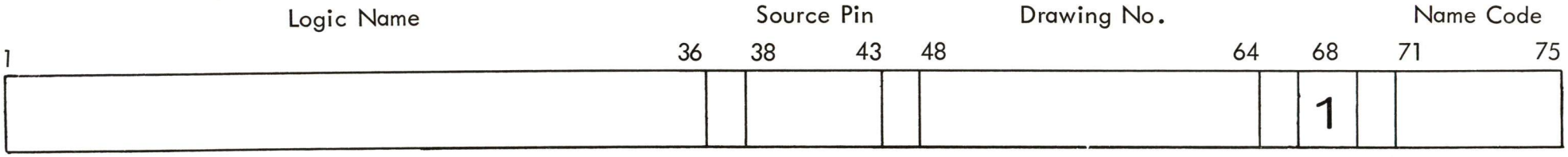
Name Code No. _____

Pin #1	Pin #2	Color or Valve	Wire or Component	Module Type or Special	End of Run	Color Code Value Code	Wire Code Component Code	Special	Pos or Neg	Level or Pulse	Name Code	Card Sequence
1 8	13 20	23 28	31 33	36 41	43	53	56	59	62	65	71 75	78 80

WIRE LISTING PDP-4

MASTER CARD

Name Code No. _____



H. Anderson

SALES CALL REPORT

FIRM University of Connecticut	DATE March 6, 1963
DIVISION Computer Center	SALESMAN Fred H. Gould
STREET	OFFICE Maynard
CITY Storrs STATE Conn.	NATURE OF CALL Visit
PHONE NUMBER 429-9321 AREA CODE Extensions 729 and 400	FOLLOW-UP DATE

CONTACTED

Professor John Lof

SUBJECT

Computer

REMARKS (CONTINUE ON BACK OF SHEET)

On Wednesday, March 6, I traveled to the University of Connecticut to install the MB 2010 at the Computer Lab. Prof. Lof is the Head of the Computer Department and the Campus-wide Computer Center. This center at present is comprised of an IBM 1620 (which they own outright) and an analog machine.

In casual conversation Prof. Lof stated that he is nearing a decision on an additional machine for the center. He has his choice down to either an IBM 7040 (a stripped-down 7090) or a Burroughs 5000. (The CDC 1604 had been eliminated earlier.)

When I asked if DEC machines had been considered he stated that he had planned (long range) that a DEC type computer would be the next generation, sort of the next step up from the MB 2010. His conception of our computers was along the line that they were on the Big Toy level - something the students could get inside of and klushe around with.

Prof. Lof stated that they would be spending 80K per year for rental of a machine, and would be increasing this figure so that the total outlay over the next five years would be 500K.

Some of his requirements are as follows: A computer starting with an 8K memory, going to 32K eventually; card reader; mag. tapes (multi mag. tape eventually). Also, Fortran programming and very high speed multiply-divide

PROMISED

HOW TO LOCATE PLANT

with floating point arithmetic. (His figures on multiply time were

IBM: 32 usec for 36 bit mantiss
Burroughs: 20 usec for same problem.)

He also seemed interested in time-sharing techniques for his machine.

The type of work that will be done ranges from engineering calculations to statistical data reduction. His interest also includes pattern recognition work, so I told him of our PDP-1 and PEPR installation, and the work of Dr. Pless. He stated he knew of this and was surprised that it was our equipment. He has interest also along the medical applications line.

He made a point of telling me he is the final word on what computer will be chosen, and in what direction the computer center will head.

At present his 1620 is used on the average of 350 hours a month. He has no regrets that he purchased it, and states, "It will last me another ten years."

For general background, he has been at the University for around 10 years. For years the accent at the Electrical Engineering school was on servo mechanisms. He feels now that the industry state of the art is so high that they will phase out of this area and concentrate on the computer field. He feels now the Univ. must lay a broad base for the technical endeavor in this direction (one of the reasons he bought the buffer and logic kit). He was quite proud that U Conn is the #2 college in Conn. and he will do all he can to keep it there. Amen.

I have promised him a day of my time in the near future in order to help him on his MB 2010 course.

I left all our computer literature and prices, stating that I felt he satisfied most of our educational discount requirements (10%). If nothing more, I have planted seeds of new thought with him.

Final statement: He led me to believe he has 100K to spend right now.

INTEROFFICE MEMORANDUM

DATE March 5, 1963

SUBJECT Numbering System for Computer Options

TO K. Olsen
H. Anderson
S. Olsen
N. Mazzarese
J. Koudela
R. Maxcy
J. Atwood
S. Grover
R. Reed
R. Best
G. Bell
T. Stockebrand
D. White
R. Savell
R. Boisvert
R. Melanson
J. Smith
E. Harwood

FROM Arthur Hall

Attached is a list of the numbers assigned to computer options.

