Box 5 Memos to Olsen
Folder 10

3 of 5

102737392

Kenneth H. Olsen
Memos Received, January, 1969

TO:	FROM:	RE:	DATE:
Ken	Ken Larsen	Mag Tape Suggestions	1/6/69
Ken	Ken Larsen	Tape Transport Suggestions	1/7/69
Ken	Lowell Henize	NCR-Winn Tripp Employment Interview/Point of Sales Negotiation	1/9/69
Ken	Ken Larsen	Tennecomp	1/13/69
Ken	Ken Larsen	Basic Tape System per Memo of 1/6/69	1/15/69
Ken	Bela Csonth	PDP-8 Situation in Erlangen	1/17/69
cc: Ken	John Holzer	PDP-16	1/20/69
cc: Ken	Ernest Luttig	DECtape transports	1/20/69
Ken	Henry Crouse	Mr. George Cogar - Mohawk	1/20/69
Managers and Supervisors	Bob Lassen	Personnel Dept. Directory	1/21/69
Ken	Jack Shields	Spare Modules for Europe	1/23/69
Marketing Committee cc: Ken	Jim Jordan	Design Staff and Exhibit ~~System~~	1/29/69
cc: Ken	Lon Beaupre	Office Furniture	1/29/69
Ken	Ed Schwartz	Rental Space Maynard Industries	1/31/69
Ken	Henry Crouse Pierre Schreebeli	Meeting in S.F. with Messrs. Newman & Morgan	1/10/69

c- Joe St. [illegible]

digital INTEROFFICE MEMORANDUM

DATE: January 6, 1969

SUBJECT: Mag Tape Suggestions

TO: Ken Olsen

FROM: Ken Larsen

In the period between now and the time we are able to satisfy the full range of tape requirements with DEC manufactured units. The following recommendations suggest methods to provide a full complement of tape capabilities with segments that can be dropped as units of DEC manufacture are deliverable in quantity.

1. Minimum Tape System - Continue with PEC incremental.

2. Basic Tape System (25 ips) - Order immediately the Ampex TM-Z units. Perfect match to PDP-8 family.

   a. High Quality - excellent serviceability.
   b. In production now.
   c. Complete unit including electronics $3,500.

3. Low Performance Tape System (45 ips) - Eliminate Datamec 2020 (TU-20) and replace with Ampex TM-7.

   a. Stop buying from Hewlett-Packard.
   b. Ampex will deliver replacement unit.
   c. DEC gains experience with single capstan techniques.
   d. High Quality - excellent serviceability.

4. Medium Performance Tape System (75 ips) - Eliminate Datamec 3030, TU-30 and replace with Ampex TM-10.

   a. Same as Section 3. above.

5. High Performance Tape System (112-1/2, 120, 150 ips) - Ampex TM-16 can do.

   a. Offer tape system to match capability of PDP-10 (enable PDP-10 to replace 7090's etc.)
   b. Permit response to speed requirements normally found in Areo-Space data acquisition environments.
   c. DEC gains experience with high performance tapes.
   d. PDP-10 system for Douglas Aircraft will have TM-16's.

If you wish to discuss these recommendations, please call me.

Attachment for your information.

c - Joe St Amand

digital INTEROFFICE MEMORANDUM

DATE: January 7, 1969

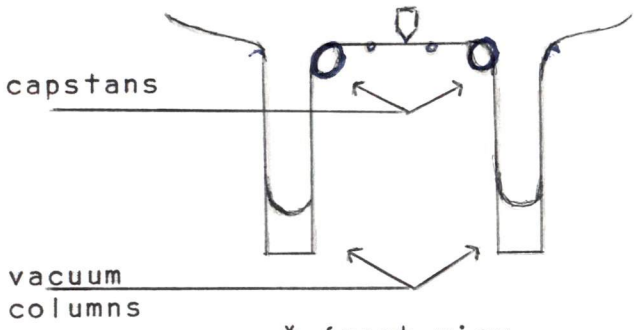
SUBJECT: Tape Transport Suggestion

TO: Ken Olsen FROM: Ken Larsen

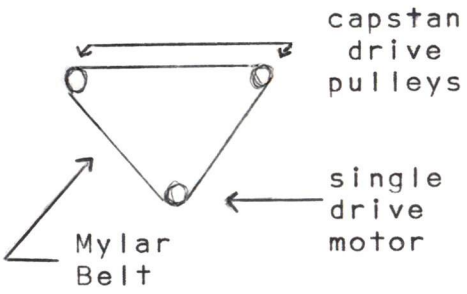
lets get a copy of patent

A friend of mine at Ampex has stated that Ampex believes that they hold patents on the single-capstan drive techniques and are currently preparing a civil suit against Potter Instruments. If Ampex wins this case or wins a substantial out-of-court settlement they will be pressing legal action against anyone else using the single-capstan drive technique. If this information is true, I would recommend the use of a dual capstan drive system.

What is a dual capstan system? Well, schematically it looks like this -



* front view



* rear view

not necessarily so

Its advantages include:

1.) The dual capstan development was made at a government laboratory therefore the design is public domain.
2.) It has the characteristic of holding the tape taut over the head uniformly regardless of which direction the tape is being accelerated (does not depend on vacuum column to pull tape through head in reverse direction).
3.) Simplified guiding system.
4.) System is more resistant to environmental effects, etc. (i.e. shock & vibration).
5.) Eliminates two critical air-bearing guides.
6.) Allows for flexibility in terms of design i.e. use of two smaller motors, vacuum column configuration, installation of two heads etc.
7.) Avoids possible legal conflict.

* not to scale

Ken

digital INTEROFFICE MEMORANDUM

DATE: 9 January 69

SUBJECT: NCR - Winn Tripp Employment Interview/
Point of Sale Negotiation (Ref. our
Telcon Thursday, 2 January 69)

TO: Ken Olsen
cc: Nick Mazzarese
Bob Collings
Gerry Moore

FROM: Lowell Henize
Dayton Office

CONFIDENTIAL

The employment interview with Winn Tripp Thursday, 2 Jan. 69, was relatively uneventful. Two possible areas came to light where he might be of value to DEC, both of them in non-technical marketing areas.

1. PDP-10 Business Applications

2. General Retail and Merchandise Inventory Applications, e.g., Point of Sale Displays

Winn, although obviously quite capable, seems to lack the "fire" that I personally like to see in a top executive. However, he is willing to fly to Maynard for additional interviews if you would like to give him further consideration. (See enclosed resume.)

During the interview, I was able to confirm some information that I had gathered from Don DeBoer of NCR's Product Planning Department.

NCR is in a mild panic over potential loss of business in the retail field, specifically:

1. NCR has a point-of-sale terminal under development with an original completion date targeted for 1971.

2. Best possible completion date for their own development would likely be late 1970.

3. Several potential competitors have already made preliminary announcements of point-of-sale terminals.

4. NCR's device is probably electro-mechanical rather than all electronic. (Their development people, having a strong electro-mechanical background, have rationalized that a point-of-sale terminal must have a non-volatile memory, so as not to lose data during a power failure.)

5. They are beginning to realize that an electro-mechanical device cannot complete with some of the new low-cost electronic systems.

6. It is also of major significance that people of Carroll's and Gardner's level came to Maynard for the initial investigation. (Keenoy himself was originally scheduled to go - he will probably be promoted to Executive Vice President within the next six months.)

In addition, NCR has shown further commitment to the philosophy of marketing devices developed and manufactured by OEM suppliers.

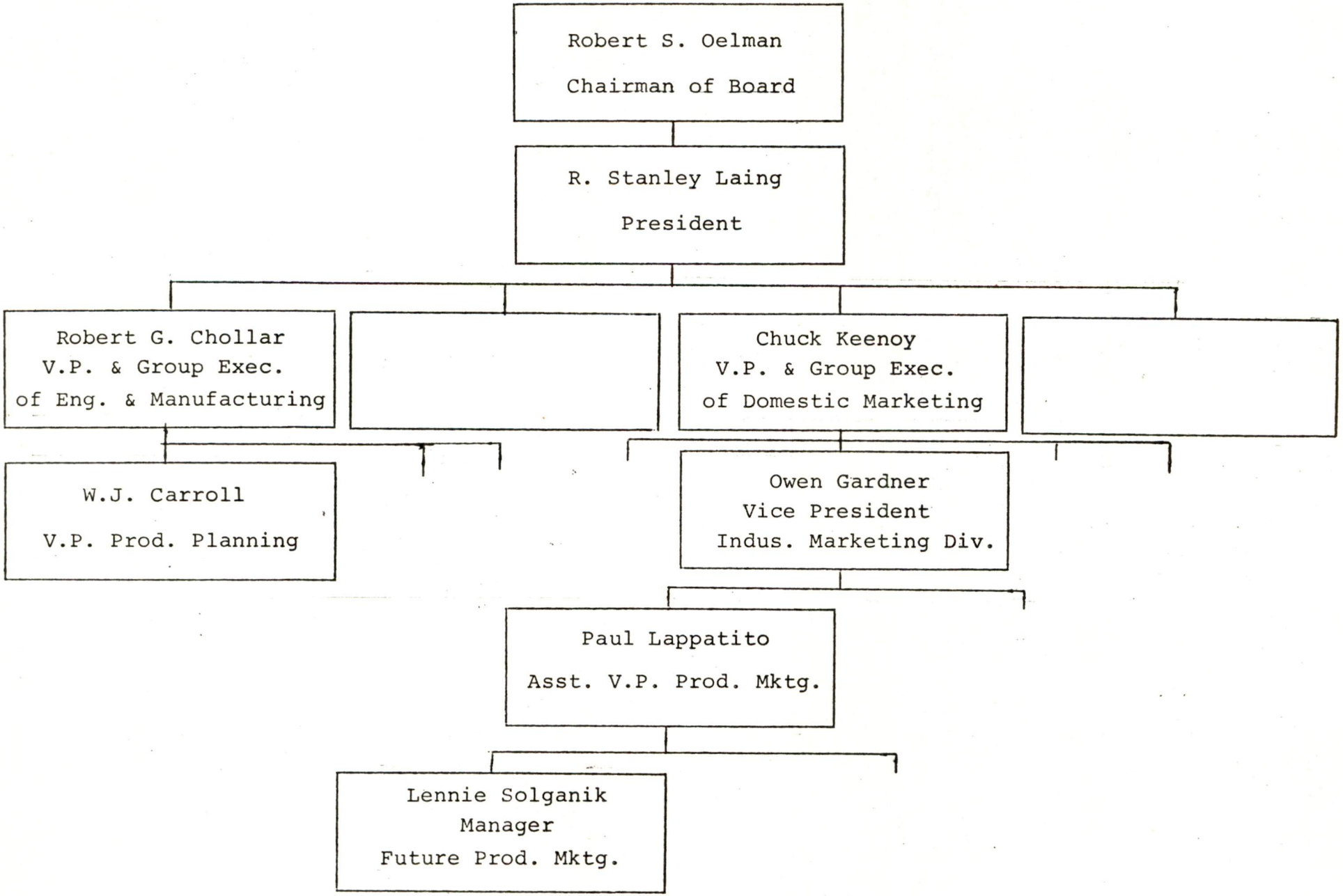
One possible snag in our point-of-sales negotiations with NCR exists at the level of Lennie Solganik and his supervisor, Paul Lappatito. (See enclosed Organization Chart.) Lennie, although ostensively very anxious to fill NCR's void in this area, may very easily take the position that NCR's device, although late, is potentially far superior to that of DEC, or any other supplier. Paul Lappatito, heavily "Century" oriented, may feel that any electronic development and manufacturing efforts must properly be handled in NCR's Hawthorne facility.

It is suggested that the Dayton staff could best contribute to this effort by establishing rapport with Lennie Solganik and hopefully, Paul Lappatito. There would seem to be some danger at this point of their feeling that the program is being "shoved down their throat."

Please advise me if and when you feel this effort should be initiated, or if you would like any other specific activity from the Dayton Office.

LH:bb
Enclosures (2)

CONFIDENTIAL


Robert S. Oelman
Chairman of Board
R. Stanley Laing
President
Robert G. Chollar
V.P. & Group Exec.
of Eng. & Manufacturing
Chuck Keenoy
V.P. & Group Exec.
of Domestic Marketing
W.J. Carroll
V.P. Prod. Planning
Owen Gardner
Vice President
Indus. Marketing Div.
Paul Lappatito
Asst. V.P. Prod. Mktg.
Lennie Solganik
Manager
Future Prod. Mktg.

RESUME:

Winston M. Tripp, Jr.
286 Cheltenham Drive
Dayton, Ohio 45459
513-434-7135

OBJECTIVE:

Marketing Manager/Director

QUALIFIED BY:

Fourteen years experience in sale of Electronic Accounting Machines, Computers, and Peripheral Equipment to Banks and Industry with international office equipment manufacturer.

Previous assignment in S. E. Massachusetts included concentration in Banks and large Industrial accounts.

Duties included survey, proposal, demonstration, and responsibility for installation after sale.

PRESENT ASSIGNMENT:

National Sales Manager - Series 500 Computer Sales. Major responsibilities are: Domestic sales and Profit quota. Duties include monitoring market policies, development of marketing plan, preparation of forecast advise and assist sales force, develop advertising and sales promotion campaigns and coordinate all functions related to the Series 500 and its peripherals.

PERSONAL:

Age: 38
Ht. : 5' 11"
Wt. : 160 lbs.
Married: with three children
Appearance and Health: Excellent

EDUCATION:

American International College, Springfield, Massachusetts. Graduated in 1952 with BS-BA. Earned 100% of expenses working as a salesman.

Completed two week AMA course in Product Management, Am. Management Association, November, 1968.

EXPERIENCE:

1967 to Present - As National Sales Manager-Series 500, have increased 1968 unit sales and revenue by 150% through better utilization of rental pool, realistic competitive pricing, and strong systems approach coupled with equipment advantages.

The National Cash Register Co.
Dayton, Ohio

1955 to 1967 - Leading EDP salesman in area.

As an account manager with junior salesmen assisting, responsibile for sales in S. E. Massachusetts to all types of businesses.

1967 Quota was increased 100%, but secured 160% of new Quota.

Have always produced at least 130% of quota for the last seven years.

1954 to
1955 - Executive Retail Training Program.

Gladding's, Inc.
Providence, R. I.

1952 to
1954 - United States Marine Corps. Enlisted as a Private, attended O. C. S. Released as a Captain.

SUMMATION:

A sincere willingness and desire to change, if opportunity offered shows advancement possibilities and rewards when earned.

References will be furnished on request.

digital INTEROFFICE MEMORANDUM

DATE: January 10, 1969

SUBJECT: MEETING IN SAN FRANCISCO WITH MESSRS. NEWMAN AND MORGAN

TO: Ken Olsen

FROM: Pierre Schneebeli/Henry Crouse

Purpose: Affiliation with DEC.

Backgrounds:

Mr. W. F. Morgan - born in Canada, MSEE, joined IBM in 1951 as production engineer, component development (printers), five patents, engineering planner specifically for 1403 Printer, technical advisor in area of general product development, presently reports to Mr. Vic Witt, Director of Plant Site in San Jose.

Comment: Marketing, organizational planning, oriented strong insight Newman interactions.

Dr. E. G. Newman - Ph.D., Columbia, Applied Mechanical Physics. Instructed at Stevens, consulted to AMF, joined IBM in 1956, worked on STRETCH I/O, hyper tape drive, high-density magnetic recording, developed tape drives 3330 and 729. Patents in and of high-density magnetic recording, 1962 project display for General Motors DAC-I for automatic body design. Involved with 2314 design. He stated that he is strong in area of engineering and manufacturing, is presently technical advisor reporting to Mr. Vic Witt at San Jose.

Comment: Scientifically oriented.

Why team approach (i.e., Morgan and Newman together)? Both feel they compliment each other and have been associates, friends, and victims of the organizational structure of IBM.

They wish to affiliate with DEC as a subsidiary or separate company to gain the leverage of DEC's electrical and software strength to the end that they design products; mainly I/O devices, but not limited to that.

Both wish to remain in San Francisco Bay area for reasons of private interest, as well as accessibility of engineering talent. They feel peripheral development is stronger on the West Coast.

They are very serious. Wish to have response from Ken Olsen as to his interest, and wish to meet with him (only) to discuss the matter.

Henry

ecc

digital INTEROFFICE MEMORANDUM

DATE: January 13, 1969

SUBJECT:

TO: Ken Olsen

FROM: Ken Larsen

Tennecomp (a subsidiary of Tennelec) has developed the following around a PDP-8:

1. *Cartridge Tape System (using Viking start/stop drive).*
2. *Automatic RIM loader.*
3. *Light pen with contact sensitive switch.*
4. *Functional Control Panel (IDIOT Box).*
5. *Display Scope with data break control (Conrac Display).*
6. *Nuclear ADC interface.*
7. *Pulse-Height analysis and data reduction system.*

Attachments describe these products.

Tennelec is the company John Jones' memo discussed.

Ken



STILL RUNNING A MODEL T?

THE

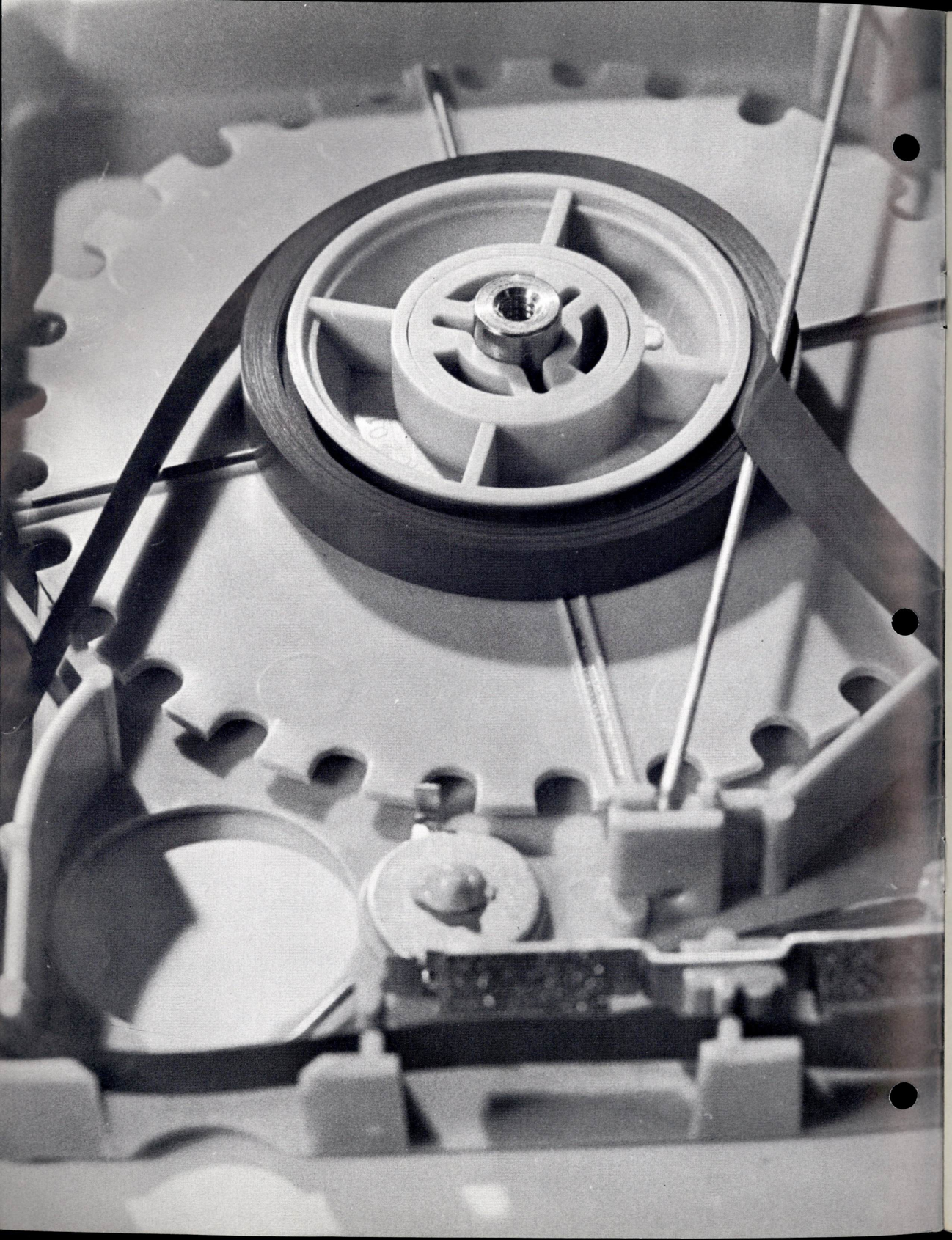
TENNECOMP

TP-1351

MAGNETIC TAPE UNIT

FOR A DEMONSTRATION, DROP IN AT OUR HOSPITALITY SUITE IN ROOM 604 OF THE JACK TAR HOTEL FROM 7 TO 10 P.M. ON DEC. 12 OR 13.

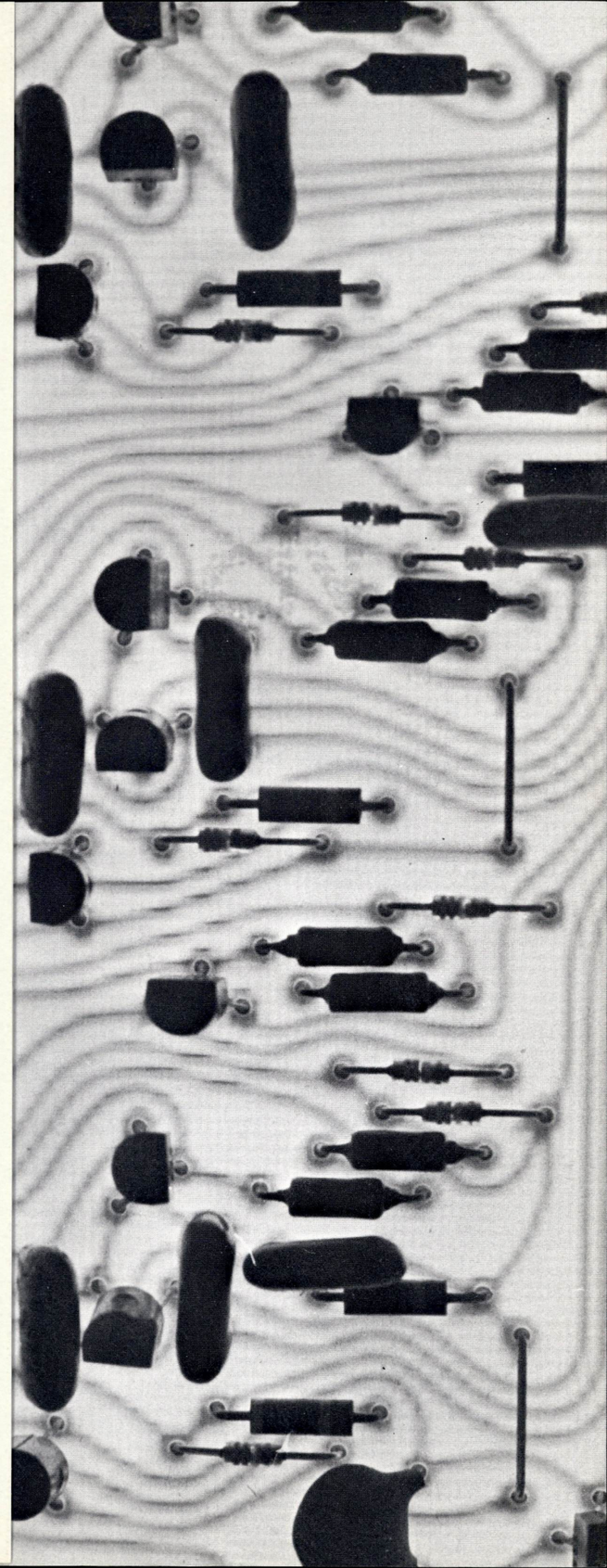
WILL MAKE YOUR PDP-8 OR PDP-8/S "TIN LIZZIE" INTO A LIMOUSINE . . .

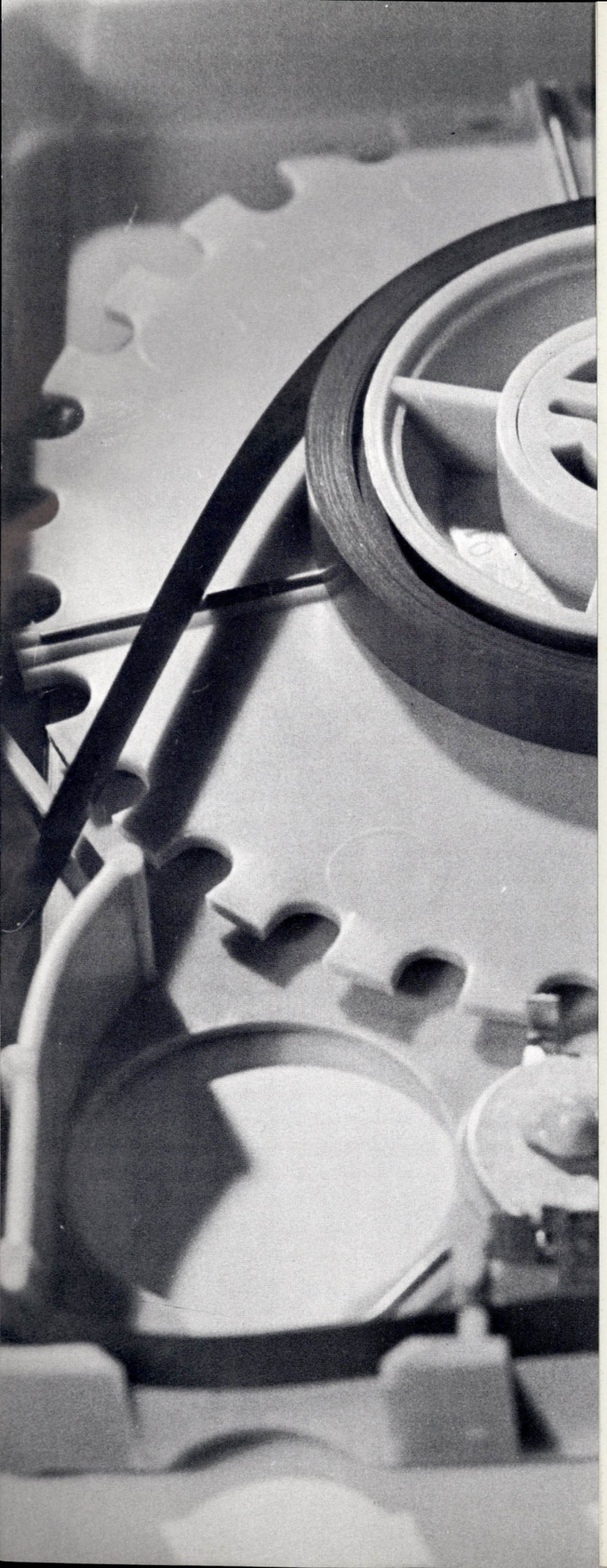


Henry's old Model T was quite a car --
Got America off its front porch rockers
and out to see the world, in fact.

Folks didn't own one long, however,
before they discovered that additions
made life a lot happier . . . A Self
Starter, a Heater, Windshield Wipers --
Stuff like that - - - -

If you're still chugging along with slow
paper tape input/output and program
storage with your PDP-8 or PDP-8/S,
TENNECOMP's new TP-1351 Mag Tape
Unit can make your life happier too . . .
at a cost which breaks the two thousand
dollar price barrier by relying on the
processor for most of its logic functions.





The TENNECOMP TP-1351
MAGNETIC TAPE STORAGE UNIT

ELIMINATES most paper tape input/output operations.

USES low-cost, easily stored tape cartridges for storage of programs and data.

ACCESSES any program in 30 seconds or less .

PERMITS high speed dumping of experimental data for later processing . . . Programs for editing and assembly with I/O from mag. tape are supplied.

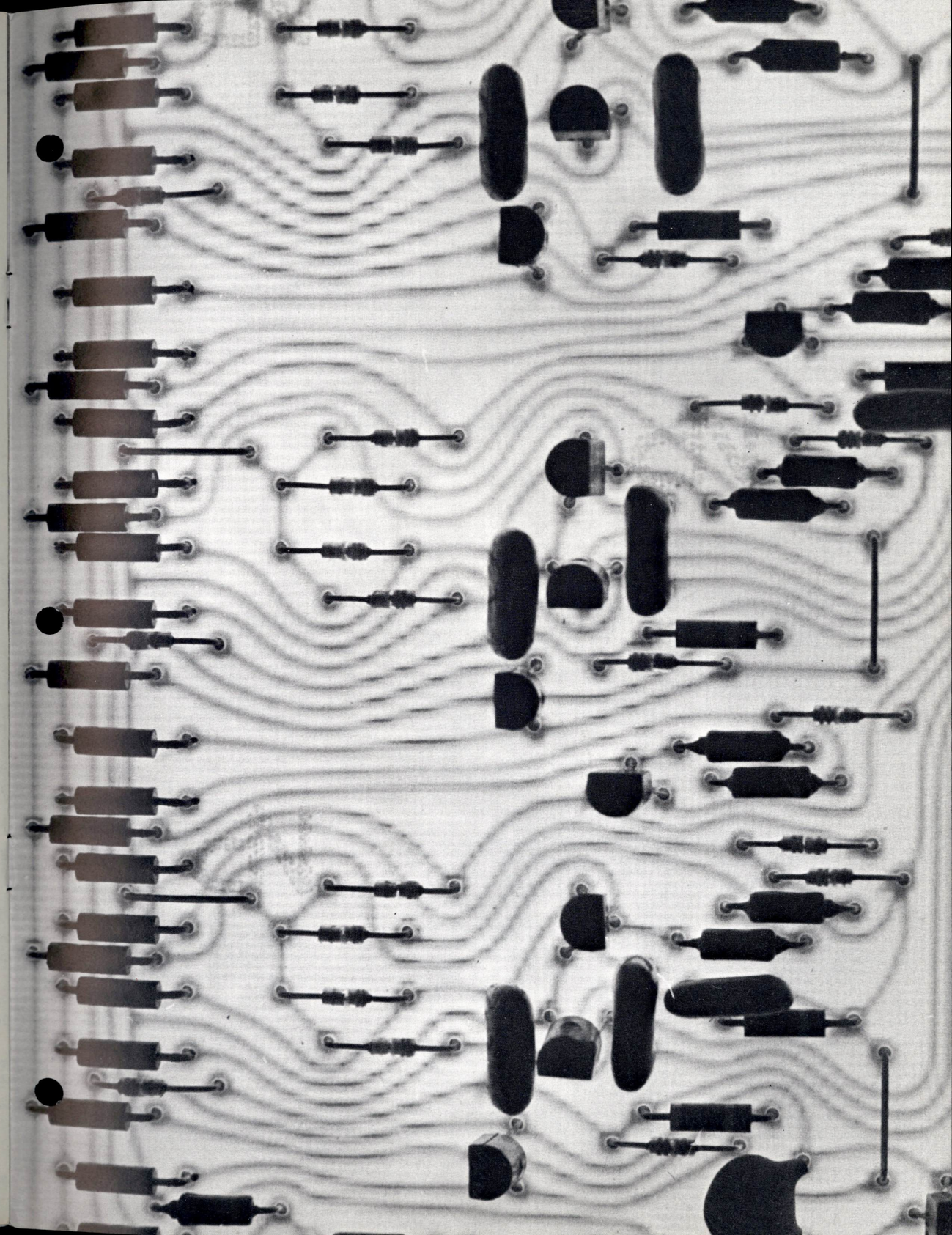
MAKES program editing and assembly from 10 to 100 times faster .

INCLUDES everything you need to get going including FLIP CHIP interface to mate perfectly with your DEC Computer.

ALLOWS completely automatic one-button (or remote) loading and starting of a complete program, when used in conjunction with the TENNECOMP TP-1346 Automatic Loader.

INSTALLS on any PDP-8, PDP-8/S, or PDP-8/I in less than an hour. Use the TP-1351 the same morning it arrives.

FLIP CHIP is a trademark of Digital Equipment Corporation, Maynard, Mass.



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Telephone: 01-560 7447

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Hans Christiansen
Hvidtjornevej 36
Telephone: (01) 71 25 39

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Prana
142, Ave. de la Republique
Telephone: 922.55.46

ATHENS, GREECE
Marios Dalleggio Representations
2 Alopekis Street
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Telephone: 88931

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Radiax S.R.L.
Corso Beccaria, 2
Telephone: 54.38.39

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Toyo Trading Company, Ltd.
P. O. Box 999
Telephone: (03) 279-0771

AMSTERDAM, THE NETHERLANDS
Line-A-Data
Bldg. 112A-Schiphol Airport
Telephone: (020) 15 16 02

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Rodland & Rellsmo A.S.
Lorenveien 6
Telephone: 22 55 89

112 39 STOCKHOLM, SWEDEN
A B Chemetal
S:T Eriksgatan 5
Telephone: 51 51 11

MUNCHEN, WEST GERMANY
Wenzel Elektronik
8 Munchen 27
Lamontstrasse 32
Telephone:0811 Munchen 48 65 58

September, 1968

TENNECOMP TP-1351 MAGNETIC TAPE STORAGE UNIT

Small computer systems have commonly been limited by their input/output facilities. Input/output through paper tape is cumbersome, and it greatly slows program editing, correction, and assembly. Previously, the cost of computer quality magnetic tape equipment has put it out of reach of many users. The TENNECOMP TP-1351 is a computer quality tape transport which breaks the price barrier by use of 1/4 inch continuous-loop tape and by relying on the computer for as many logic functions as possible.

The TP-1351 provides four main capabilities:

* Storage of an unlimited number of programs with access to any program in less than 30 seconds.
* Replacement of paper tape operations in carrying out standard operations with EDIT-8, PAL-III, and other systems programs.
* Accumulation of data or storage of data for later processing.
* Completely automatic "one-button" loading and starting of a program (in conjunction with the TP-1346 Automatic Loader).

The TENNECOMP-1351 is a read/write magnetic tape transport and control for the PDP-8/S, PDP-8, or PDP-8/I computers. It was inspired by a device developed by J. J. H. Park of the National Research Council of Canada, with additional features added.

* MAGNETIC TAPE FORMAT Four track 1/4" magnetic tape in a continuous self-contained tape cartridge. Cartridges can be loaded or unloaded in less than 5 seconds. Tape is enclosed in transparent plastic affording protection from dust, tearing, and marring.
* RECORDING FORMAT Bit serial in a single track. Since only one track is used at a time, track-to-track skew (the major cause of tape errors) is eliminated and high reliability results. A switch is provided to select desired track.
* SOFTWARE Read and Write programs are provided for the PDP-8/S, PDP-8, PDP-8/I. Because of difference in execution speed, a different program is required for the PDP-8/S.
* CAPACITY Four program segments of up to 31 pages in length may be stored on one 15-foot cartridge. Up to 300-foot cartridges may be used for storage of data.
* SPEED Tape speed is 7 1/2 inches per second. Reading time is approximately 200 words/second.
* ELECTRONICS Read electronics are feedback controlled D. C. coupled for excellent time and temperature stability. Write electronics are file protected to prevent accidental writing over permanent programs.
* INTERCHANGEABILITY Tapes recorded on a PDP-8 or PDP-8/I may be used on any other PDP-8 or PDP-8/I. Tapes recorded on a PDP-8/S may require adjustment of the processor clocks of the two machines to within 5% for compatibility.
* CONTROLS Four position track select switch. Test mode switch. File protect indicator.
* MOUNTING Mounts in standard 19-inch relay rack. Transport requires 7 inches rack height. Control requires 5 1/4 inches of rack height.
* POWER REQUIREMENTS

115 ± 10 volts, 60 ± 1/2 Hz, 100 watts		
+ 10 volts	100 mA	Standard DEC voltages
- 15 volts	600 mA	

* ORDERING INFORMATION Six ribbon cables (4 feet long) with WO21 connectors for "daisy-chaining" to computer I/O bus are supplied. The transport is also available for 220 volt, 50 Hz operation.

Post Office Box J ■ Oak Ridge, Tennessee 37830 ■ Phone (615) 483-8408

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Lorenveien 6
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A B Chemetal
S:T Eriksgatan 5
Telephone: 51 51 11

MUNCHEN, WEST GERMANY
Wenzel Elektronik
8 Munchen 27
Lamontstrasse 32
Telephone: 0811 Munchen 48 65 58

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7756   6062   KCC
7757   6031   KSF
7760   5357   JMP .-1
7761   6036   KRB
7762   7106   CLL RTL
7763   7006   RTL
7764   7510   SPA
7765   5357   JMP .-6
7766   700
7767   603
7770   536
7771   603
7772   742
7773   377
7774   337
7775   535
7776   700
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HAVE YOU EVER BEEN FRUSTRATED BY WIPING OUT YOUR RIM LOADER?

HAVE YOU EVER KEYED IN THE LOADER ONLY TO FIND YOU HAVE TO DO IT OVER AGAIN -- AND AGAIN?

HAVE YOU EVER WISHED YOU COULD RELOAD A PROGRAM WITHOUT FUMBLING AROUND WITH MANUAL LOADING?

THEN JOIN THE

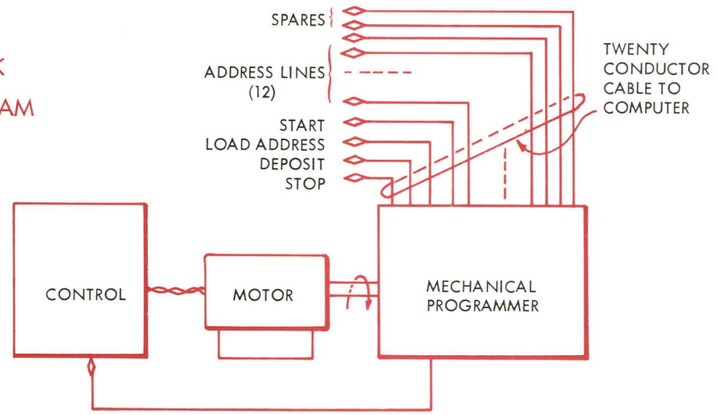
TENNECOMP CLUB!

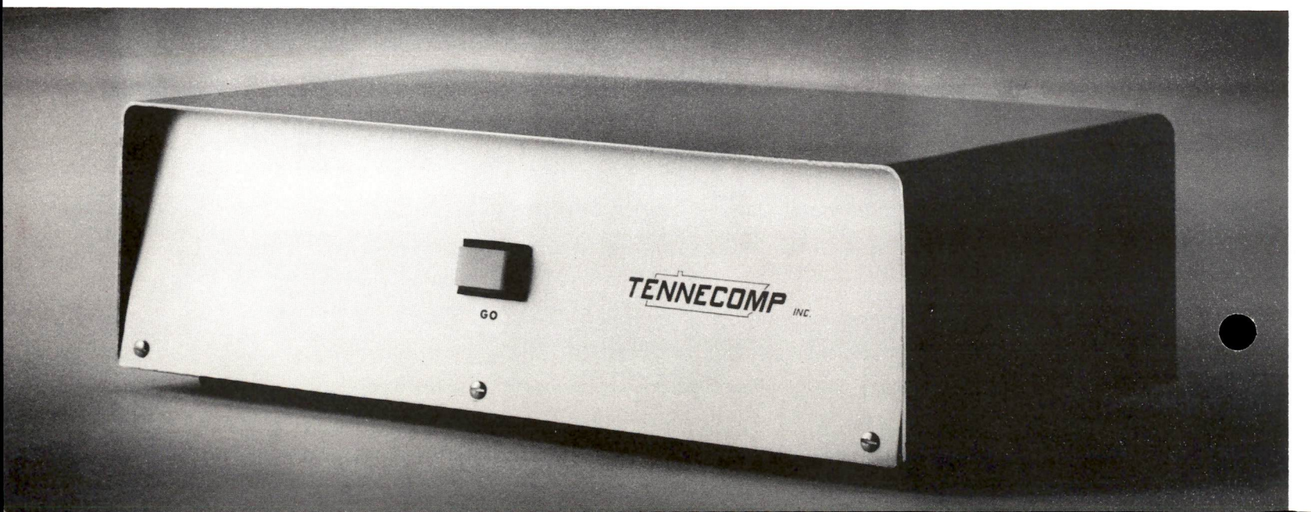
The TENNECOMP TP-1346 Automatic Loader is an inexpensive extremely reliable programmer for automatically loading the RIM loader (or any other short program) into PDP-8, PDP-8/S, or PDP-8/I computers. Pushing a single button loads the program and can (optionally) start the computer. Programming is by means of movable plastic pins. The TP-1346 comes complete with interconnecting cable, connectors, and instructions for connection to the front panel switches of the computer.