Some numbers have been changed so that they conform to the numbering system. Drafting is now changing the pertinent drawings and Advertising has the new (changed) numbers on new price lists.

This memo constitutes official notification that the new system is in effect. It is assumed that any persons whose area of responsibility is affected by these number changes will initiate whatever action is necessary to bring their paperwork into harmony with the new numbers.

Persons requiring numbers for new options should consult Arthur Hall. All such numbers are subject to change by the Computer Guidance Committee.

Options have been and will be assigned two or three digit numbers. The first digit of the number indicates the broad category into which the options fall.

First digit of #	Option category
1	Primarily Logic
2	Drums and Disk Files
3	Illuminated Displays
4	Card Handling Equipment Punches Even #'s Readers Odd #'s
5	Magnetic Tape Equipment
6	Printers and Typewriters
7	Paper Tape Equipment

Multipurpose equipment which does not naturally fall into a particular category will be assigned depending upon its primary purpose.

Unlisted numbers and numbers listed but not described are unassigned and may be used.

PRIMARILY LOGIC OPTIONS

Option #	For PDP-	Cost	Description
10	1	10,300	Automatic Multiply & Divide
11			
12	1	30,000	Magnetic Core Memory Module
12A	1		Special (time Sharing) Memory
13	1		Special (Time Sharing) Memory Switch
14			
15	1		Magnetic Core Memory Extension Control
15A	1		Memory Extension Control for Special (Time Sharing) Memory
16	4	9,000	Magnetic Core Memory Extension Control
17	4	24,000	Magnetic Core Memory Module
18	1	9,150	Extended Arithmetic Control Unit
19	1	9,000	High Speed channel Control
100 through 119		Do Not Use	
120	1	15,300	16 Channel Sequence Break System
123	1	11,000	High Speed Data Channel
125	4		Real Time Option
126	4		Foxboro Real Time Option
130			High Speed Data Channel

DRUMS AND DISC FILES

Option #	For PDP-	Cost	Description
20			
21			
22			
23	1		Parallel Drum (BBN System)
24A	4	31,600	16,384 Word Block Transfer Drum System
24B	4	36,300	32,768 Word Block Transfer Drum System
24C	4	43,400	65,536 Word Block Transfer Drum System
25			Drum File System
26			
27			
28			
29			
200 through 219 Do Not Use			

ILLUMINATED DISPLAYS

Option #	For PDP-	Cost	Description
30	1 & 4	14,300	Visual 16-inch CRT Display
31			
32	1 & 4	1,300	Light Pen
33	1 & 4	4,900	Symbol Generator
34		3,061	Display w/o Tecktronics Scope (#503)
		3,906	Display with Tecktronics Scope (#503)
35			
36			
37			
38			
39			
300 through 319 Do Not Use			

CARD HANDLING EQUIPMENT

tion #	For PDP-	Cost	Description
40	1 & 4	15,000	Card Punch Control
41	4	14,900	Card Reader and Control (200 cpm)
42			
43	1		200 cpm Card Reader and Control
44			
45			
46			
47			
48			
49			

400 through 419 Do Not Use

MAGNETIC TAPE ~~HANDLING~~ EQUIPMENT

Option #	For PDP-	Cost	Description
50	1 & 4	18,000	Magnetic Tape Transport
51	1	7,500	Magnetic Tape Control Unit
52	1	38,000	Magnetic Tape Control Unit
53			
54	4	7,000	Magnetic Tape Control Unit
55			
56		67,500	Magnetic Tape Control Unit
57	4		Magnetic Tape Control Unit
58			
59			
500 through 509 Do Not Use			
510	1		Block Transfer Tape Control
550			DEC Tape Control
555			DEC Tape

PRINTERS AND TYPEWRITERS

Option #	For PDP-	Cost	Description
60			
61			
62	1 & 4	72,800	Line Printer and Control
63	1 & 4		(300 lpm) High Speed Printer
64			
65	4	7,000	Printer-Keyboard and Control
66	1		Teletype Interface Module
67	4	1,950	Relay Buffer
68			
69			
600 through 609 Do Not Use			
650 through 679 Do Not Use			

PAPER TAPE ~~HANDLING~~ EQUIPMENT

Option #	For PDP-	Cost	Description
70			
71			
72			
73			
74			
75		5,000	Perforated Tape Punch and Control
76	4	13,900	On-Line, Off-Line Flexo and Logic
77			
78			
79			

710 through 799 Do Not Use

INTEROFFICE MEMORANDUM

DATE March 5, 1963

SUBJECT Radiation Test of PDP-4 and PDP-1

TO K. Olsen, H. Anderson, S. Olsen, N. Mazzarese, R. Beckman, R. Shields, E. Harwood, F. Fortin, R. Mangsen, R. Best, G. Bell, A. Blumenthal, R. Hughes, J. Fadiman
All Computer Engineers

FROM Arthur Hall

On 1/30/63 and 2/13/63 respectively the PDP-1 and PDP-4 were taken to Acton Labs for radiation tests. The test methods used were the same in substance as those called out in MIL-I-26600 (USAF) (a computer testing specification).