Some of the uses are:

* Quick and error-free way to read in the RIM loader (or the DECTAPE or DISC loader)
* Initiate bootstrap loading of complete programs from Teletype, Disc, or DEC tape. With automatic starting!
* Can be operated by a "watchdog" circuit to restore the memory in case of a system failure.

BLOCK DIAGRAM





TENNECOMP INC.

The TENNECOMP TP-1346 is a 58-step programmer which can be used to load a program into a PDP-8, PDP-8/S, or PDP-8/I computer. A momentary push button switch closure initiates the loading cycle.

SPECIFICATIONS

FUNCTIONS PROGRAMMED: Load Address (any 12 bit address)
Start
Stop
Deposit (any 12 bits of data)
End of Program (stops loading cycle)

READING TIME: Approximately .2 sec per step.

INSTALLATION: Connections are made in parallel with the panel switches of the computer. Matching connectors and instructions are supplied.

POWER REQUIREMENTS: 115 volts ± 10 volts, 50-60 Hz 10 watts
-15 volts D. C. 90 ma (from computer)

MOUNTING: Choice of table top or 19" relay rack mounting (requires 3 1/2 in. of rack height).

PROGRAM: Choice of the following programs:

RIM LOADER (Basic Loader for PDP-8/S, PDP-8 or PDP-8/I)
(either high-speed reader or low-speed reader version)
CRIMP LOADER (Basic Loader for PDP-8 or PDP-8/I)
DECTAPE LOADER
TENNECOMP MAGNETIC TAPE LOADER
SPECIAL PROGRAMS of up to 58 steps length supplied by user (stop, load address, deposit, and end of program count as 1 step each).

Extra plastic pins are supplied so that users may insert their own programs.

PRICE: TENNECOMP TP-1346, $594 U. S. and Canada
(Slightly higher overseas)

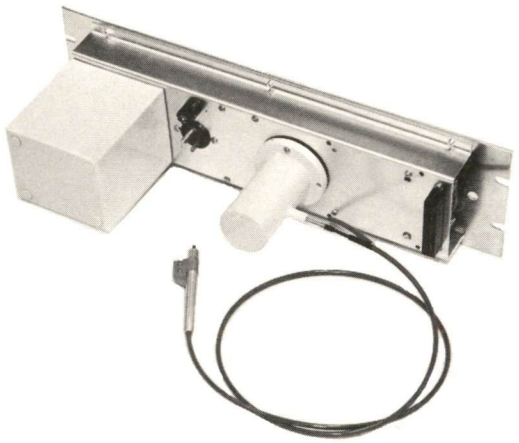
ORDERING INFORMATION: Rack Mount, RIM Loader, and 115 volts AC is standard.
(No extra charge for options).

Specify otherwise if:

for table top mounting
for 220 volts mains
program or programs other than RIM loader are desired.
(Enclose octal listing with order for special programs.)

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TP-1345 TENNECOMP LIGHT PEN ASSEMBLY



The Light Pen Assembly provides the user of Tennecomp systems with a simple and powerful technique of communication. In conjunction with the TP-1442 Display Scope and User-Aid Software, information can be transferred either into or out of the system by simply "writing" on the screen. In addition, the Light Pen can be used to initiate program operations.

The assembly consists of the pen and the photomultiplier pulse-shaping circuit. The pen barrel, lightweight and pencil size, is connected to the photomultiplier pulse-shaping circuit through a 4 ft. durable plastic fiber bundle. The pen incorporates a contact sensitive switch for computer interrogation of "pen down". The photomultiplier pulse-shaping circuit contains the photomultiplier, high voltage supply, and pulse-shaping circuit which provides standardized pulses acceptable to the system's computer. The assembly is sensitive to a wide range of screen intensities but is insensitive to ambient light.

Although the Light Pen Assembly is especially tailored for use with the Tennecomp System and User-Aid Software, it is sold as a unit and may be plugged into any Digital Equipment Corporation Computer or can be adapted for use on most other computers.

POWER REQUIREMENTS	115 V A. C. +10 V D. C. -15 V D. C.
MOUNTING REQUIREMENTS	The photomultiplier pulse-shaping circuit is mounted on a 5 1/4 in. by 19 in. rack mount panel

September, 1968

TP-1380 LIGHT PEN SWITCH CONVERSION KIT

The TP-1380 Light Pen Conversion Kit is designed to add a new dimension to light pen interaction with Digital Equipment Corporation (DEC) computers. When moving a "tracking cross", in a "drawing" program, it is highly desirable to be able to control the point at which drawing begins and stops. This control may not be easily accomplished with an optical on/off shutter because the computer loses track of the "cross" when the shutter is off. Many users of DEC displays have improvised their own finger or foot-operated button which can be interrogated independently of the light pen.

The TENNECOMP Light Pen Switch Conversion Kit adds an additional input/output instruction to the processor to sense the PEN UP/DOWN switch on the TENNECOMP TP-1345 Light Pen. A very natural type of interaction results which is much like touching a pencil to a piece of paper to write. Two additional instructions add the capability to ENABLE and DISABLE the Light Pen Flag interrupt. This capability simplifies many display interaction programs. When the computer is turned on, the POWER CLEAR signal sets the standard DEC light pen condition of interrupt ENABLE so that old programs will run without modification. A Conversion Kit is not required with the TENNECOMP TP-1402 Display Control since it already contains the required logic. Instructions added are:

SKIP ON PEN DOWN
ENABLE LIGHT PEN INTERRUPT
DISABLE LIGHT PEN INTERRUPT

INSTALLATION: The TP-1380 installs just below the DEC type 34D or 34H display control and is wire-wrapped to the SKIP BUS and to the PROGRAM INTERRUPT BUS on the 34D or 34H.

POWER REQUIREMENTS: +10 volts D.C. / -15 volts D.C. } obtained from 34D or 34H

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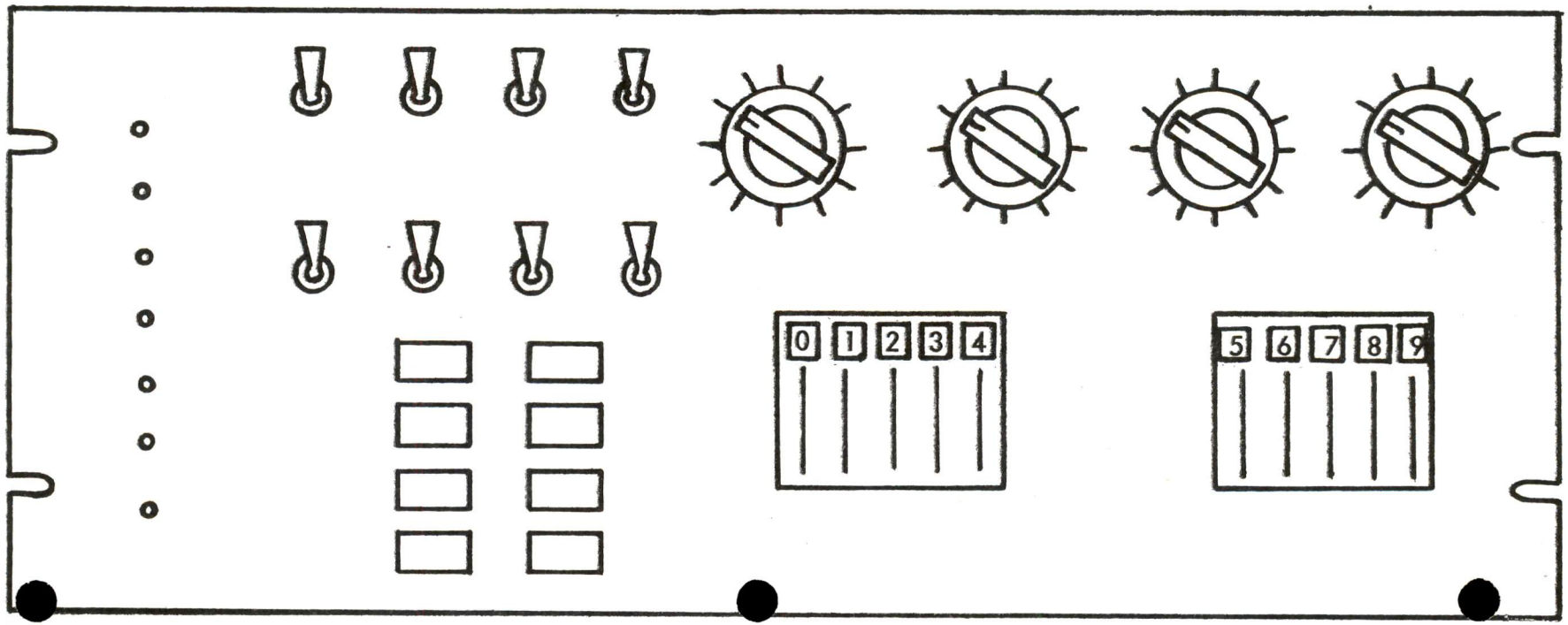
August, 1968

TENNECOMP TP-1347 FUNCTIONAL CONTROL PANEL

Although it is possible to obtain operator communications through the teleprinter keyboard or the computer entry switches, it is highly desirable to have a control panel which is separate from the computer and which is laid out in such a fashion as to simulate the conventional pulse-height analyzer front panel. The TP-1347 was evolved specifically for nuclear pulse-height analysis applications and complements the use of the keyboard, the computer entry switches, and a light pen. The panel is designed with a sufficient number of rotary switches, push buttons, and toggle switches so that most of the standard functions may be controlled entirely from the functional control panel.

The TP-1347 provides switches for input and status lamps for output. Labels are mounted (or printed) on removable slip-over covers so that the switches and lamps may be easily and quickly relabeled when the computer programs are changed.

The panel provides two 5-digit (6 optional) decimal entry switches, 8 snap-action push buttons, 8 toggle switches, four 12-position rotary switches, and 7 panel status lamps. The control panel logic control is compatible with the Digital Equipment Corp. computers and provides 16 instructions for interrogation of the switches and 7 instructions for setting or clearing 7 flip-flops (connected to the status lamps and to an external output plug).



TENNECOMP INC.
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September, 1968

TP-1442 DISPLAY SCOPE

Many applications require extensive interaction with graphical display data. This interaction is greatly facilitated by a large screen display oscilloscope. The TP-1442 uses magnetic deflection and a high resolution electron gun to achieve a small bright spot. The TP-1442 is ideally suited to computer displays up to a rate of 40,000 random points per second.

*	Kinescope:	14" diagonal screen size P-7 phosphor standard (P-31 optionally available)
*	Deflection:	Magnetically deflected Corner to corner deflection time: 25 microsec Small signals response for .2 inch deflection: 2 microsec
*	X-Y Amplifiers:	D.C. coupled Sensitivity adjustable from .25 volts/inch to 1.5 volt/inch
*	Linearity:	2% full scale
*	Acceleration Voltage:	11 KV
*	Plotting Area:	8" by 8"
*	Z Unblanking Signal:	-3 volts to unblank
*	Intensity:	Normally varied by controlling duration of unblanking signal (e.g. 1, 3, 9 microsec)
*	BNC Connectors	X-def., Y-def., Unblank, Signal Ground

CHASSIS SIZE:	19" relay rack mounting, 15 3/4" high, 20 1/2" deep
WEIGHT:	57 pounds
INPUT POWER:	115 Volts A.C., 60 Hz, 150 Watts

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August, 1968

TENNECOMP TP-1402 DISPLAY SCOPE CONTROL

The TP-1402 Display Scope Control is designed to interface display scopes to the Digital Equipment Corp. Family-of-Eight Computers. The conventional type of display control for small computers transfers X and Y information from the accumulator of the computer to the display control. In order to maintain a high quality display (with, for example, several thousand points), a large fraction of the processing capability must be devoted to a program which continuously refreshes the display. The TP-1402 Display Scope Control allows the automatic display of a block of data from a core buffer relieving the computer program from the task of point-by-point display generator.

Digital information is transferred from the computer through the 3-cycle data break facility to the Y-deflection buffer in the control unit and converted to an analog signal in a 10-bit digital-to-analog converter. Upon initialization, the Y-deflection information and the intensity information are taken from sequential core locations. The X-coordinate may be initialized by the central processor and is automatically incremented after each point. The display control will accommodate scopes manufactured by Tennecomp, Hewlett Packard or Tektronix.

In addition to interfacing a display to the computer, the TP-1402 also has provisions for interfacing a light pen (such as the TP-1345). Circuitry is provided which produces a computer interrupt when the light pen sees a spot being illuminated on the display scope. In addition, the skip facility can be actuated by a switch on the light pen providing convenient writing capability with a "tracking cross."

SPECIFICATIONS:

* The Y information is taken from the lower order 10 bits of a word in the display buffer.

* Accuracy of X and Y deflection signals are at least .2% of full scale. The display system is capable of resolving at least 512 points plotted across the diagonal of the screen.

* The intensity information is taken from bits 0 and 1 of a word in the display buffer. Three intensities are provided in addition to off.

* Time required per point is 3 memory cycles, plus scope response time.

* Instructions are provided for:

  CLEAR AND LOAD the display X-axis buffer
  CLEAR all display flags
  SKIP on word count overflow flag
  SET the X-axis increment to 0, 1, 2, 4, 8, or 16 units
  ENABLE the display
  DISABLE the display

* Light pen instructions are provided for:

  CLEAR the light pen flag
  SKIP on light pen flag
  SKIP on pen down
  DISABLE the light pen from the interrupt system
  ENABLE the light pen to the interrupt system

  When the light pen is enabled to the interrupt system, a light pen hit sets the pen flag, disables the display sweep, and causes an interrupt level to be sent to the central processor.

  When the light pen is disabled from the interrupt system, a light pen hit sets the pen flag but does not disable the display sweep and does not cause an interrupt level to be applied to the processor interrupt request bus.

* Mounts in 19-inch relay rack. Requires 5 1/4 inches rack height.

* Power requirements: + 10 volts
  - 15 volts

* A similar model is available which utilizes the 4-cycle Data Channel of the PDP-9.

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September, 1968

TENNECOMP TP-1514 FLEXIBLE NUCLEAR ADC INTERFACE

Experimental problems in nuclear research are often poorly defined and become apparent only during the course of an experiment. It is difficult to anticipate all the modes that will be needed. Tennecomp has the answer in their FLEXIBLE interface.

This ADC interface is designed to give the researcher the flexibility he requires and may be used with the PDP-8, PDP-8/I or PDP-9 computer. ADC control signals are brought out to a CONTROL PATCH PANEL for instant "reconfiguration" of ADC operation.

* Up to 7 NIM Modular ADC's may be accommodated,
  Northern Scientific 50 MHz Model NS-628 (8,192 channels maximum) is standard,
  Victoreen and Nuclear Data Models may be specified.

* Any ADC may be replaced by a "FLOP BOX" which allows binary auxiliary or control information to be read-in along with ADC data.

* An auxiliary CONTROL PANEL associated with each ADC provides test switches (for setting any bit to "0" or "1" for program check-out), a switch to select ADD 1 or LIST mode, a DATA PATCH plug, etc.

* CONTROL LOGIC PATCH PANEL allows the control signals from the ADC's to be combined for different configurations.

* Each ADC may operate in either the ADD 1 or LIST mode and may be operated independently or in coincidence with others.

* ADD 1 gives the fastest count rates of up to 50,000 counts/sec (limited by detector electronics), and LIST mode gives the greatest versatility (typically limited to 5,000 to 10,000 events/sec by the analysis program).

* Several independent 2 or 3 detector coincidence experiments may be accommodated simultaneously.

* Up to 13 data bits and an "invalid data" bit may be stored in the LIST mode. (The PDP-8 is limited to 12 bits maximum.) Up to 8,192 cells may be addressed in the ADD 1 mode.

* INSTALLATION: The TP-1514 is connected to the I/O bus and to the Data Break facility of the PDP-8 and PDP-8/I computer. It is connected to the Data Channel of the PDP-9 computer.

* MOUNTING: Standard 19-inch relay rack.

* POWER REQUIREMENTS: 115 ± 10 volts A.C., 60 Hz
  +10 volts D.C.
  -15 volts D.C.

September, 1968

COMPUTER PERIPHERAL ASSESSORIES DOMESTIC PRICE LIST FOR PDP-8 FAMILY AND PDP-9

TP-1346	Automatic Loader (for PDP-8 family only)	$ 594
TP-1351	Magnetic Tape Unit	1941
TP-1345	Light Pen and Electronics	1650
	Pen mechanical assembly with fiber optics available separately	150
TP-1380	Light Pen Switch Conversion Kit	455
TP-1347	Functional Control Panel with Interface	2700
	(control panel assembly available separately)	785
TP-1442	Display Scope	1900
TP-1402	Block Transfer Display Control	3480 for PDP-8
		3880 for PDP-9
TP-1514	FLEXIBLE Nuclear ADC Interface	on request

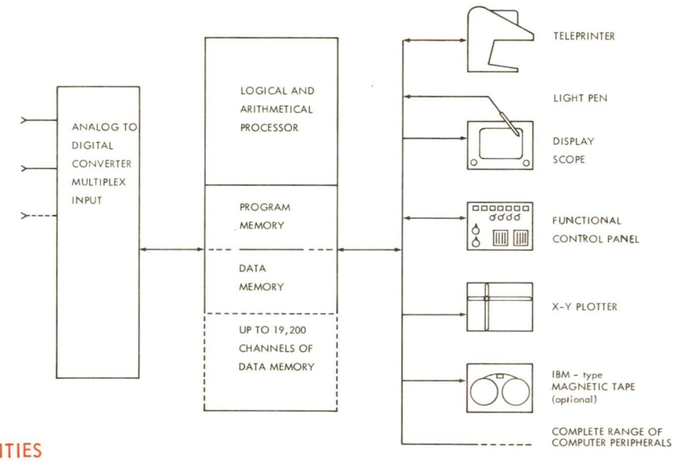
TENNECOMP

TENNECOMP INC.

THE TENNECOMP TP-1000 NUCLEAR ANALYSIS SYSTEM

the CONCEPT

The TENNECOMP TP-1000 system is a complete pulse-height analysis and data reduction system. It is a fully integrated unit from the ADC to the reduced data output. The heart of the system is a general purpose arithmetical and logical processor which gives the user a highly versatile and flexible nuclear analysis system. A wide variety of input and output devices are available, but most important is the ability to reduce the data to meaningful information immediately and to easily adapt to new problems. It can give on-the-spot reduction such as the unfolding of complex gamma ray spectra, integrating the area under peaks, finding the centroids of peak, calculating the energy of the channel number, and much more. The TP-1000 is a ready-to-go system and requires no knowledge of computers or programing. The system organization and features are described below.



INPUT CAPABILITIES

* Up to 19,200 channels
* 260,000 counts/channel capacity (other capacities available)
* Multiple detector inputs
* Combined count rates of up to 100,000 counts/sec

COMPREHENSIVE DISPLAY AND OUTPUT FACILITIES

* 8 in. by 8 in. Big Screen Display
* Lightweight contact-sensitive Light Pen
* X-Y Plotter
* Teleprinter
* Wide range of optional input/output devices

VERSATILE PROGRAMS

* Pulse-height acquisition
* On-line unscrambling of discrete and continuous scintillation spectra
* User-Aid programs for on-line data processing and analysis
* FORTRAN program preparation package (ASA Standards)
* Custom Programing for your Special Jobs

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SYSTEMS DESCRIPTION

ANALOG-TO-DIGITAL CONVERTERS

Choice of converters

* A new Tennelec ADC with μsec conversion time. Up to 4,000 channels.
* Conventional Wilkinson-type ADC with a clock rate of 40 MHz. Up to 4,000 channels.

MEMORY

* 8 μsec cycle time
* 260,000 count capacity per channel (standard)
* Accommodates 3,000 data channels (standard)
* Modularly expandable in increments of 2,700 channels

LOGICAL AND ARITHMETIC PROCESSOR

* 12 bit instruction word length
* General purpose instructions
* Simple plug-in modules for input/output devices

DIRECT MODE INPUT

* Channel is incremented directly by hardware
* Up to 100,000 count/sec are possible

INDIRECT MODE INPUT

* Channel numbers go into a memory "list"
* Multi-dimensional data may be transformed by logical and arithmetical processor at rates of 300/sec

LARGE SCREEN DISPLAY

* 8 in. by 8 in. useful size
* Bright screen
* Magnetically deflected

LIGHT PEN

* Lightweight pencil size barrel
* Durable plastic fiber optics
* Contact-sensitive switch contained in pen tip
* Sensitive to wide range of screen intensities
* Insensitive to ambient light

SOFTWARE PACKAGES

PULSE-HEIGHT ANALYZER

* Complete pulse-height analysis software
* Communication with user through functional control panel and conversational "keyboard interpreter" on teleprinter
* Display software
* Output software

USER-AID SOFTWARE

* Display scale expansion
* Peak finding
* Integration under peaks
* Background subtracting
* Light Pen sketching

NaI(Tl) SCINTILLATION GAMMA SPECTROSCOPY

* Display both pulse-height distribution and actual gamma spectrum while data is accumulating
* Automatically correct for variations in scintillator efficiency with gamma energy
* Reduce Compton background and escape peaks by a factor of 30 from 100 keV to 10 MeV
* Works with discrete or continuous spectra or combinations

PROGRAMS FOR EXPANDING SYSTEM CAPABILITIES

* American Standards Assoc. FORTRAN
* JOSS-like interpretive system for analysis program preparation during data acquisition
* Neumonic Assembler
* Linking Loader
* Conversational Debugging Program

CUSTOM PROGRAMMING

* Special programs for activation analysis, tracer studies, etc.
* Modifications to existing programs or additions of new ones done by our programmers to your specifications

OPTIONAL SYSTEM COMPONENTS

DETECTORS

* 3 in. by 3 in. NaI(Tl) gamma detector
* Ge (lithium drifted) gamma detector
* Liquid scintillation neutron detector

DETECTOR ELECTRONICS

* Main amplifier
* Preamplifier
* Electronics matched to detector for maximum performance

MAGNETIC TAPE

* IBM-compatible
* Tape Buffering for delayed analysis

digital INTEROFFICE MEMORANDUM

DATE: December 19, 1968

SUBJECT: TMZ

TO: Joe St. Amour
cc: Win Hindle

FROM: Ken Larsen

Mr. Jim McKeown (Marketing Manager) and Mr. Boom (Project Engineer) gave me a detailed explanation of the TMZ unit. The TMZ is quite an interesting package for a simple tape transport with the following construction features:

1) Built on an easily manufactured casting.

2) The reel servo and a capstan servo electron·.s is exactly the same to maximize the commonality of parts in the system.

3) The control electronics is mounted on one large printed circuit card approximately 10 x 12 inches with all of the read/write electronics mounted on another large card approximately 12 x 14 inches.

4) The tape guides, EOT and BOT sensing, read after write head and the capstan are all mounted on one assembly and precision aligned before installation on the main casting.

5) Easy to load with guide panel to eliminate the operator problems normally encountered by servo-arm system (Potter 906 II).

The TMZ unit looks good from a serviceability point of view. They have done an excellent job of using interchangeable components when similar functions are required, such as the servo drive electronics for the reels and capstan use the same components.

Because the head and capstan assembly are factroy aligned, this permits the field service organization to carry a pre-aligned capstan-head assembly and thereby provide the precision of factory alignment to the field environment.

I am attaching the following documents for your information. The first is a one-sheet bulletin on the TMZ. The next is an interim specification for the TMZ tape memory system consisting of seven pages. The third is a D size block diagram of the transport and status electronics.

I hope this information will be useful to you. If you have any questions, please feel free to call me.

mlc

digital INTEROFFICE MEMORANDUM

DATE: January 15, 1969

SUBJECT: Basic Tape System per Memo of January 6, 1969

TO: Ken Olsen

FROM: Ken Larsen

Attached is information on the Ampex TM-Z tape system.

Because my background consists mostly of field experience, I tend to view the features of a device and fix priorities based on customer and field operating/service experience. Ampex neglects to state in their literature what could from this view point be considered quite important:

1. Trim cover covers the tape buffer arm rollers while door is open - prevents loading errors that plagued the Potter 906-II drives (i.e. cockpit error).

2. For commonality, the three servo drive stages utilize identical components - (upper reel, lower reel and capstan) - control logic only is on a large card.

3. Head and capstan assembly includes critical tape path guides. This assembly is precision aligned before mounting on main casting. Field replacement of this assembly guarantees the precision of factory alignment in field environment.

The TM-Z looks well-designed with many good operator and service-oriented features.



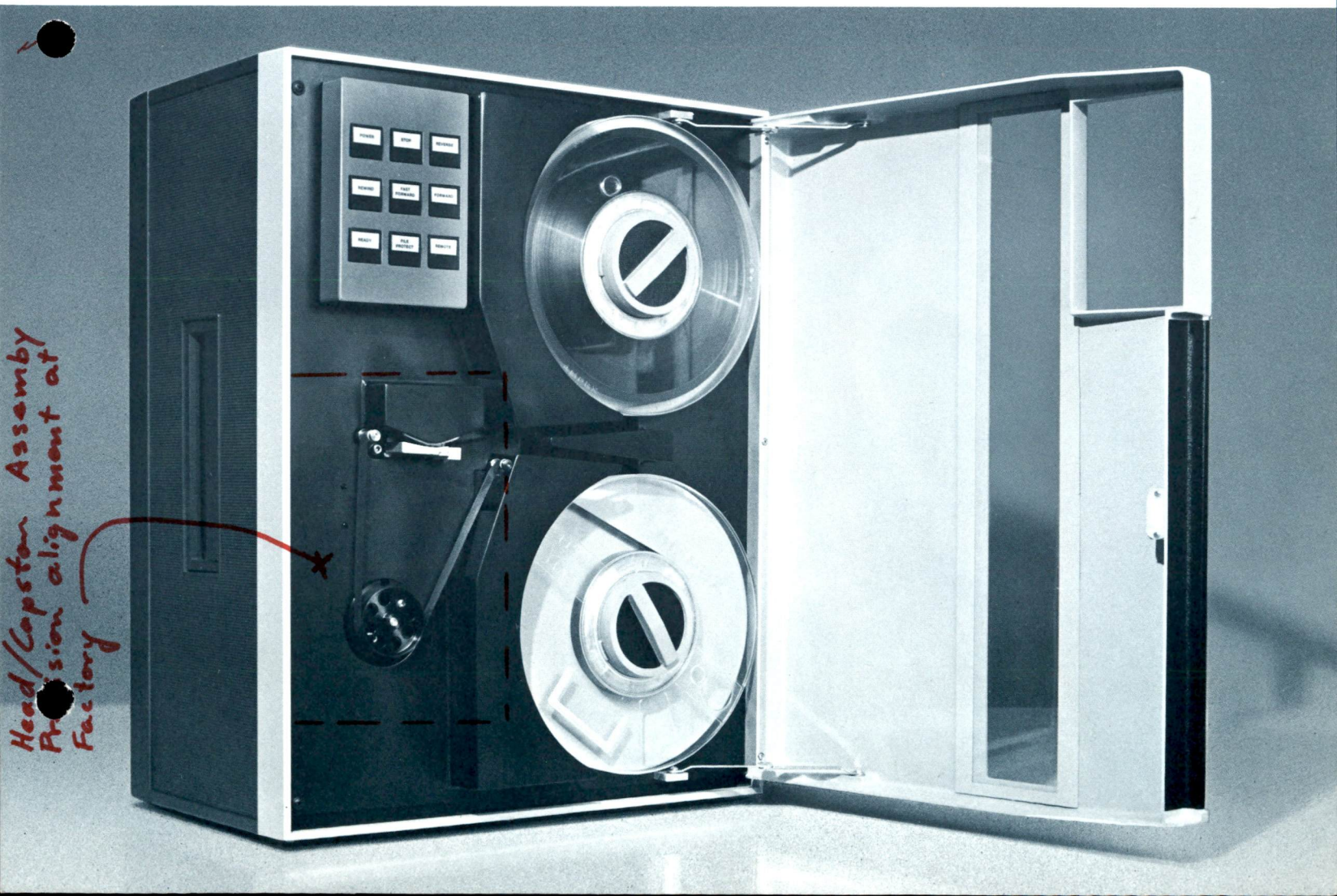
AMPEX

TM-Z low-speed, high-performance, computer-class tape memory system

The new Ampex TM-Z is a tape memory system that best fulfills the need for a low-cost, high-performance, low-speed unit for your computer, data terminal or data acquisition system. Completely computer-compatible, it conforms to all requirements of IBM and ASCII 7- and 9-track formats.

At its standard speed of 24 ips, the TM-Z provides a data transfer rate of up to 19.2 kHz. Optional speeds down to 10 ips are available.

Simplicity of design results in the utmost in reliability and easy maintenance. This completely new, ready-to-plug-in tape memory system features the same precision as the higher speed Ampex TM-7 and TM-16 tape memories, yet it is priced as low as $3,500 for a complete system including read/write electronics.



TM-Z digital tape memory system



three versions of the TM-Z are available:

TM-Z-1 Digital Tape Memory System with Read and Write data electronics

TM-Z-2 Digital Tape Memory System with Read only electronics

TM-Z-3 Digital Tape Transport with control and servo electronics (less data electronics) but including read/write head

To maximize component reliability, DTL and TTL integral circuit plastic dual in-line units are employed in conjunction with silicon transistors. Electronics are packaged on three connector interfaced circuit board assemblies: (1) 9-channel read and write data electronics board; read-write heads interfaced with connectors; (2) transport electronics board; (3) option board.

Precision mechanical construction is emphasized. The magnetic head assembly has minimal gap scatter. A precision head adjustment is provided to eliminate azimuth error. This eliminates the need for read and write deskewing electronics and permits bi-directional read operation without complicated network adjustments.

The system converts from 9-track (standard) to 7-track (optional) by a simple head assembly change.

major system components are:

tape transport assembly—Houses the mechanics of the capstan servo drive, reel servos, read/write and erase heads, photosensing, file protect, and local operator controls.

transport electronics assembly—Contains the power supply and electronic components necessary to actuate capstan and reel drive servos. The control logic and control I/O circuitry are packaged in this assembly.

data electronics assembly—Consists of nine write amplifiers, nine peak detection read amplifiers, data control and data I/O circuitry.

PERFORMANCE CHARACTERISTICS

tape speeds:
Standard speed is 24 inches per second, Read/Write (19.2 kHz transfer rate at 800 cpi). Any single tape speed between 10 and 24 ips can be obtained by utilizing a continuously variable adjustment.

tape width and thickness:
½-inch width, 1.5 mil by 2400 feet (732 meters)—for best performance use Ampex Tapes 832, 838, 839 or 873.

tape reels:
10½-inch (26.7 cm) IBM or NAB type.

recording density:
Standard: 556 and 800 cpi. Optional densities available.

recording formats:
Standard: 9-track, ASCII, 0.6 inch IRG (IBM 360, 2400 Series compatible).
Optional: 7-track, NRZI, 0.75 inch IRG (IBM 7330, 729 Series compatible).

read/write gap to gap spacing:
9-track—0.150 ±0.005 inch
7-track—0.300 ±0.005 inch

rewind and fast forward speed:
150 inches per second nominal

start/stop:
Tolerances permit bilateral interchange of tapes with equipment compatible with IBM and ASCII 9-track standards.

instantaneous speed variation:
Short-term speed variations are less than ± 1% of the design center character rate.

linear speed variation:
The average tape speed of any and all one-second intervals is within ± 3% of the design center speed exclusive of start-stop transitions.

input voltage and frequency:
Voltage: 100-250 volts RMS with transformer taps. On each tap the system meets all specification requirements at the design center tap voltage ± 10%.
Frequency: 48 to 63 Hz.
Consumption: Average, 400 watts. Peak, 500 watts.

operating environment:

	Operating	Shipment and Storage
Ambient Temperature:	40° to 110°F	−30° to +140°F
Relative Humidity:	20% to 80%	5% to 95%
Altitude:	0 to 10,000 feet	0 to 40,000 feet

acoustical noise:
Within the limits of curve NC60 or MIL-STD-803-2.

interface requirements (TTL, Data and Control Lines):

inputs:
TRUE = **+0.2 volt** (−0.2 + 0.2 volt) −19 ma max. customer sink current
FALSE = **+3.3 volts** (−0.9 + 1.7 volts) −3.5 ma sink current to plus 16 ma source

outputs:
TRUE = **+0.2 volt** (−0.2 + 0.2 volt) +16 ma max. customer source
FALSE = **+3.3 volts** (−0.9 + 1.7 volts) − 0.4 ma max. sink current

dimensions:
The complete tape memory system, including self-contained data electronics, can be mounted in a standard 19″ or 24″ rack.
Height: 24″
Width: 19″ or 24″
Depth: 17″ overall (14½″ rack depth)

weight:
100 lbs. max.

controls/indicators:
Remote: Pushbutton, backlighted
Stop (reset): Pushbutton, backlighted
Forward: Pushbutton
Reverse: Pushbutton
Rewind: Pushbutton
Fast Forward: Pushbutton
Power On: Indicator only
File Protect: Indicator only

	TRUE	FALSE
Run/Stop Line	Run	Stop
Rwd/Rev Line	Fwd	Rev
Rewind	Rewind	Rewind

Functional Modes (selective):
1. Write Forward, Read Forward
2. Read Only Forward
3. Read Only Reverse

Options:
1. Vertical Parity Check
2. Vertical Parity Generate
3. Write Echo Check
4. Longitudinal Parity Check
5. Longitudinal Parity Generate

All specifications in this document are based on standard Ampex test procedures and are subject to change without notice.

AMPEX
Ampex Corporation, Computer Products Division
9937 West Jefferson Blvd.
Culver City, California 90230

Sales Offices in: CALIFORNIA, Los Angeles Area (213) 245-9373, San Francisco Area (415) 367-3861 • FLORIDA, Cocoa Beach (305) 783-1811 • ILLINOIS, Chicago Area (321) 439-4600 • MASSACHUSETTS, Boston Area (617) 899-2040 • NEW YORK, New York City Area (212) 736-6116 • PENNSYLVANIA, Philadelphia Area (215) 887-7650 • TEXAS, Dallas (214) 637-5100, Houston (713) WA8-3741 • WASHINGTON D.C., Washington Area (703) 671-4000 • and throughout the world

LITHO IN U.S.A. -C087-10-68

SPECIFICATION (INTERIM)

TM-Z TAPE MEMORY SYSTEM

1. PURPOSE

The purpose of this specification is to define the features, performance characteristics, and physical characteristics of the TM-Z Tape Memory System. This specification is preliminary in nature and is subject to change.

2. GENERAL

The TM-Z Tape Memory System is a low cost, high performance, high production quantity item. Effort has been concentrated on the use of materials and production processes suitable to achieve this end. The major theme of the program is simplicity, both from the standpoint of hardware design and marketing efforts. This will best be achieved by holding the requirements for optional features and performance requirements to an absolute minimum, consistant with industry needs.

3. EQUIPMENT DESCRIPTION

The TM-Z Tape Memory System is a low speed computer compatible recording system conforming to the requirements of IBM and ASCII for parallel digital recording at densities of 200, 556, and 800 characters per inch.

The system will consist of four basic subassemblies: the tape transport, transport electronics, data electronics, and trim package.

TAPE TRANSPORT ASSEMBLY

This assembly consists of an integral cast chasis upon which the reel motors, control panel, and electrical assemblies are affixed. A precision assembly containing the capstan motor, guides, read/write head, EOT/BOT sensors, erase head and tape cleaner is also secured to this assembly.

TRANSPORT ELECTRONICS

A single printed circuit board contains the power supply regulation circuitry, capstan and reel servo electronics, and the integrated circuit control logic and I/O circuitry for the control functions.

DATA ELECTRONICS

This printed circuit board contains nine channels of read and write electronics. In addition, provisions have been made for VPC, LPC and special interface requirements which can be offered on an "Optional" board.

TRIM PACKAGE

This consists of a door with provisions to view the supply and take up reels, along with an "over lay" which covers the chasis and exposes the reels, tape path and control panel.

4. SPECIFICATIONS-TAPE TRANSPORT

Tape Speed-Read & Write	Any single tape speed between 10 and 24 inches per second bidirectional can be established by a continuously variable adjustment.
Inst. Speed Variation (ISV) (Short Term Variations)	When reading a tape, pre-recorded on the same machine, the peak to peak jitter shall be less than ±1% of the design center character rate.
Linear Speed Variation (LSV) (Long Term Variations)	The average tape speed of any and all 1 second intervals shall be within ±3% of the design center speed exclusive of start-stop transitions.
Tape Speed-FF & RW	150 inches per second ±10%.
Start and Stop Distances	Start and stop distances will be as required for bilateral interchange of tapes with equipment compatible to IBM and ASCII 9 track standards.
Command Rate	50 commands per second maximum average.
Tape Type	Ampex 832, 838, 839 and 873 types as applicable per IBM/ASCII specifications.
Tape Capacity	2400 feet of 1 mil tape specified above.
Reels	10.5 inch diameter per IBM/ASCII specifications.

Recording Densities	Standard 556/800 characters per inch. Optional: 200/556 characters per inch.
Recording Format	Standard - 9 track IBM/ASCII. Optional: 7 track IBM
Read-Write Gap to Gap Spacing	9 track - 0.150 ± 0.005 inch 7 track - 0.300 ± 0.005 inch

Controls-Local

Remote	Push button backlighted.
Stop-Reset	Push button
Forward	Push button
Reverse	Push button
Fast Forward	Push button
Rewind	Push button

Indicators

Power	Backlighted button
File protect	Backlighted button

Interface Requirements — Data and Control Lines (TTL Logic Employed)

Inputs

TRUE = +0.2 Volts (-0.2 +0.2 volts)
-19 ma. max. customer sink current.

FALSE = +3.3 Volts (-0.9 +1.7 volts)
-3.5 ma. sink current to plus
16 ma. source.

Outputs

TRUE = +0.2 Volts (-0.2 +0.2 volts)
+16 ma. max. customer source.

FALSE = +3.3 Volts (-0.9 +1.7 volts)
-0.4 ma. max. sink current.

Controls - Remote	TRUE	FALSE
Run/Stop Line	Run	Stop
Fwd/Rev Line	Fwd	Rev
Rewind	Rewind	Rewind

Selective Features

Magnetic Head Assembly

9 track - read and write with erase head (standard).

7 track - read and write with erase head (special order).

Functional Modes

Write Forward, Read Forward

Read Only Forward

5. SPECIFICATIONS - DATA ELECTRONICS

Construction

Nine channels of Read/Write NRZ-I data electronics are packaged on one printed circuit board. Deskew electronics are not employed because of other design considerations.

Optional features are packaged on a second printed circuit board. These options are discussed in section 6.

Format Compatibility

The system functions shall provide all compatibilities required to read and write information on tape at densities up to 800 bpi that is bilaterally interchangeable with tapes prepared on IBM 729 or ASCII compatible tape transports.

Density

A density of 556 or 800 bpi can be selected by means of the density select switch. A status line to the customer is provided to indicate high or low density. As an option, densities of 200 or 556 can also be provided.

Interface Requirements

All connections for interface data signals will be made through AWG #24 twisted pairs of single wires. The maximum length of the single cables shall be 20 feet. These cables shall be supplied by the buyer.

Input Requirements

Input List

Signal Name	No. of Lines
Write Data	7 or 9
Write Strobe	1
Write Reset	1
Write Permit	1
Read Permit	1
Select	1

Input Voltage Levels

See Interface Requirements of Section 4.

Input Timing

Compatible with DE-211.

Output Requirements

Output Signal List

Signal List	No. of Lines
Read Data	7 or 9
Read Clock	1
Write Enable	1
Unit Select Status	1
Write Echo Check Error (Option)	1

Output Voltage Levels

The standard levels are given in Section 4. Other levels can be furnished as extra cost options.

Output Timing

The timing requirements for all outputs are to be compatible with Ampex DE-211 output timing requirements. The values shall be for a combined cable and load capacitance of 500 pf max.

Reliability

Temporary Error Rate

A temporary error shall be an error that persists for less than 16 successive tries. The error rate shall be defined according to modes of operation as given below and shall be averaged over any two successive read passes of 5,000 blocks of 1,024 characters per block.

1. Write/Check Mode. In this mode, the Write/Check temporary error rate shall be less than 2 in 10^7 bits.

2. Read Only Mode. In this mode, the Read only temporary error rate shall be less than 1 in 10^7 bits.

6. OPTIONAL ITEMS

Optional Extra Cost Features (choose any or all for 100 unit minimum order.)