The susceptibility of the computers to RFI (from 14KC to 920 MC) was tested with RFI placed first on the line cord and then radiated toward the computers. Power levels were the maximum attainable with the equipment at Acton Labs. During these tests the computers were running programs which punched and read tape and typed and which were designed to come to an error halt if registers or memory were changed by the radiation. No computer errors were caused by RFI in either computer.

RFI caused by the computers and detectable outside was measured both by antenna and on the line cord from 14KC to 920 MC. The results are briefly summarized below.

(Details, exact readings and graphs, are available separately for each computer on reproducable drawings from Arthur Hall.)

PDP-1C-34

Program being used was "Micro - Blast" by Leo Gossel. Program tape, symbolic listing and write-ups are available from Arthur Hall.

Comments by Frank Fortin:

RFI output, conducted

25 KC high noise level from #735 transformer

RFI output, radiated

14KC noise with IO equipment operating was 4DB higher (due to Punch & Teleprinter)

400 KC Noise was high in the following locations 1A15, 1C23, & 1D23. Noise was very high at 1E18, 1D2, 1E2, 1F2, 1J2 and on all -15 VDC marginal check lines.

8MC Typewriter cable was radiating. Noise with Typewriter operating was 13D higher than with it off.

25MC High noise from 1D23 & 1D24 (20DB higher than average)

100MC Computer on but not running 47DB
Checkerboard running 52DB
Checkerboard & IO running 52DB

The computer exceeded thelimits allowed by MIL-I-26600 (USAF) at all frequencies below 190 MC.

PDP-4B-8

Program being used was "Simple Test" by Dit Morse. Program tape, symbolic listing and write-ups are available from Arthur Hall.

Comments by Dick Mangsen & Frank Fortin:

RFI output, conductive

25KC High noise from #735 transformer

150KC to 640KC Reader clutch & brake operation cause noise spike. 20DB above average noise

1.4MC High noise in the following areas (IO equip. off)
1A13, 1A14, 1A15, 1B11, 1C11, 1D8, 1D9, 1D14, 1D15
1E1, 1E10, 2C, 3B13
High noise followed the -15VDC marginal check lines.
Highest noise came from the memory.

2.81MC High noise in PC and timing chain
With computer not running, manual typing causes an increase in in noise of 20 DB.
Continuous read-in of a tape caused a 10DB increase in noise.

RFI output, radiated

4.6 MC Noise increase due to manual teleprinter operation; 24 DB
9.1 MC Noise increase due to manual teleprinter operation; 4 DB
15.1 MC Noise increase due to manual teleprinter operation; 25 DB

Conducted noise levels exceeded mil specs. only when teleprinter was operated.
Radiated noise levels exceeded mil specs. between 150KC and 140MC.

INTEROFFICE MEMORANDUM

N.E.C.

SUBJECT: JOB ALLOCATION, MECHANICAL DESIGN DATE: March 5, 1963

TO: All Engineers
Ken Olsen
Stan Olsen
Harlan Anderson
N. Mazzarese
M. Sandler
J. Smith
R. Maxcy
B. Maroni
K. Peirce
H. Crouse
W. Brackett
W. Hindle

FROM: Loren Prentice

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

Engineer	Job number or EN number	Description	% complete
Scott Miller	1026	New Mag Tape	5%
		Remote typewriter table	15%
	1027	Display 30 shroud	98%
	1036	Light pen holder	25%
	1095	PDP-4 sales colors - JPL	75%
	1136	Hub lable (new)	25%
		Reel Package	50%
	1177	PDP-5	75%
	1178	PDP-3	25%
	1184	Variable field light pen	95%
		Product identification	OPEN