1. Vertical Parity Check
2. Vertical Parity Generate
3. Write Echo Check
4. Longitudinal Parity Check
5. Longitudinal Parity Generate

7. SPECIFICATION-SYSTEM

Weight	100 lbs. max.	
Dimensions	19" x 24" x 16" (14.5" from rack rail). May be mounted in a 19" or 24" RETMA/EMA rack.	
Input Power		
Frequency	48 to 63 cps	
Voltage	100 to 250 volts RMS with transformer taps. On each tap the system will meet all specification requirements at the design center tap voltage ± 10%.	
Consumption	Average: 400 watts	
	Peak: 500 watts	
Environment	Operating	Shipment and Storage
Temperature	40°F to 110°F	-30°F to +140°F
Relative Humidity	20% to 95%	5% to 95%

Components	Plastic, Dual In Line, Transistor - Transistor Logic is used for all integrated circuit components.
Altitude	Operating: 0 to 10,000 ft; Shipment and Storage: 0 to 40,000 ft
Acoustical Noise	Within the limits of curve NC60 or MIL-STD-803-2.
Mean Time Between Failure	No less than 3,000 hours per MIL-Handbook 217A.

digital EQUIPMENT G. M. B. H. MÜNCHEN

INTEROFFICE MEMO

SUBJECT PDP-8 Situation in Erlangen

DATE January 17, 1969

TO Ken Olsen

FROM Béla Csonth

cc. Helmuth Coqui

The situation at Siemens Erlangen has essentially improved since their visit to Maynard in October 1968. This is mainly due to the excellent performance of our new Field Service Manager in the Munich office, Steve Cooke.

Please find enclosed a copy of a short note from Dir. Gellinek of Siemens Erlangen to me, which expresses his re-gained confidence in our company.

Béla Csonth

Enc.

digital INTEROFFICE MEMORANDUM

COMPANY CONFIDENTIAL

DATE: January 20, 1969

SUBJECT: The PDP-16, etc.

TO: Stan Olsen
Al Devault
c.c. Ken Olsen
Fred Gould

FROM: John Holzer

As you pointed out, Stan, it is not too early to be thinking about complementary products for the PDP-14. Stan and Al, please consider this as a preliminary proposal for two such products.

1. The PDP-16

The PDP-16 is a mini PDP-14 using a less complex and less costly-to-implement instruction set than the PDP-14. Not only are the PDP-14's essential features covered by our patent application (filed January 7, 1969), but so are those of the PDP-16. The PDP-16 is a "straight sequential" machine; by that I mean, it executes every instruction in its instruction sequence, (it has no jumps).

I have a feeling that the PDP-16 would have the following features.

a. Straight sequential processor
b. Blocks of 500 word memory up to 2K
c. 10 bit instructions
d. One I/O box standard; expandable to four I/O boxes
e. Basic machine and room for all pre-wired options fit in one 1943 panel
f. Computer monitorable
g. Much of the 8L-based PDP-14 systems software could be modified to serve the PDP-16 (the Compiler, Assembler, and Simulator). Thus, as with the PDP-14, the PDP-16 could help the user automatically generate machine code, debug it off-line, and debug it on-line. Hopefully, we could devise ROM based diagnostics for the PDP-16 to check out the processor, I/O boxes, and memory. It is not now clear that we could do this with a straight sequential machine.

i. The target list price for the PDP-16 would be in the $1500 to $2200 range using a 3.0 to 3.3 markup factor.

The PDP-16 would be aimed at the small machine control market. It would beat relay initial price in systems involving only eight or ten control outputs.

Thus, by offering both the PDP-14 and PDP-16, we would cover perhaps 85% of the control market which is presently being filled by relays. Once more, the incremental cost of designing and marketing the PDP-16 should be small because much applicable design has been done in the PDP-14 development.

We now have a personnel rec in for a logic designer. I propose bringing that man in, acquainting him with DEC hardware and procedures (by letting him institute PDP-14 ECO's and letting him do some PDP-14 applications work). Then, in June or July, he would be ready to do a written study on the advisability of designing and marketing the PDP-16. Presumably, the study would indicate that a PDP-16 is both desirable and attainable and, therefore, would include initial PDP-16 specifications.

2. A Monitoring System Compiler

Detroit wants all new transfer machines and large special machines to be monitored. Each of the machine tool OEM's is exceedingly insecure, uninformed, and unintelligent about machine/control monitoring. Right now, we are forcing monitoring customers to go to Dave Entrekin, a systems house, or a competitor (such as IBM). To some extent, because of DEC's own lack of spare applications programming talent, we are side-stepping the opportunity of standard DEC-computer-based monitoring systems.

And, the number of customers who will come begging at our door will not dwindle; but, rather, because the PDP-14 enables the user to monitor his machine by peering into the 14 at the machine, the number of monitoring customers will increase fantastically. Once the PDP-14 is in the place, the user has an AC input interface for free.

Furthermore, I believe that the techniques of machine monitoring problem are so standard that DEC can develop standardized monitoring program packages for the user. Really, what is needed is a Monitoring Program Compiler.

Here is how a Monitoring Program Compiler might work:

a. The user sits down at a PDP-10 teletype and types in the characteristics of his monitoring process.
   (1) Number of monitoring inputs, outputs
   (2) The characteristics of each of his standard sequences
   (3) The content of his standard error messages
   (4) The time resolution he desires
   (5) The standard and catastrophic times for each sequence step.

b. The Compiler types back
   (1) The monitoring coding needed in each PDP-14
   (2) The monitoring program written for either a PDP8/I or a PDP-12
   (3) The amount of memory and disk required for the job
   (4) A list of other required or optional peripherals.

The existence of the Monitoring Compiler would increase demand both for PDP-14's and for PDP-12's (or 8/I's). The total demand each year for DEC monitoring computers could easily exceed 100. It would free us from special systems work for monitoring customers, by offering an attractive standardized programming package. It would also vastly increase our awareness of machine tool user problems.

We already have a general need for a process control programmer in the PDP-14 applications group. I propose that we hire such a man, let him do 14 applications programming for a while, and then turn him loose on Monitoring. I know a masters candidate from MIT who is now doing consulting for Boeing on real time control. I plan to invite him in and to interest him in our control/monitoring programming opportunities.

3. Conclusion

If we succeed with the PDP-14, the PDP-16 and the Monitoring Compiler, I daresay that we would be regarded as the IBM of the factory.

mf

digital INTEROFFICE MEMORANDUM

DATE: January 20, 1969

SUBJECT: Your Memo of November 21, 1968 to Ken Olsen

TO: John Leng

FROM: Ernest Luttig

cc: J. St. Amour
K. Olsen ✓

I am sincerely gratified to read of your interest in specifying the environmental conditions under which the DECtape transports will operate correctly.

I have an environmental chamber now in operation in which we are creating low humidity conditions and actually measuring static charge. When we complete these tests we will amend the operating specifications accordingly.

There is some information regarding the noting of the apparent low and high humidity problems in the field which would be of great interest and help to me. Your letter intimated that you had some first hand encounters with the problem and I am in hopes that this coupled with your obvious interest in the problem will enable you to get and send this information to me.

Some of the information I would like is:

1. The temperature at the time you noticed the problem.
2. The Relative Humidity
3. Were there any noticeable contaminants in the air? I mean easily detectable such as dust, oil mist, sulfur or sulfur products, etc.

I am looking forward to receiving any information that you have or can get.

/bca

encl. 1. Preliminary Report on DECtape Low Humidity Testing.

digital INTEROFFICE MEMORANDUM

DATE: January 20, 1969

SUBJECT: MR. GEORGE COGAR - MOHAWK

Nick

TO: Ken Olsen
cc: Bill Burns

FROM: Henry Crouse

Mr. Cogar started MDS along with E. V. Johnson (current President) and helped design initial data storage and entry systems.

In early 1967, he objected to the "Anelex purchase" and left MDS a rich man ($14,000,000 in stock).

At that time, he formed a software house called "Information Services" (non-public).

Rumors say he was discussing a possible merger with Xerox in the field of telecommunications.

He has no link now, outside of a brother, Senior Engineer type, with MDS.

Henry

ams

digital INTEROFFICE MEMORANDUM

DATE: January 21, 1969

SUBJECT: PERSONNEL DEPARTMENT DIRECTORY

TO: All Managers & Supervisors FROM: Personnel (Bob Lassen)

Attached for your information and reference is a Directory of services performed by this office and an outline of the major responsibilities of the Personnel Staffs within the department.

We hope this will be of use to you in locating the right source for a number of your questions. Keep in mind that this is just a brief outline and will be expanded and updated as the need arises.

jfr

PLANT PERSONNEL STAFF

MANAGER	
P. F. Chambers (G. Lawrence)	Plant Personnel Administration, Policy/ Procedure, Salary Administration (Wage Class 1 and 2), Organizational Staffing, Counseling, Employee Development and Performance Activities.
SUPERVISOR	
J. D. Murphy (G. Lawrence)	Plant Personnel Employment (all wage class 1 and 2 except Technicians, Wiremen), Salary Administration Research and Review, Supervision of Industrial Nursing Department, Employment Advertising Procedures, Manpower Forecasts, Employee Counseling
SUPERVISOR	
J. F. Gaffney (P. Sawyer)	Plant Personnel Employment Field Service (Wage Class 2 and 4), Technicians, Wiremen - Salary Administration Research and Review, Employment Advertising, Immigration Visas, Employee Counseling, Manpower Forecasting.
REPRESENTATIVES	
A. Silva (B. Wakefield)	Recruiting - Field Service
J. Young (P. Sawyer)	Recruiting - Field Service
J. Poor (B. Wakefield)	Recruiting - Technicians, Wiremen Draft Deferments Administration
R. Grzyb (L. Searles)	Employment - all Wage Class 1 and 2 employees except Technicians and Wiremen
K. Woolf (L. Searles)	Employment - all Wage Class 1 and 2 employees except Technicians and Wiremen
J. Sullivan (B. Wakefield)	Recruiting - Field Service

PROFESSIONAL PERSONNEL STAFF

NAME	AREAS OF RESPONSIBILITY
MANAGER	
G. A. Thayer (Louise Warren)	Professional Personnel Administration - Policy/Procedure, Salary Administration W/C 4, Engineer Review Board Proceedings, Employee Training/Development*, Professional Employment, Organizational Changes/ Appointments, Professional Personnel Staffing Problems, Employee Counseling. *Does not include Sales Training or Training Department Programs
SUPERVISOR	
P. Koch (Toni Hopkins)	Professional Personnel Recruiting, Sales Recruitment Coordination - Field Offices, Employment Advertising, Employment Procedures, Manpower Forecasts, Professional Personnel Staffing Problems.
REPRESENTATIVES	
R. Wilk (Donna Shomphe)	Recruiting - Finance, Programming, Sales Promotion, Personnel, Manufacturing
D. Madigan (Carole Stonick)	College Recruiting/Relations. Recruiting - Engineering/Marketing.

1/16/69

PERSONNEL DEPARTMENT - DIRECTORY OF SERVICES

Service	Contact	Extension
Address Changes	M. Guptill	2794
Automobile Registration	B. Wheeler	2794
Badges (New and Lost)	B. Wheeler	2794
Bulletin Board Notices	P. Malinski	2565
Cafeteria	J. Murphy	2607
Car Pool/Ride Assistance	L. Searles	2797
Contract Workers	J. Reilly	2603
Draft Deferments	J. Poor	2604
Employee Publicity	D. Dimancesco	2565
Group Insurance	L. Callahan	2606
Immigration Visas	J. Gaffney	2602
Dispensary	D. Hudson	2374
Lost and Found	M. Stephens	2794
On-Line Publication	D. Dimancesco	2565
News Bulletin	D. Dimancesco	2565
Name Signs (New Employees)	B. Wheeler	2794
Parking	J. Murphy	2607
Pension Plan	G. Lawrence	2628
Payroll Savings	L. Callahan	2606
Stock Purchase Plan	L. Callahan	2606
Shift Premium Forms	B. Wakefield	2794
Recreation Programs	P. Chambers	2601
Safety	J. Murphy	2607
Tuition Refund Forms & Information	G. Lawrence	2628

digital INTEROFFICE MEMORANDUM

DATE: January 23, 1969

SUBJECT: YOUR MEMO ON SPARE MODULES FOR EUROPE

TO: Ken Olsen FROM: Jack Shields

cc: Stan Olsen

I am writing just to let you know that we haven't forgotten about your concern on module repair backup in Europe. The reason for the delay in answering your memo is due to the fact that the customs situation has changed and is practically dictating individual module repair facilities in all of our subsidiaries. (We are presently doing this in the UK and Germany on a limited scale.)

Bill Newell will be discussing the overall situation with me on his trip around the middle of February, and I can give you detailed plans at that time.

JJS:ned

digital INTEROFFICE MEMORANDUM

DATE: January 29, 1969

SUBJECT: DESIGN STAFF AND EXHIBIT SYSTEM

TO: Marketing Committee
cc: Ken Olsen ✓
Joe St. Amour
Loren Prentice

FROM: Jim Jordan

We in Industrial Design want to help Marketing and Sales with the important exhibit effort. Unfortunately, we do not have sufficient manpower to develop exhibits and carry out our primary responsibility, product design. If you want us to continue, then your support (in dollars) is required to build an adequate staff.

We want to help you develop the ability for DEC to go to the many (65+) trade shows in which we are involved each year in a way which will be most effective in terms of low cost, maximum exposure, maximum sales and consistant message. We believe that the most important problem is effective marketing control and responsibility for each show either by way of a single marketing manager for all shows or, less desirably, an assigned marketing manager for each show. Effective planning and coordination of marketing goals, advertising strategies and shows will yield successful, low cost exhibits.

Industrial Design can provide the vehicle for this ideal situation. We can either refurnish the present booth or build a new one (I feel we will get a longer life and increased flexibility with a new system). However, it is really immaterial whether we build a new booth or keep the old one. The things that will make the difference between the hodge podge of present shows and a truly effective exhibit effort are, marketing goals (both long range and for each show), planning (say two months ahead for small shows (10 to 30 feet) and three months ahead for larger shows (40 to 80 feet and island configurations) such as FACEP, WESCON, IEEE and the JCC's), and coordination of Marketing, Advertising and Industrial Design functional areas for each exhibit.

We look forward to working with you.

Jim

bn

Ken Olsen

digital INTEROFFICE MEMORANDUM

DATE: January 29, 1969

SUBJECT: OFFICE FURNITURE

TO: Henry Crouse
Nick LoRusso
Pete Waldron

FROM: Lon Beaupre

We have received bids from representatives of several manufacturers, including Correy Jamestown, All-Steel, and Globe Wernicke. We are awaiting bids covering Invincible, General Fireproofing, and several others.

We will stop accepting bids Tuesday, February 4th at 5:00 P. M.
I would like to meet with you to review these bids on Friday, February 7th.
Anne Simoes will call you to set the time and place.

Lon

ams

Ken:
Nick suggests the furniture standards be up-graded to a line with longer life. Off-hand estimate is about a 10% increase in direct cost w/ longer term savings.

digital INTEROFFICE MEMORANDUM

DATE: January 31, 1969

SUBJECT: Rental Space
Maynard Industries

TO: Ken Olsen

FROM: Ed Schwartz

I have just been informed by Irving Burg that in the mill that Maynard Industries owns in Hudson (totally containing 218,000 square feet) there presently exists, open for rent, approximately 36,500 square feet on the fourth floor. The balance of the building (except for some warehouse space, which we can get if we want it) is occupied as follows:

Company Name	Square Feet	Termination Date
Dennison	110,000	two years
Hudson Lock	21,500	four and one half years
Darrell (?)	11,000	three years

Their building in Hudson is located approximately one and one half miles from Route 495.

EAS:o

Kenneth H. Olsen
Memos Received, February, 1969

TO:	FROM:	RE:	DATE:
Ken	Norm Doelling	FOCAL Systems	2/6/69
Ken	Pierre Schneebeli	DISK RS/RF08	2/17/69
Ken	Nick LoRusso	Auto Licence Number File	2/18/69
Ken	Ron Eisenhauer	Status of Foxboro Co. Computer Activities	2/21/69
Ken	Ron Smart	Computer Order Processing Rules and Timing	2/25/69
Ken	Geoff Shingles	Meeting with Sir Gerald Nabarro, House of Commons	2/26/69
Ken	Bev Young	New Markets for Small Computer in Communications	2/28/69

digital INTEROFFICE MEMORANDUM

DATE: February 6, 1969

SUBJECT: FOCAL Systems

TO: Ken Olsen

FROM: Norm Doelling

FOCAL is both a language and a number of operating systems for our 12-bit machines.

1) A single-user system will operate in a basic 4K machine.

2) A four-user system has been developed and is currently operating. This system requires 8K of core. The lower 4K is devoted to the FOCAL interpreter and a single 1000-word block of core in which the current user resides. Timesharing is accomplished through core-to-core swapping of user programs between the upper 4K and the 1000-word block in the lower 4K.

3) A seven-user system can be obtained by the addition of a DF32 disc. In this system timesharing is accomplished through core-to-disc swapping. At any given time two users reside in the upper 4K of core. This system also features a set of library commands which enable the user to store FOCAL programs on the disc so that they need not be punched out and read in on paper tape.

digital INTEROFFICE MEMORANDUM

Ken Olsen

DATE: February 17, 1969

SUBJECT: Disk RS/RFØ8

TO: Those Listed

FROM: P. Schneebeli

Since February 11 (Memorandum from J. St. Amour on same) Dick Best, Grant Saviers and Ulrich Skowronek in collaboration with Jack Williams have been revising the basic concept of the RS/RFØ8 electronics. Several shortcomings have been found, corrected and implemented on one or several of the five units in systems check. The improvement gained through those changes is significant. The list follows:

a. Eight word transfer failure was a too narrow and too heavily loaded IOT pulse that could not clear the add register. The problem was fixed by increasing the pulse width.

b. The complex erratic and rare failures of the data tests have vanished since the installation of the H714 line filter.

c. Address track flop TBH change was successfully installed.

More theoretical work and massive test is required to achieve specification goal. They are as follows:

a. Time margin increase.

b. Present improper use of B683 module will be corrected.

c. Minor "glich" in address comparison logic requires careful analysis.

d. PDP-8/I bus problem are present on both TSS/8. Support from PDP-8 line is absolutely mandatory. Signal loading into RFØ8 will require intensive analysis.

e. More work required on TBH flop to correct occasional failure in the address test section of Disk Data.

F. Relay switching is an internal source of noise.

Time necessary to take care of these problems could be as long as three weeks but if the present corrective procedures should prove their reliability an earlier release could be met.

/bca

cc: Engineering Committee
Marketing Committee
Operations Committee
R. Antonuccio
D. Knoll
G. Saviers
R. Vogelsang

digital INTEROFFICE MEMORANDUM

DATE: February 18, 1969

SUBJECT: Automobile License Number File

TO: Ken Olsen

FROM: Nick LoRusso

You may or may not know that many of the things you mentioned in your letter of February 4 have already been carried out. The responsibility for maintaining an up-to-date list of employees has been given to the Personnel Department. The part Office Services will play in this area will be limited to paging. Personnel has already sent around a questionaire asking for the information needed. They in turn will send up-dated information to Data Processing who will periodically update the listing and send copies to the switchboard and the guards. The system has been established and responsibility has been fixed. All that remains to be done is to carry out the program.

Altogether too often I have heard the comment, "Every year DEC starts something on parking, but they never carry it out." Personally, I feel rather strongly that in order for this parking policy to be truly effective, responsibility must be fixed on an employee who has a proven record for getting things done.

Nick

C - Bill Long

CONFIDENTIAL

digital INTEROFFICE MEMORANDUM

DATE: February 21, 1969

SUBJECT: Status of Foxboro Company Computer Activities

TO: Ken Olsen
Ted Johnson
Nick Mazzarese
Roger Handy

FROM: Ron Eisenhauer

The purpose of this memo is to establish the activities of the Foxboro Company in the selection of a new computer supplier and to recommend a course of action that I feel is necessary to hold this account.

Approximately eighteen months ago Foxboro approached SDS and considered using their Sigma 2's in place of our PDP-8's. They did in fact place an order for two Sigma 2 computers and subsequently cancelled them because of software difficulties and the working relationship in general.

It is a fact that Foxboro has been less than happy with DEC for the past six months. Their dissatisfaction stems from the following:

1. DEC's apparent lack of appreciation of environmental requirements necessary to satisfy the process control industry.

2. DEC's reluctance to ruggedize and/or design a special computer to assure reliability.

3. The 1,000 hours MTBF of the PDP-8 at several Foxboro installations is not nearly adequate.

Many of the problems that we have had with Foxboro can be traced to poor communications. Much progress has been made in recent months in this area. Foxboro has been reorganized and has assigned much more competent people to manage their computer systems. Prior to this reorganization, and after investigating many possible alternate sources of supply, Foxboro selected Sylvania Electronic Systems Division to design a computer. Sylvania was chosen because of their "experience" in designing and building militarized computers. This is known as Project 50 at Foxboro, and the negotiations are not fully completed. The present plan is that they will design a computer which is quite similar to the MSP 24 which was designed and built by Sylvania for the Minuteman Ground Support System approximately 4 to 5 years ago.

This is a small 24 bit computer and is construc5ed with integrated circuits. The basic memory contained 16,000 words with a cycle time of 2μsec. I have a copy of the MSP 24 Manual in my office. The proposed plan is that Sylvania will supply Foxboro with two prototypes and will build the first fifty units at which time Foxboro will assume the manufacturing responsibility for the life of the computer.

During the past year, while covering the Foxboro account, I have made it quite clear that I feel this course of action is a big mistake because of the following reasons:

1. Sylvania is a poor choice as a computer designer - the record speaks for itself.

2. The cost of a unit of this type.

3. The responsibility of sustaining engineering and the development of new products.

4. The total combined effect of Point 3 with competition.

As a result of these inputs several of Foxboro's top management are beginning to question the wisdom of this decision. They are starting to ask the following questions:

1. How many years will it take to get the development costs back?

2. When will the Systems Division start making money?

3. What will our competition be doing at that time?

Despite the problems that we have had with Foxboro in the past, I feel that Foxboro now realizes that other companies have more severe problems than we do. It is also quite possible that Foxboro will continue to market the PDP-8/I for the PCP-88 systems irregardless of the decision that will be made on Project 50.

We recently announced the PDP-11 to Joe Lombardo of the Foxboro Company who was here at the request of the Vice President of Engineering, Mr. Thomas Flint, and the Vice President of Marketing, Mr. Gerald Gleason, to learn as much as possible about the future products of DEC. The Systems Division was not aware of this decision.

The course of action that I suggest should be taken at this time would be a meeting of our top management with their top management to confirm our interest and desire to work with Foxboro, and if necessary, build a specialized computer for them. This meeting should take place within the next 2 to 3 weeks since the final negotiations of the Sylvania contract are to be completed in about 5 to 6 weeks time. We will also plan a formal presentation to Foxboro on the PDP-11 to the people responsible for Project 50.

I mentioned to Foxboro it may not be too late for DEC to alter the design of the PDP-11 as a special separate product for Foxboro. I have recently learned that Foxboro has been talking with Dynamics Research in Stoneham regarding their 24 bit computer. The fact that Foxboro was talking with Dynamics Research indicates that they are not fully convinced that the Sylvania approach is the best one. Also, for information purposes, Foxboro is working on another project known as Project 8 which is a small special purpose 16 bit controller with optional Read Only Memory to be used for smaller chemical and BATCH processing applications. This sounds like a natural for either the PDP-11 or possibly the PDP-14, which is all the more reason that a formal presentation should be made to respective project groups in the very near future.

/mp

Ken Olsen

digital INTEROFFICE MEMORANDUM

DATE: 25th February, 1969.

SUBJECT: COMPUTER ORDER PROCESSING
RULES & TIMING

TO: Product Lines,
Production, Sales
(see distribution
list)

FROM: Ron Smart

PURPOSE

This memo defines the way in which production levels are agreed upon and customers' order scheduled.

SUMMARY

Production capacity is established by Product Lines "forecasting" their requirements and Production advising the extent to which they can meet these requirements. The amount of equipment which Production agrees it can supply, is referred to as the "allocation".

The entire manufacturing cycle, from ordering parts to shipping a complete system, takes from four to eight months. To give quick delivery and to smooth production, "system components" (processors, memories and options) are manufactured in anticipation of customers' orders. The month in which the system components are integrated into a specific configuration, is the latest time when a customer can be assigned, without risk of reworking the system. This is called the "system start" month. The Product Lines' forecasts and Production's allocations specify the numbers of processors, memories, options etc. available for system start in each of the next eight months. These numbers are reviewed each month.

There is thus a stream of system components coming down the pike, against which specific customer orders are "scheduled" by Computer Order Processing. Customer orders are generally assigned the first system start month (also called the "manufacturing month") in which there are enough system components available to begin assembling the entire system. The "shipping month" depends on the number of months necessary to assemble and checkout the whole system, and can be up to three months after system start month.

25th February, 1969.

This memo defines the rules and timing for making forecasts, agreeing about allocations and scheduling customers into this allocated capacity. It deals with the problems resulting from the option mix of actual orders differing from the forecast, and with the problem of the actual production output differing from the allocated output.

The major headings are:

Establishing Manufacturing Capacity
Establishing Delivery Dates
Handling Deviations of Actuals from Forecasts
Detailed Timing of Communications
Control Reports
Last Minute Changes
Responsibilities

Figure 1: Gives timing detail for the manufacturing activity and the mutual communications.

Enclosures:
1. Sample Forecast Form
2. Sample Allocations Form
3. Sample Backlog Reports by System Start Month and by Ship Month
4. Sample Option Report
5. Sample Sales Activity Report

COMPUTER ORDER PROCESSING RULES AND TIMING

Establishing Manufacturing Capacity

1. Product Lines forecast their requirements for each processor and option, eight months into the future, paying special attention to release dates on new options as well as the historical relationship between actual orders and previous forecasts.

2. Production examines this forecast, takes into account their inventory levels and the production engineering status of new options etc., then allocates the availability for each processor and option for each of the same eight months.

3. Computer Order Processing schedule customer orders and delivery reservations (LOI's) into this available production capacity, being careful not to exceed the allocations. No orders will receive an official delivery date until there is an official allocation from Production.

4. The numbers of units forecast, allocated and scheduled as in 1, 2, 3 respectively above for each month, are the numbers of "system starts". Figure 1 illustrates where this point is, in the production sequence of a computer.

Establishing Delivery Dates

1. The elapsed time between "system start" and "ship" dates is a function of the equipment size and is available from Production for any item. E.g. for most options shipped separately as add-ons, and for simple 8/I and 8/L systems, it is less than a month. For larger 8 systems (exceeding $50K) it is 1 to 2 months. PDP-9 and 12 take up to 2 months, and PDP-10 systems mostly take 3 months. Special Systems work will generally add to these times.

2. Computer Special Systems Department reviews each individual order that requires non-standard equipment. Delivery is established based on available Special Systems Department manpower and delivery of the standard system to Special Systems Department from Production. Both Production and Special Systems Department are checked by Order Processing before establishing any Special Systems delivery dates. Change in Production delivery date (early or late) to Special Systems must be co-ordinated with Special Systems and Order Processing.

COMPUTER ORDER PROCESSING RULES AND TIMING (Cont'd.)

3. Ship dates are estimated by Computer Order Processing Department for obvious cases, using rules laid down by Manufacturing. Any large systems or questionnable configurations are checked out with Production before a delivery date is established.

4. The "system start month" (Manufacturing Code) and the "ship month" are both recorded on the salesman and customer acknowledgements, the construction requisition and in the backlog file.

Handling Deviations of Actuals from Forecasts

If the numbers of actual orders and their configurations differ from the equipment available based on forecasts and allocations, either the backlog will build up giving longer deliveries, or the inventory will build up. These problems are handled as follows:

1. To reduce backlogs, Product Lines can ask for increased production by revising their forecasts upwards. In general however, increases can only be made three months or more hence, because of delays in increasing parts supplies. There are also limits on the rate of build-up of production capacity (e.g. 10% increase in the fourth month). A considerable effort is therefore justified to arrive at a good forecast in the first place.

2. If customers are not available for all the allocated output of processors and options for a particular month, Production will cut their parts ordering, to minimise inventory build up. This usually cannot take effect less than three months hence. If Product Lines wish to build up inventory with this excess output, to give larger allocations in future months, this is requested of Production early in the system start month. Agreement must be reached between Product Lines and Production, concerning whether these items will be inventoried for future use, or disposed of at the discretion of Production (e.g. to satisfy other Product Line's requirements or to reduce future parts orders). Production cannot unilaterally wipe out a Product Line's unused allocation without discussion with the Product Line.

COMPUTER ORDER PROCESSING RULES AND TIMING (Cont'd.)

3. Equipment forecast, allocated but not produced and available in the system start month, remains owing by Production in addition to the normal output of subsequent months. The one exception is that unused (unscheduled) equipment, other than that specifically requested by Product Lines to be inventoried, is handled by Production at their discretion.

   An "overdue backlog" is maintained against which Production specifies revised delivery dates on all overdue equipment. This overdue status and revised delivery date is advised by Production during the system start month, even though the ship date may be later. This will give early warning of a probable delivery slippage.

Detailed Timing of Communications

1. Setting Production Output. Each month, the following events take place to establish the available production output levels.

   (a) On the first Wednesday of each fiscal month, Computer Order Processing give each Product Line its forecast worksheets. These worksheets list every item to be forecast, and provide space for new forecast figures in the "unfirmed" months (see Figure 1) and show the "firm" forecast levels against the actual usage, or commitments, in those "firm" months (see Sample Forecast Sheet).

   (b) On the second Wednesday of each fiscal month, the Product Lines return their filled-in forecast worksheets to Computer Order Processing, who combine the cross product line options (TU55, ASR-33, etc.) and pass on the complete package to Production.

   (c) On the third Wednesday of each fiscal month, Production give their allocated outputs for each item. Computer Order Processing distribute these by product line for common options (arranging Product Line meetings if necessary to resolve conflicts).

   (d) Computer Order Processing make up (or adjust) their "Tally Sheets", which specify the available quantity of each item against which customers may be scheduled, so as to keep within the agreed allocations.

COMPUTER ORDER PROCESSING RULES AND TIMING (Cont'd.)

2. Scheduling Customers. Computer Order Processing Department schedules system starts for firm customer orders and reserves slots against LOI's and other reservation media, according to Product Line rules. Configurations are entered onto Blue Lines and the construction requisition copied and filed, ready for Production. The timing is as follows:

   (a) For PDP-10 and TPL, the Product Line reviews the purchase order before scheduling and indicates system start and ship months. They do this because both these Product Lines generally have pre-assigned slots to the customer prior to receipt of the P.O. Other Product Lines have the delivery reservations and scheduling done by Computer Order Processing directly.

   (b) A "Preliminary Blue Line" and associated construction requisitions, with only firm customers, is submitted to Production by the 15th of the month prior to system start. Delivery reservations are closed out approximately two weeks earlier and firm customers moved up in place of LOI's, if possible.

   (c) If the Preliminary Blue Line did not fully use the available allocations, additional systems will be scheduled with Production's agreement and the final Blue Line with these additions, given to Production by the beginning of the system start month.

3. Status Information. Production is responsible for advising Computer Order Processing of any changes in delivery dates, from those originally scheduled. This is controlled as follows:

   (a) At weekly status meetings, early warning will be given of potential changes in the allocated output for any of the "firm" months.

   (b) Production will send advice cards to Computer Order Processing as each system is started, indicating expected ship date or transfer date to Special Systems Department.

   (c) Production will advise Computer Order Processing, one week at least prior to the end of the fiscal month, of any equipment scheduled to ship which will not go. New dates will be estimated by Production.

COMPUTER ORDER PROCESSING RULES AND TIMING (Cont'd.)

(d) Production will give revised ship dates for any other overdue equipment which did not ship as expected.

(e) For equipment being built by Special Systems Department, they will provide the above information in place of Production.

(f) Computer Order Processing will give delivery information to field offices and customers, based on official delivery information from Production Department and Shipping Department.

Control Reports

The General Backlog File, maintained on the EDP system, will be the main control record. This is planned to be operational by March. It is similar to the existing Backlog File, but will include all items which go on the Blue Line, i.e. LOI's, Demos, etc., instead of just firm P.O.'s. This data file will continue to be used to keep Sales Offices aware of their backlog and deliveries. Its new function will be to ensure that Product Lines, Production and Order Processing are all working with the same backlog, delivery dates, and mix of firm orders and LOI's for each month's production. This report is now in operation for the financial backlog only (March for the general backlog). Printouts are available by Product Line, broken down either by system start month or by delivery month.

Forecasting data available includes this backlog report by option, the "option report" giving historical data and a smoothed forecast, and the Sales Activity File for dollar value and number of processors forecasts (see attached samples).

"Last Minute" Changes

1. The Blue Line and corresponding Construction Requisitions will be finalised two weeks before the beginning of the "system start" month. If firm customer P.O.'s are not in by that time, Product Lines or the Sales V.P. must have signed an Unusual Order Form covering the equipment to be built on speculation in that month. If there is unused production capacity and unused allocations, additional firm orders can be Blue Lined up to the beginning of the system start month with Production's agreement.

2. No changes to configurations will be made after the Blue Line goes to Production, without a Product Line decision and the agreement of Production. Delivery slippage may result and Product Lines may decide to make a penalty charge for any rework or unused equipment resulting.

3. Requests for allocation changes in the "firm" months, e.g. changes in option mix, can be made at any time with Product Line approval. All such changes must take into account the possible effect on other Product Lines and on other months' outputs. In general only very minor changes will be possible.

Responsibilities

Product Lines are responsible for Forecasts. Production is responsible for Allocations (including unreleased options for which Production Engineering specify the Allocations). Computer Order Processing is responsible for scheduling purchase orders, and keeping sales offices and customers reliably informed on delivery dates.

If there are priority situations, the accommodation of which will upset delivery of other scheduled customers, the priorities will be decided by the Product Lines. However any changes of this kind will be done through Computer Order Processing, such that their records remain up-to-date.

jr
encl.

FIGURE 1

TIMING OF MANUFACTURING ACTIVITY AND ORDER HANDLING COMMUNICATIONS ON EQUIPMENT FOR AUGUST SYSTEM START

	Manufacturing Activity	Product Line, Production and Computer Order Processing Communications
January	Plan manufacturing capacity and order long lead time components for August system starts	Make initial forecast and allocation for August system starts.
February		Review forecast and allocations for August system starts.
March		Review forecast and allocations for August system starts.
April		Review forecast and allocation for August system starts.
May	Place preliminary parts order.	Review small machine forecast and allocation for August system starts, firm up PDP-10 forecast and allocation for August system starts.
June	Finalise parts orders. Start PDP-10 Basic Processors.	Firm up small machine forecast and allocation for August system starts.
July	Start options and small processors as separate items.	Preliminary Blue Line for August with firm P.O.'s. Final Blue Line for August including late P.O.'s within production capacity.
August	System Start Month. Ship add-ons. Ship "small"** systems.	1st Wed.* ← Product Lines request disposition of unused August Allocations. 2nd Wed.* 3rd Wed.* ← Final disposition of unused August Allocations settled.
September	Ship "medium"** systems.	
October	Ship "large"** systems.	

*Note 1. Each month's detailed timing is:

1st Wednesday, Computer Order Processing give Product Lines their forecast forms.

2nd Wednesday, Product Lines turn in their forecasts to Production through Computer Order Processing.

3rd Wednesday, Production returns its allocations to Product Lines through Computer Order Processing.

**Note 2. "Small" system is 8 Family system less than $50K with released options.
"Medium" system is PDP-9 or 12 with standard options or very small 8 Family Special System.
"Large" system is PDP-10 or large Special System.

dec INTEROFFICE MEMORANDUM

DATE 26th February 1969

SUBJECT Meeting with Sir Gerald Nabarro, at House of Commons, Monday, 24th February 1969

TO
K Olsen
Operations Committee
J-C Peterschmitt
A Gordon
D Knoll

FROM
G Shingles
Geoff.

Present:- Sir Gerald Nabarro, M.P.
Tom Hartshorne, Managing Director, Scientific Advertising & Marketing
Geoff Shingles, Digital.

Sir Gerald Nabarro is a Member of Parliament of long standing - since 1950. He is a very strong personality, and operates from the back benches with vigour. His connection with Digital is via Scientific Advertising & Marketing (SAM) - he is a Director of the holding company of SAM. Sir Gerald, although a Conservative M.P. is a personal friend of Anthony Wedgewood-Benn, the Minister of Technology.

The meeting was arranged as a follow up to a résumé of the present position of Digital in the U.K., which was sent to Sir Gerald earlier.

Sir Gerald stated that he was of the opinion that we were in a situation where although our products were American-based, their use frequently contributes to narrowing our "trade-gap"; eg in the case of the Rolls Royce PDP-10 which will be used extensively in the RB-211 aero engine test and the RB-211 is a major export item.

Continued...

He will make personal, informal contact with the Minister of Technology on our behalf concerning our case, and has asked that we provide him with information in concise form to allow him to do this. The form that this will take:-

1. Of total sales, what is imported content?

2. How much do we export?

3. Do we contribute to exports by purchase of U.K. components for U.S. use?

4. What key installations have we had in Government departments?

5. What resistance have we met, directly and indirectly?

6. What are our future plans?

Sir Gerald will also be able to give an insight into the role played by the Treasury and Board of Trade in the whole situation.

It was made clear that the input on a matter such as this at a high level in a Ministry could be extremely helpful.

My next action on this basis is to provide Gerald Nabarro with suitable information for his contact with the Minister.

GSS/BAK/3MT

digital

digital INTEROFFICE MEMORANDUM

DATE: 28 February 1969

SUBJECT: New Markets for Small Computers in Communications

TO: Nick Mazzarese
Win Hindle
Dave Cotton
John Cohen
Robert Savell
Ken Olsen ✓

FROM: Bev Young

cc K. Lill
A. Lauck
R. Cady

The rapid development of smaller, less expensive general digital computers is proving to have a significant effect in communications. This impact has been most visible in the changing economics of commercial time-sharing operations: it is becoming increasingly profitable, both for the computer utility and for its customer, to dedicate such computers to the tasks of gathering, buffering, pre-processing, and controlling the transmission of data from users' stations. The central computer, typically orders of magnitude more expensive than these peripheral controllers, is then almost totally free of input/output chores, and can devote itself to the execution of users programs, at which it is more efficient.

Two basic classes of communications processor exist. Local, or "front-end", processors are physically near the central computer and assume its input/output load for all user terminals, which are typically low data rate devices. Communication with the central computer is via high speed, direct memory access channel. Remote processors may be any distance from the central computer and communicate with it, either directly or through a peripheral processor, over telephone lines or other common carrier facilities. At the remote site the processor's work may range from simple buffering and pre-processing to control of sophisticated peripheral or user equipment and/or execution of programs.

The most important applications of remote communications processors are:

1. Remote batch terminals - processor and modem interface plus some combination of batch equipment, such as card reader/punch, line printers, Magtape or DECtape, etc. Gives the user the capability of running programs in batch mode without expensive travel or mail delays.

2. Remote line concentration - operates like a "front-end" processor for a group of low-to medium-speed lines in a geographical region relatively distant from the central computer. The

use of a single high-speed line reduces costs to the service bureau, and consequently its charges to users are lower.

3. Remote interactive terminal - typically for on-line problem solving, using remote processor for simple operations and as buffer-controller for large computer backup on more complex processing, such as execution of FORTRAN programs. Variations may include keyboard-display terminals, such as those manufactured by Tektronix and Conrac, more sophisticated 338-type displays, x-y plotters and a simple core-resident interpretive language such as BASIC or FOCAL.

4. Remote data acquisition - to be used for on-line monitoring and collection of production or manufacturing process data. Applicable range is roughly that of existing INDAC equipment, including simple closed-loop control operation.

The primary customers for remote batch and remote line concentrators will be the time-sharing utilities. Besides reducing their operating costs and consequently enabling them to offer more attractive rates, such terminals tend to "lock-in" the utilities' customers by making their software increasingly dependent upon that particular system. These are the largest and fastest - growing segments of the remote terminal market at present and should continue so for some time. Remote interactive and data acquisition terminals are just beginning to catch on and probably will continue to account for a smaller portion of this market. Principal customers will be multi-operation companies with centralized data processing facilities for remote data acquisition terminals, with interactive terminals being divided about equally between such companies and the computer utilities.

Given that Digital should move to exploit the remote terminal market, the advent of the PDP-11 is a two-fold advantage. The primary advantage is the superior efficiency of this computer in data handling problems of this type, as well as its price advantage. Second, great care must be taken in approaching the entire communications market with the PDP-11, so that the danger of premature obsolence of the new 680/I is minimized: by concentrating the PDP-11 in the remote terminal segment a reasonable payback period on the 680/I should be realizable.