Ron Cajolet	2320	31 Display	Finish DEC Display (some rework)	99%
	1064	31 Display	Casting adj. mechanism Better shock mounts	10%
	1157	Automatic Module Tester	layout front end	60%
	1097	Dynasert board aligner	Finish sketches -design control switches	60% (hold)
	2432	Honeywell System	Front end layout	85%
	1026	Burroughs tape	Cabinet layout & indicator panel	20% (hold)
	1156	Incremental Platter	Ind. Panel -attach cabinet and table	90%
	5500-9051	31 Display	Supervise building and checking prints	40%
Ken FitzGerald	1023	Assembly jig for 1914 mounting panels		95%
	1000	Paint adhesion on steel components		30%
	1053	Drill jigs for standard computer cabinets		70%
	1051	Drill jig for classroom modules		80%
	1000	New stroke sander machine for sheet metal shop		20%
	1000	Sheet metal, machine, cabinet assembly, and carpenter shop supervision and administration		
	1000	Engineering technician tool boxes		85%
Loren Prentice	1136	555 Tape Unit		75%
	1097	Mod. development		75%

1065	Large display	10%
1173	PDP-3 computer (24-36 bit)	2%
1184	Variable field light pen	started

Jobs Pending - Unassigned		Assigned Electronic Eng.
1016	Memory mounting redesign	A. Blumenthal
1151	Large tape storage	T Stockebrand
1165	Projection display	R. Savell
1179	Display 30 cast reduction	R. Savell
1180	Camera equipment for 30 display	R. Savell
1181	Camera equipment for 31 display	R. Savell
1182	Electrostatic display development	R. Savell
1086	Holley printer	R. Savell
1064	Eye-ball unit	R. Savell

INTEROFFICE MEMORANDUM

DATE March 1, 1963

SUBJECT HOUSE COMPUTER PROBLEMS

TO Ken Olsen
Harlan Anderson

FROM Jack Atwood

CC Stan Olsen
Gordon Bell
Dit Morse
Steve Piner

We have been waiting since January 23, the day of the General Radio "demonstration," for mailing list listings and labels to be produced on the PDP-4. The specific projects are:

1. A checking copy of the entire list to be used for up-dating
2. Information copies for the present district offices
3. Information copy for the Munich office
4. Special Northern California listing for West Coast office
5. Labels for the next general mailing
6. Labels for the PEEE show mailing
7. Labels for the IEEE show mailing
8. Labels for the EBM show mailing
9. Labels for the CNLM show mailing
10. Labels for the SWIRECO show mailing
11. Labels for the NST show mailing
12. Labels for the Bell Labs computer mailing
13. Labels for the NASA-Greenbelt mailing
14. Labels for the Brookhaven mailing
15. Labels for the March PGEC mailing

Previous to January 23, we received labels for the New York portion of the EEE show mailing. The rest were hand-typed. Since January 23, we have received only labels for the February PGEC mailing.

If we are still without service as the dates for Items 6 through 15 come due, we can either take girls off other work and hand-type more labels or send the list in town for processing. If we take the

latter course, it will involve a fair amount of expense for sorting and merging the cards on each run. If we take the former course, it can mean delays in other important work.

The tab room can handle a certain portion of the label printing for us, but they cannot give us the full print-out of the information on the cards which we need for Items 1 through 4.

We are also waiting to put our publicity mailing list on the computer. This has been coded in much the same manner as the mailing list, and it can produce the same type of selected listings or label sets for any given type of release.

So far we have spent our waiting time hand-typing labels for publicity releases on the Bell-Morse PGEC talk, Bob Lassen's promotion, Henry Crouse's promotion, the IEEE show, the PEEE show, the NST show, and three new literature releases. The addressees for each of these sets of labels had to be individually selected from our list, and the source documents had to be handled three times - for selection, for typing and for proofing.

All 700 labels could have been selected and printed in a matter of minutes on the PDP-4.

We would like to get the mailing list and publicity list applications going. Both will be most helpful to us, both will save a substantial amount of time and money, both will enable us to do a better job with direct mail and publicity, and <u>both are saleable</u>.

Can you help us?

INTEROFFICE MEMORANDUM

DATE March 1, 1963

SUBJECT HOUSE COMPUTER PROBLEMS

TO Ken Olsen
Harlan Anderson

FROM Jack Atwood

CC Stan Olsen
Gordon Bell
Dit Morse
Steve Piner

We have been waiting since January 23, the day of the General Radio "demonstration," for mailing list listings and labels to be produced on the PDP-4. The specific projects are:

1. A checking copy of the entire list to be used for up-dating
2. Information copies for the present district offices
3. Information copy for the Munich office
4. Special Northern California listing for West Coast office
5. Labels for the next general mailing
6. Labels for the PEEE show mailing
7. Labels for the IEEE show mailing
8. Labels for the EBM show mailing
9. Labels for the CNLM show mailing
10. Labels for the SWIRECO show mailing
11. Labels for the NST show mailing
12. Labels for the Bell Labs computer mailing
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