As presently conceived Digital's remote terminal product will be a hardware-software system based upon standard PDP-11 line equipment to the maximum possible extent, and general enough to embrace any one (or combination) of the above four applications. This will be accomplished by basing the software on a monitor routine which will supervise the execution of a group of device-handling subroutines, allocate buffer storage, control other common operations including timing, and control the transmission link with the central computer. The device-handlers are added modularly as the desired

peripherals are interfaced to the bus, to arrive at the desired remote terminal configuration. The number and variety of terminal options will then be limited only by the speed and memory expansion capability of the PDP-11.

The first phase of this project will begin as soon as the PDP-11 initial engineering effort is sufficiently complete to make the relevant personnel available. Goals will include the greatest feasible definition of technical details, including system software, basic terminal hardware and selection of peripheral options. These in turn will pinpoint pricing and market size estimates, as well as allowing good estimates of inital developmental and marketing cost for the product. This phase will be complete within two months of its inception.

The second phase will concentrate upon product development; i.e. the actual "build and test" phase. Primary attention will be toward remote batch and line concentration versions, in order to begin by building a solid base in the segment of greatest demand. Secondary attention, where available, will be directed to market development. The duration of this phase will depend somewhat upon the final configuration of the product, but it is not unreasonable to foresee deliveries in early 1970.

Finally: growth of PDP-11 products in communications will depend upon the fate of existing communications products, to the extent that change is not forced by our PDP-11 customers. However, the existence of a working PDP-11 with-modem-interface will give us a head start on front end processors with the capability of controlling a combination of low- and medium-speed lines, which seem to be the trend in the near future. It will be simple to move into that market from remote terminal products if it should appear that the 680/I no longer satisfies demand.

Kenneth H. Olsen
Memos Received, March, 1969

TO:	FROM:	RE:	DATE:
Ken	Al Hanson	Proposed 500,000 square ft. plant	3/5/69
Ken	George Rice	Waterbury Farrel Jones & Lamson	3/6/69
Ken	Jack Shields	Central Complaint Dept.	3/7/69
cc: Ken	J.C. Peterschmitt	Inaccuracies in paperwork	3/7/69
Ken	Jim Jordan		3/10/69
Ken	Gordon Bell	building HAL	3/11/69
Ken	Peter Watt	Stock Exchange of Melbourne	3/27/69
Ken	Mark Nigberg	Proposed Astrotype Installation	3/27/69

Attachment in Letters Enclosure File

digital INTEROFFICE MEMORANDUM

Memo #510

DATE March 5, 1969

SUBJECT: Proposed 500,000 square foot plant

TO: Ken Olsen

FROM: Al Hanson

Attached you will find a brochure from Carlson Corporation with outline specifications and cost breakdown of a 500,000 square foot, one story plant.

The cost per square foot is approximately $7.50 and would include everything except moveable partitioning, special tile on the concrete floor, and interior decorating. All other construction costs are in the proposal.

I am working with Carlson Corporation developing costs for a 100,000 square foot module to compare with this proposal.

If you have any further questions, please call me.

March 6, 1969

Information from George Rice:

Waterbury Farrel has just recently expanded their discount agreement with us to purchase 7 PDP-8/L's (1 already delivered, 6 more on order). They have also bought a few of our modules.

Jones & Lamson is not buying machines from us, but from Bedford Associates (who buys from us), a systems house that specializes in numerical control.

John Holzer,
Bill Miller
These are the two Co's the Pres
of Textron said we may want
introductions.
Ken Olsen
cc

Ken Olsen

digital INTEROFFICE MEMORANDUM

DATE: March 7, 1969

SUBJECT: CENTRAL COMPLAINT DEPARTMENT

TO: Jim Cudmore FROM: Jack Shields

I am concerned about the fact that a Central Complaint Department will be redundant, especially concerning Field Service problems which are now handled by the Product Support Organization.

Further, I feel that any sort of Complaint Department that is not part of or directly related to the Product Lines will tend to generate another layer of organization between the Product Lines and their source of inputs and problems.

In short, it would seem that the Product Lines and the various functional groups involved should set up a complaint department; or better yet, define their organizations and those who are responsible for solving problems and answering questions.

A periodic publication indicating who the key people are in each group is required.

It is my opinion that problems involving cross functional groups and product lines must be brought to the attention of and resolved by the Product Lines.

JJS:ned

CC: Operations Committee

DIGITAL

INTEROFFICE MEMORANDUM

DATE March 7th 1969

SUBJECT Inaccuracies in paperwork

TO B. Dill

FROM J.C. Peterschmitt

cc. K. Olsen
T. Johnson

A) Attached is a case example of a shipment where documents do not check with contents. The results are :

1) For this order, a delay until we can present new documents to customs.

2) For subsequent orders, complete item by item inspection by customs. Even if no discrepancy is found, this takes several more days than when customs make only spot checks (i.e. one shipment out of ten or fifteen). If a discrepancy is found, we pay a heavy fine, as we have already paid several times in the past.

B) We have also had several cases where customs did not notice that items were missing, and we paid customs on the full list price shown on the documents. When the missing items came later, we had to pay duty a second time (in one case, this included a DF 32).

C) We have been trying for two years to improve these inaccuracies in paperwork, without success, I would like to see this resolved rapidly and definitely.

I am sending a copy of this case example to Ken Olsen because I believe that it also relates to the problem I have already mentioned repeatedly. I believe that this sort of deficiencies is not only due to deficiencies of individuals, but to the fact our organisation is not adequately equiped to handle many routine matters which cut across responsibility lines. As I see it (we have exactly the same sort of problems in Europe) it can only be solved by ~~people~~ somebody devoting full time to this kind of systems problems

Jean-Claude

digital CORPORATION

MAYNARD, MASSACHUSETTS 01754

PHONE: AC 617-897-5111 TWX: 710-347-0212 - CABLE: DIGITAL MAYN. TELEX: 9-4819

DATE INVOICED	INVOICE NO.
1/24/69	[illegible]

REFER TO THIS NO. ON ALL INQUIRIES

REMIT TO: DIGITAL EQUIPMENT CORPORATION
P. O. BOX 1685
BOSTON, MASS. 02105

2 ctns.
25 lbs.

SOLD TO
Equipment Digital
233 Rue de Charenton
Paris, 12, France

SHIP TO
Equipment Digital
c/o Donat & Cie
Paris Orly Airport, France

F.O.B.	TERMS
MAYNARD, MASS.	NET 30 DAYS

DATE TYPED	CUSTOMER ORDER NO.	PART.	COMP.	SALESMAN	SHIP VIA
1/27/69	F104		C		Air Freight

DATE REQUIRED	STOCK ROOM	RENEG.	CUST. CODE	SALES OFFICE	STATE CODE	D.E.C. NO.	DATE SHIPPED
			0342	22	62	FS 55206	

ITEM	QUANTITY			DESCRIPTION		UNIT PRICE	EXTENSION
		3		D130	Modules	50W	60.00	180.00
		3		D133	"	"	23.30	69.90
		3		D134	"	"	31.00	93.00
		3		D135	"	"	17.00	51.00
		1		D137	"	"	13.00	13.00
		3		D138	"	"	59.00	177.00
		3		D141	"	"	24.50	73.50
		3		D156	"	"	25.00	75.00
		3		D163	"	"	31.00	93.00
		3		D165	"	"	21.20	63.60
		1		~~D166~~	"	"	31.00	31.00
		3		D167	"	"	34.00	102.00
		4	→	D168	"	"	31.00	93.00
		1		D169	"	"	31.00	31.00
		1		D172	"	"	15.00	15.00
		1	→ 2	D190	"	"	115.00	115.00
		1		~~D197~~	"	"	64.00	64.00
		2		D204	"	"	28.00	56.00
		1		D212	"	"	71.00	71.00
		1		D213	"	"	42.00	42.00
		3		D214	"	"	31.00	93.00
		2		D250	"	"	300.00	600.00
		3		D311	"	"	64.00	192.00
		2		D393	"	"	50.00	100.00
		3		D394	"	"	52.00	156.00
		3		D395	"	"	27.00	81.00
		3		G022	"	"	145.00	435.00

These commodities licensed by U. S. for ultimate destination [illegible] diversion contrary to U. S. law prohibited.

FREIGHT CHARGES

Continued [illegible]

FORM DE 50-43-9/65

digital EQUIPMENT CORPORATION
MAYNARD, MASSACHUSETTS 01754

PHONE: AC 617-897-5111 TWX: 710-347-0212 - CABLE: DIGITAL MAYN. TELEX: 9-4819

DATE INVOICED	INVOICE NO.
1/24/69	11[illegible]8

REFER TO THIS NO. ON ALL INQUIRIES

REMIT TO: DIGITAL EQUIPMENT CORPORATION
P. O. BOX 1685
BOSTON, MASS. 02105

SOLD TO
Equipment Digital
Page Two

SHIP TO

F.O.B.	TERMS
MAYNARD, MASS.	NET 30 DAYS

DATE TYPED	CUSTOMER ORDER NO.	PART.	COMP.	SALESMAN	SHIP VIA
1/27/69	F124		C		Air Freight

DATE REQUIRED	STOCK ROOM	RENEG.	CUST. CODE	SALES OFFICE	STATE CODE	D.E.C. NO.	DATE SHIPPED
			0642	22	62	FS 55206	

ITEM	QUANTITY ORD.	QUANTITY SHP.				UNIT PRICE	EXTENSION
	4		G219	Modules	50W	108.00	432.00
	3		G700	"	"	7.00	21.00
	3		G701	"	"	28.00	84.00
	1		G703	"	"	7.00	7.00
	2		G803	"	"	25.00	50.00
	1		G851	"	"	100.00	100.00
	1		G859	"	"	10.00	10.00
	1		G852	"	"	20.00	20.00
	1		G900	"	"	50.00	50.00
	1		G913	"	"	41.00	41.00
	3		R001	"	"	4.00	12.00
	2		R002	"	"	5.00	10.00
	2		R107	"	"	24.00	48.00
	1		R111	"	"	14.00	42.00
	3		R113	"	"	20.00	60.00
	2		R121	"	"	17.00	34.00
	2		R123	"	"	15.00	30.00
	1		R141	"	"	18.00	36.00
	1		R151	"	"	33.00	33.00
	1		R161	"	"	33.00	33.00
	1	3→	R201	"	"	22.00	22.00
	1		R202	"	"	23.00	23.00
	2		R220	"	"	62.00	124.00
	1		R303	"	"	45.00	45.00
	1		R451	"	"	45.00	45.00
	1		R501	"	"	75.00	75.00
	2		R503	"	"	22.50	45.00

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FREIGHT CHARGES

FORM DE SO-43-9/65

digital CORPORATION
MAYNARD, MASSACHUSETTS 01754
PHONE: AC 617-897-5111 TWX: 710-347-0212 - CABLE: DIGITAL MAYN. TELEX: 9-4819

DATE INVOICED	INVOICE NO.
1/21/69	11643

REFER TO THIS NO. ON ALL INQUIRIES

REMIT TO: DIGITAL EQUIPMENT CORPORATION
P. O. BOX 1685
BOSTON, MASS. 02105

SOLD TO
Equipment Digital
Page three

SHIP TO

F.O.B.	TERMS
MAYNARD, MASS.	NET 30 DAYS

DATE TYPED	CUSTOMER ORDER NO.	PART.	COMP.	SALESMAN	SHIP VIA
1/21/69	5103		C		Air Freight

DATE REQUIRED	STOCK ROOM	RENEG.	CUST. CODE	SALES OFFICE	STATE CODE	D.E.C. NO.	DATE SHIPPED
			0042	22	42	FS 59206	

ORDERED	SHIPPED	B/O	ITEM	DESCRIPTION	PRICE	UNIT	AMOUNT
2			[illegible]	Modules			
3						50W	25.00
3						"	27.20
3						"	14.00
3						"	35.00
3						"	45.00
3						"	25.00
3						"	31.50
3						"	31.50
3						"	25.00
3						"	31.00
3						"	36.00
3						"	24.00
3						"	33.00
3						"	22.00
3						"	17.00
3						"	40.00
3						"	40.00
3						"	40.00
3						"	10.00
3						"	33.00
			W768				
			W701				
			W600				

Not in Package

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Subtotal
Less 50% Discount
Subtotal

FORM DE 50-43-7/65

Ref 17114

MAYNARD, MASSACHUSETTS 01754

PHONE: AC 617-897-5111 TWX: 710-347-0212 - CABLE: DIGITAL MAYN. TELEX: 9-4819

REFER TO THIS NO. ON ALL INQUIRIES

REMIT TO: DIGITAL EQUIPMENT CORPORATION
P. O. BOX 1685
BOSTON, MASS. 02105

SOLD TO
Equipment Digital
233 Rue de Charenton
Paris 12, France

SHIP TO
Equipment Digital
c/o Danet & Cie
Paris Orly Airport, France

F.O.B.	TERMS
MAYNARD, MASS.	NET 30 DAYS

DATE TYPED	CUSTOMER ORDER NO.	PART.	COMP.	SALESMAN	SHIP VIA
1/27/69	F104		C		Air Freight

DATE REQUIRED	STOCK ROOM	RENEG.	CUST. CODE	SALES OFFICE	STATE CODE	D.E.C. NO.	DATE SHIPPED
			0642	22	62	FS 55206	

QUANTITY		STOCK NO.	DESCRIPTION		UNIT PRICE	AMOUNT
1		~~12-5517~~	Switch PA3003	"	1.76	1.76
1		12-4907	Switch	"	1.53	1.53
1		12-4903	"	"	1.23	1.23
~~2~~	4	12-4909	"	"	1.40	2.80
2		12-4790	Friction Brake & Shoe	"	18.00	36.00
1		12-5697	Switch	"	.77	.77
3		12-4707	"	"	.10	.30
3		12-5375	"	"	.18	.54
3		~~12-5941~~	"	"	.15	.45
3		~~12-5317-1~~	Actuator	"	.08	.24
3		~~12-5317-2~~	"	"	.08	.24
3		~~12-5317-3~~	"	"	.08	.24
1		~~12-5028~~	TTY Jack	"	.78	.78
10		12-5550	Ind. Bulb	"	.27	2.70
1		~~12-2765~~	80-15 Fan	"	6.30	6.30
2		~~12-4903~~	#6475 Osram Bulb	"	.15	.30
1		70-5152	Photodiode Assembly	"	19.41	19.41
1		~~29-11424~~	Card	"	18.00	18.00
1		~~29-11421~~	Transistor	"	.97	.97
1		~~29-11217~~	Shoe	"	.63	.63
1		~~29-11218~~	"	"	.50	.50
1		~~29-11223~~	Wire Rope	"	1.70	1.70
1		~~29-11222~~	" "	"	1.30	1.30
1		~~29-11221~~	Pulley	"	.10	.10
1		~~29-11237~~	Hammer	"	.67	.67
1		~~29-11540~~	Type Box	"	24.30	24.30
1		~~29-11242~~	Relay	"	1.15	1.15
			FREIGHT CHARGES			

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Scratched items not in package

Continued page two

FORM 43-9/65

MAYNARD, MASSACHUSETTS 01754

PHONE: AC 617-897-5111 TWX: 710-347-0212 · CABLE: DIGITAL MAYN. TELEX: 9-4819

1/27/69 | [illegible]

REFER TO THIS NO. ON ALL INQUIRIES

REMIT TO: DIGITAL EQUIPMENT CORPORATION
P. O. BOX 1685
BOSTON, MASS. 02105

Page SIX Two

SOLD TO
Equipment Digital
Page 2

SHIP TO

F.O.B.	TERMS
MAYNARD, MASS.	NET 30 DAYS

DATE TYPED	CUSTOMER ORDER NO.	PART.	COMP.	SALESMAN	SHIP VIA
1/27/69	rtc1		C		Air Freight

DATE REQUIRED	STOCK ROOM	RENEG.	CUST. CODE	SALES OFFICE	STATE CODE	D.E.C. NO.	DATE SHIPPED
			0342	22	62	FS 00283	

ITEM	QUANTITY ORDERED	QUANTITY SHIPPED	B.O.	DESCRIPTION		UNIT PRICE	AMOUNT
		1		~~29-11094~~	Contact Screw	N	.15
		1		~~29-11544~~	Toggle Screw	"	.10
		2		~~29-11035~~	magnet	"	1.20
		2		~~29-10992~~	Lower Magnet	"	2.12
				~~29-10993~~	Upper "	"	2.40
				~~29-10994~~	Lower "	"	2.40
				~~29-10995~~	Spacer	"	.10
				~~29-10996~~	B. Screw	"	.10
				29-11744	Sensor 350-106-001	"	2.50
				29-10125	Lamp 302-100-001	"	1.50
				Lamp Ass'y. 60458-01		"	32.40
				29-11778	Plate Kit 59997-01	"	127.20
				29-10106 Field, Ribbon Clutch 91774-1		"	18.30
				Field Brake 55612-01		"	78.50
							404.07
				Subtotal			
				P/L Code		C	

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Scratched items not in package

Insurance	PREPAY CHARGES BY	O	.27
			405.34

FORM DE 50-43-9/65

Items in excess in package

Excedent dans les Colis

Nb Pieces	REF
1	M 502
1	G. 626
1	305082
1	9.1774
1	91769
1	PA 3003
2	PK 6202
1	55668
1	150044
1	1601-10130
1	151923
1	150043
1	1AI-1270
1	1550-224
1	60458 G1
1	150225
1	181821
1	1601-00073

Nb Pieces	Ref
3	125134
2	6475
3	94-5419/3
3	34-5419/1
1	283 B.50
1	1601-00083
3	34-5319/2
1	154095
1	181675
1	304740
1	1601000.63
1	6320
1	150712 ou G.171
1	B168
1	B 198
2	R 201
1	[illegible]
[illegible]	

T.S.V.P.

Items in excess in package

Suite excedent

Nb pièces	Ref.
(1)	1175-08-6458
(1)	PAT. N° 2904709-3209434 (Ventilateur)
(1)	PAT. N° FB 1810924 Serie 8-290
(1)	PAT. N° FB 1810924 Serie 8-314
(2)	124909

Manquants

Ref pièces rayées sur les deux factures

digital INTEROFFICE MEMORANDUM

DATE: March 10, 1969

SUBJECT:

TO: Ken Olsen

FROM: Jim Jordan

It looks good. Quite straight forward.

Questions:

1. Do you intend the block to be molded as one piece?
2. Will the indicator panel plug into the first block?
3. Will the frame be strong enough?
4. Where does the power supply go? In the rear or along side?
5. Are we building a fully feasible model, i.e. electrically, to fit this concept?

This design does not present us with any problems.

Jim

lmm

digital INTEROFFICE MEMORANDUM

DATE: March 11, 1969

SUBJECT:

TO: Nick Mazzarese

Ken Olsen
Roger Cady

FROM: Gordon Bell

I strongly favor building HAL because:

1. People (and compilers) can write programs for it.
2. I believe we will be happy with it during the next 6 years too.
3. It matches the elegant bus structure and new mechanical design (the PDP-11 by comparison is clumsy).
4. It has the right benchmark performance.
5. It is contractible and expandable.
6. It does not change memory, I/O device and other systems designs.
7. It is no more difficult to do than PDP-11.

bwf

digital INTEROFFICE MEMORANDUM

DATE: 27th March, 1969.

SUBJECT: STOCK EXCHANGE OF MELBOURNE

TO: Ken Olsen

FROM: Peter Watt

cc: Win Hindle
Bob Savell
Roger Pyle
Ron Smart

I've been advised that Mr. Peter Looker, Chairman of the Stock Exchange of Melbourne, may phone you in the next few days, in order to "seal the contract" (as he puts it) between the Exchange and Digital.

I hope the attached summary of the Stock Exchange project will be useful in bringing your facts up to date.

Peter Watt.

jr
encl.

STOCK EXCHANGE OF MELBOURNE

SUMMARY OF PROJECT 3/27/69

In June 1968, Digital Australia tendered hardware and software to meet draft specifications written for the Stock Exchange of Melbourne, for a real-time Securities Information System. By late December the Exchange had completed its final specifications, requiring DEC hardware worth approximately $600,000, and special software quoted at $112,500.

3-28-69 Dr Reid said Contract has now been signed

During January and early February, much effort went into devising a contract acceptable to DEC and to the Exchange. This contract has not yet been signed, though it has been unofficially approved by both DEC's legal personnel and the Exchange's Secretary. I expect that the Exchange will sign the contract within three or four days.

Towards the end of February we had analyzed the software commitment in sufficient detail to be able to give a "firm" shipment date of 31st December, 1969. This was somewhat later than we had initially envisaged, but is consistent with the late delivery of functional specifications to Digital.

Delivery of the system on schedule requires adherence to both software and hardware delivery schedules. We are somewhat ahead of the software schedule, but the hardware schedule (specifically the delivery of a DC08 system) appears likely to slip. Roger Pyle is attempting (so far without success) to allocate another programmer to the project, to make us less dependent on the hardware schedule. The Exchange is aware that we are trying to include another programmer, and I suspect they may try to add weight to this request.

The project requires interfaces to Bunker-Ramo displays (being checked out on schedule) and connection to Scantlin Electronics remote terminals through DC08 systems. With the exception of the DC08 schedule, I am pleased with the progress the whole project is making.

Peter Watt,
27th March, 1969.

digital INTEROFFICE MEMORANDUM

DATE: March 27, 1969

SUBJECT: PROPOSED ASTROTYPE INSTALLATION

TO: Ken Olsen
Stan Olsen
Nick Mazzarese
Ted Johnson
Win Hindle
Pete Kaufnrann

FROM: Mark Nigberg

Representatives of Information Controls Systems recently approached us with a proposal to install a four-port Astrotype System at DEC*. The system normally sells for $56,000, but ICS would sell us the system for $12,500 with the stipulation that we would permit them to bring customers into the plant on occasion, so that they could demonstrate the virtues of their product. ICS would provide shipping, five user manuals, training programs, four typewriters, four typewriter interfaces, and four desks. DEC would provide the PDP-8/I or PDP-8/L type controller, tapes and modules as required to build the total system. Delivery will be made thirty days following receipt of all equipment required at the ICS plant in Ann Arbor. The differential cost of the system is $12,500, payable by DEC to ICS thirty days following delivery and installation at DEC.

I have discussed the system in some detail with Bob Lassen, Personnel; Pat Greene, Sales Administration; and Gabe d'Annunzio, Advertising and Sales Promotion; and the three would like to share the cost of the system as described in the attached brochure.

We therefore request that you approve a joint purchase by these three departments of the Astrotype System as part of their Fiscal 1970 Capital Equipment Budget.

MN/dj

* This is not the specialized system proposed for Tech Pubs.

Kenneth H. Olsen
Memos Received, April, 1969

TO:	FROM:	RE:	DATE:
Ken	Ed Schwartz	Product Liability	4/1/69
Ken	Bobby Choonavala	PHILIPS	4/8/69
Ken	Bob Lane	PDP-8/VR12	4/11/69
Ken	John Holzer	Acquisition of MTI	4/14/69
Ken	Jack Shields	Field Service Installation Rept	4/14/69
Bill Segal cc: Ken	Burr Tupper	PDP-9 Software	4/28/69
Ken	Gabe d'Annunzio	Springfield Exposition September 13-22	4/29/69
cc: Ken	Pierre Schneebeli	DEC and Communication	4/3/69
Al Devault cc:Ken	Russ Doane	N/C Plan	4/7/69
Ken	Rick Merrill	The 16-bit PDP-8/M Macro)	4/8/69
Operations Committee	Ted Johnson	Dining Area for Visitors	4/9/69
Ken	Joe St. Amour	Jim Jordan and attached memo from him to Joe	4/17/69

digital INTEROFFICE MEMORANDUM

DATE: April 1, 1969

SUBJECT: Product Liability

TO: Ken Olsen

FROM: Ed Schwartz

I read with interest the Staff Recommendations pamphlet put out by Research Institute of America, entitled "Product Liability: New Hazards". Most of the legal information supplied by this pamphlet was not new to me, but rather confirmed the feeling which I had that the law with regard to product liability is becoming more of a "hazard" to the manufacturer.

There are three ways to protect a manufacturer from getting involved in a product liability situation, and they are as follows:

1. To develop and maintain a committee of individuals capable of analyzing all risks inherent in any new or old products being sold by the company.

2. To maintain adequate insurance coverage as to content and liability limits.

3. To draft contracts with sufficient wording to protect the manufacturer against litigation to such a degree as the law may allow.

Let me say that as to numbers two and three above, I believe the company is presently as well protected as we could desire. Our insurance coverage has been recently increased to $30 million (an umbrella policy) and our terms and conditions of sale have sufficient language to adequately protect us from claims against parties with whom we directly deal. Of course, situations do arise with regard to each product line in which pressures brought create variances to our standard terms and conditions, subjecting us to additional risks in this area. I do, in all such situations, advise the product line people of the risk they are taking. There is nothing we can do contractually to prevent law suits which might result from injuries received by third parties (persons other than the ones with whom we directly contract).

The best protection in this area is what I call "preventative maintenance." This idea comes within the scope of Paragraph 1 above. We here at DEC should thoroughly review all our products, on a periodic basis, to see what hazards are inherent in the use of these products. If hazards are recognized, steps should be taken to remove them. These steps should certainly be documented and filed away for future reference. I do not think a good quality control area is the cure all, but rather an analysis of product liability should be made in the design stage.

I would be most happy to sit down and discuss this matter further with individuals whom you believe would be charged with the responsibilities of seeing to it that our products are safe when properly used.

EAS:o

digital INTEROFFICE MEMORANDUM

DATE: April 3, 1969

SUBJECT: DEC and Communication

TO: Joe St. Amour FROM: Pierre Schneebeli

cc: P. Kaufmann
K. Olsen

A company devoted to industrial communications should not be victim of shortcomings in its own internal communication network.

A lack of communication is expensive. A lack of communication causes delay and decreases the efficiency of everyone.

The list below shows a trend which can only lead to Corporate failure if not curbed.

1) Several departments (Production, example Antunuccio; Programming, example Earl Haight; Mechanical Engineering, Example Ira Morris; our own department, Special Projects, to mention but a few, do not have secretaries to take calls when individuals are out.

   A better telephone handling could be achieved by diplexing the lines to make sure that even when one secretary is out the calls are taken by another one.

2) The personnel department knows that the disk development group need mechanical engineers. There are applicants in this field which are walking through the plant without getting jobs and without being routed to this department.

3) A discussion with Ward MacKenzie (PDP 10) indicates that this group still feels strongly about an in-house developed fixed head file to replace the present Burroughs disk or planned Bryant drum and was under the impression that such a file was being developed in-house now. This is a typical problem where our engineering group does not know about another group's activity because no communication channels have ever been established.

4) April 2nd, yesterday, I was supposed to attend to two meetings in my group only to find out five minutes before the first one that no meeting would be held, the person being absent. Secretaries are typically not performing their task of informant (this is a rule rather than an exception!)

5) Suppliers of critical components (Magnetic sliders and disks for RS/RF08 are typical examples) are not informed by purchasing of the change in requirements. Already two main vendors (Data Magnetics and Tech Met) made it clear they thought they had been dropped by DEC when really orders to them in the millions of dollars were waiting in the procurement department, blocked by inefficiencies and lack of concern.

6) It has been agreed by the writer and involved parties that the clean room should be the responsibility of production. It has been agreed that engineering should not interfere with production but it has been found out that engineering personnel (not under the supervision of the writer) are borrowing tools from production in the same way that made life so hard in the small clean room; they have not been told the applicable rules.

7) The clean room may develop into an engineering and production bottleneck if two way communication does not exist. Barry Bornstein, for example, received, 6 weeks ago, the air filtration system so needed to clean heads and disks. He stored that system to oblivion and heads and disks have suffered from that.

8) Information sheet about applicant carries a line where it is asked from the manager to indicate for what position this applicant will be interviewed. This line is never filled and the personnel department cannot inform the applicant of the type of job with which he will be faced.

   Two solutions: The line is not necessary (which is highly doubtful) and should be removed from the information sheet or the line is useful and should be filled.

There are "fixes" to these problems. Let's implement them before the problems fix us.

md

Ken Olsen

digital INTEROFFICE MEMORANDUM

DATE: April 7, 1969

SUBJECT: N/C PLAN

TO: Al Devault FROM: Russ Doane

cc: Listed at end of memo

Here are my preliminary thoughts which I'd like to discuss with you after you've read my trip report. Sorry about the rambling, but I haven't written them all down before.

A. Real-Time vs. Hard Wired

I've reached the conclusion that it would be a serious mistake to come out with a tape input, hardware interpolator like G.E., Bendix, Bunker-Ramo, Cincinnati, Westinghouse, Superior Electric, and Icon at this time. Probably at any future time too. Here's why:

1. G.E. has much more than half of the market and has had for 9 years, while the other 6 are doing a good job filling the gaps left by G.E. Of course we could compete, and I guess we could make some money, but I'm convinced we'd be flogging a tired nag. There is very little we could add to the user's benefit with such a product line, and the users would know it.

2. Small machine tool manufacturers would be our most natural prospects, but these outfits are totaly subservient to the end-users' whims. Most end users specify a control like the ones they already own for training and maintenance reasons, and the small end users are more conservative than the machine builders. With anything like a "me too" product our potential market would be very restricted, probably to end-users buying for entirely new plants, and the established companies would fight tooth and nail for that business.

3. Even cutting the selling price in half, we would find the above factors very strong. On top of that, N/C users are accustomed to a good bit of applications assistance, training, etc. on systems costing about what a basic 8L costs. I doubt we could afford the same at a lower price without sacrificing profitability.

4. The real-time area is relatively fresh, and we have the advantage there with small cheap computers in volume.

5. CNC allows big machine tool manufacturers to take the initiative, and we need their help in selling end users

6. Many user benefits (see below) can be included at low cost in CNC which are not now available or only at high cost, giving everybody a plausible justification for trying a new supplier.

7. High benefit/cost ratios can be made to yield high profit.

B. The Future of Quickpoint

Existing N/C machines will need tape preparation as long as they live, and I don't see any reason for Quickpoint to die soon. However, we aren't supporting it much and it needs to be developed. During the development of added features and capabilities we can shrink its core consumption per function in a number of ways, which can make Quickpoint the basis of Compupoint. Contouring can be added too perhaps, but it is significant that 80% of all metalworking is straight lines and circles.

C. Compupoint (Quickpoint in real-time)

1. Benefits for the User
   a) One computer system provides both tape preparation and control, for lower cost.
   b) Two N/C machines can be loaded and unloaded by one operator. Compupoint can control two machines.
   c) Tape readers, the most dirt-sensitive and least reliable components in today's N/C, are never used the the shop and are run once per lot instead of once per part.
   d) Tapes are short, containing commands rather than complete XYZ coordinates. Slow readers, lack of spoolers OK because tapes are short.
   e) Tapes never leave programmer's office, don't get lost or damaged, needn't be duplicated unless for security, don't wear out.
   f) Management information is generated without machine operator intervention and in real time, available remotely by teletype.
   g) Program may be identified and studied simply by running the tape through a teletype. Commands are printed as they were generated, and minor modifications can be made easily. Input tape is not affected, so multiple versions of a part are easy to generate.
   h) No expensive coaxial cable required. No high frequencies outside the computer enclosure.
   i) Compatible PDP-12 lets big users view cutter path, store parts programs on DECtape, call up more elaborate management reports.

2. Disadvantages to the user
   a) Too expensive to replace single machine control being easily programmed manually?
   b) If computer goes down, both tape prep. and machine(s) go down
   c) Maintenance man must understand computer as well as servo interface, may be even scarcer and slower to respond than today's scarce slow man.

3. Major technical features of hardware
   a) NEMA 12 enclosure on shop floor contains 4K PDP-8L, servo interfaces, and seldom-used controls and indicators. Computer lights and switches hidden, used only for servicing.
   b) Wires leading from computer enclosure go to remote TTY, nearby electromechanical devices, servomotors and sensors, movable pedestal controls, and machine-

b) cont.
mounted controls. Input power is 220/240, 440, or 660, well filtered, 50/60 Hz.

c) All options (readouts, thumbwheels, servo adapters, auxiliary function interfaces) that use the computer enclosure plug in. Some are prewired too.

d) Machine tool manufacturer builds or has built all controls outside the enclosure, interfacing via connectors provided. All human engineering and corporate identity is his responsibility. All components mountable in standard cabinets if he'd rather.

e) Real-time clock included for management information use.

4. Major features of software

a) Tape preparation uses a small portion of memory to edit commands, add and subtract, count steps, and check format. Object is to generate minimum length of alphanumeric tape. Each carriage return punches that line if its OK, so only small buffer in memory req'd. If format is wrong, line fails to feed and punchout doesn't occur. Both character and line rubout provided.

b) at machine time, tape going thru TTY reader is compacted as it comes into program buffer by BCD to binary conversion, binary encoding of alpha characters or groups, and stripping off the step number. (A search routine can reason out the step number if machine operator requests a jump, or during two-machine operation, and the step number(s) is (are) normally held in a buffer for continuous display). Object at this stage is to produce a minimum-core record of the part program, such that a 200 step program fits in 1000 words by consuming an average of 2 1/2 double- precision words per 3 axis location or command. Adding an extra 4 K automatically expands the parts program capacity.

c) Servo commands are generated in realtime by modified Quickpoint with double precision instead of floating point arithmetic, and probably lacking the LPM feature (might be added to the edit program, but doubt we can spare memory space anywhere). About 2000 words.

d) Servo interface depends upon which servo being used. Six axis programs for two 3-axis machines. About 400 words.

e) Management information program measures elapsed time between each step 000 and every other step 000, and also between step 000 and step 001 (setup time). Makes available ten quantities under each of two part numbers:

i) number of cycles
ii) minimum cycle time
iii) maximum cycle time
iv) average cycle time
v) minimum setup time
vi) maximum setup time
vii) average setup time
viii) average percent utilization
ix) total cycle time
x) total setup time

printout for all of these will occur automatically whenever a new program is being read into the program buffer, when machine goes down, or at any other time requested. (Day and date must be added manually). In addition, prints on the same record the next part number(s) being readied for run if any, so the order of part runs can be traced back later if necessary. Finally, prints time of

day. By splicing tapes or printouts at the end of the day, a compact management report can be generated without using up much computer memory.

D. Likely Competition

Bedford Associates is offering in NC World (new magazine) for $22K a PDP-8 family computer complete with interfaces for 4 servo axis and made to operate in real time. I don't know much about it yet but probably other customers are going to be serious competition along with the usual computer manufacturers and N/C control manufacturers (Bendix uses a PDP-8I already).

Most DEC customers will probably use our computers to approach the Sundstrand system or other ambitious, complex systems. This is partly because they will perhaps lack imagination, but mostly because our customers must add significant quantities of hardware to justify a profitable markup. Our contribution can be maximized by showing what can be done with a minimum configuration (4K 8L) and minimum interface hardware, and allowing our OEM customers to outshine us with sophisticated features.

E. Manpower

1. Quickpoint needs one hot-shot programmer for modifications, condensation, and conversion to Compupoint. A second programmer should phase in with Bill Wigglesworth on past-processors, as he wants to move to sales support in 6 months and we'll need him there.

2. One system engineer and one circuit engineer are needed for the hardware design, along with one technician each.

3. The enclosure design will take a third of a Designer and half a packaging man temporarily.

4. Sales support will need another man in addition to Wigglesworth as soon as we get rolling (we can call them "Applications Engineers"). Even the two of them will not be enough after a year; these type customers need a lot of hand-holding over a long period of time.

5. One road-runner (call him coordinator, administrative assistant, production interface, etc.) after prototype is running will be needed to get release-to-build and production release lubricated.

F. Longer Term Prospects and Plans

1. A single 5-axis machine with 3 dimensional calculations should fit in the same Compupoint hardware and software framework used for two 3-axis machines with 2-axis contouring.

2. Several Compupoint systems can be linked with a PDP-12 to give large users these benefits:
   a) cutter path monitoring before metal cutting
   b) DECtape storage of parts programs
   c) DECtape assembly of management reporting data, including additional inputs from badge-readers etc.
   d) automatic signalling of human or machinery inconsistencies that should lead to some kind of preventitive maintenance or supervisory action.

3. An N/C applications group (initially two men) should sell the sales force on N/C by offering sales support and by documenting the various options and choices in an easy to understand way. (I should have put this under "Manpower" since one of these people ought to start right now with Quickpoint and Computer Special Systems, using Tom Stockebrand's applications notes for the Kickoff).

4. Adaptive control might be added to both 2 x 3 and 5 axis types of Compupoint as it becomes clear which variables are the effective ones. (However, a great many applications are sufficiently loose-tolerance and short-run not to need it.)

5. An 8K version of Compupoint with full circular and parabolic interpolation capabilities should be started as soon as the 4K 5 axis program is done, or maybe even before that. The extra room should also allow for longer parts programs and more sophisticated management reporting.

6. When PDP-11 is fully available and has soaked into those markets not needing much software (including some N/C applications) we should likely take over some of the 8L market with the 11 and expand on it. However, the 8L is the right machine to start with because:
   a) we know it's available
   b) N/C customers have actually used it
   c) c) Quickpoint exists to build on
   d) more than 16 bits is needed in very many metal machining applications, and 20 bits (100 inches at 0.0001" resolution) plus sign and function index pack neatly in a pair of 8L words.

7. PDP-15 can give 25 inches total travel at 0.0001" resolution, single-precision, which is enough for many metalworking jobs. My attitude about the 15 is similar to the 11: when the existing 15 markets have shown how hungry they are and the manufacturing costs are well established, we'll look at it carefully.

8. PDP-10 is big enough to do the really ambitious N/C jobs, but I think every 10 N/C prospect will want to do his own software and interfacing so as to be entirely proprietary. The N/C product line can contribute little except to publicise its existance that will help such sales.

G. Promotion and Advertising

The best way to promote N/C products in the metalworking industries is by testimonials. The reason for this is the large size of the commitment being asked for, relative to the prospect's total business. Until someone says "I have used it successfully" the knees are all wobbly. Since Compupoint will be mainly a standard 4K 8L, the obvious way to get the testimonial effect is through cooperative advertisements with Bendix, Bedford Associates, and others who are selling 8 family computers for N/C metalworking already. This is another reason (not that we needed another) for solving our OEM-relations problems. The N/C effort would flop if we let the end-user prospect even occasionally assume he can get the identical benefits buying bits and pieces from us that he'll get buying a total system from one of our OEM customers.

The cooperative ads will have no shortage of outlets ("N/C World" is an ideal one, especially while it is new.)

H. Summary

Here are the major points I expect to make in my proposal:

1. We're 2 years too late to enter the hardware interpolator market successfully, and right on time for real-time (CNC). I want to ignore tape-driven interpolators altogether, and consentrate on CNC exclusively.

2. Quickpoint has a long-term future, but I want to get it supported properly asap.

3. Quickpoint should be the basis of Compupoint. I want every Quickpoint or Wiedepoint used to be a Compupoint prospect; and I want to concentrate on the same low-cost low-performance end of the market, leaving the expensive and complex applications to our OEMs.

4. Software and hardware development must interact intimately with each other and with system specs. This will take one outstanding programmer, probably an expensive one.

5. The entire effort must be sensitive to OEMs, both to use them and to attract and keep them. We will sell more bare computers through OEMs for N/C than we will ever sell as complete N/C systems, and our efforts must boost this tendency rather than defeat it. (In the same manner that 8Ls sell 8Is,etc.)

cc: Brad Vachon
Tom Stockebrand
Jack Shields
Stan Olsen
Nick Mazzarese
Bill Long
George Rice
Ken Olsen
Bill McNamara
John Holzer
Alan Ricketts
Fred Gould
M. Gordon
R. Lancaster
B. Wigglesworth

digital EQUIPMENT
BENELUX OFFICE
THE HAGUE

INTEROFFICE MEMO

SUBJECT PHILIPS

DATE April 8th, 1969.

TO Jean-Claude Peterschmitt

FROM Bobby Choonavala

Copies: Ken Olsen
Ted Johnson
Nick Mazarese
John Jones
Bill Long

As you are aware, we have been putting in a great deal of effort since the second half of 1968 to get Philips to use our PDP-8/I and 8/L computers in their instrumentation control systems. We have held seminars and discussions in both large and small groups on PDP-8 hardware and software and provided them with as much literature and documentation as was available. We have visited them with DEC Maynard dignitaries and representatives and even provided them with advance information on some of our new products.

As you also know, our efforts seemed to be bearing fruit beginning of this year and Philips were talking about some kind of licensing arrangement to build PDP-8/L's. Both Bill Long and John Jones have been involved to varying degrees in these discussions. The main reasons for a re-consideration of the choice of the 3C machines by Philips have been the increasingly wider acceptance of the PDP-8 family computers for all applications, their software and their low-priced processors and options. These reasons played a prominent part in the seeming success of the efforts by both us and those at Philips wishing to use our computers. However, the announcement of the 316 by Honeywell has deflated the price argument somewhat and generally pulled the rug out from under our feet. Moreover, Philips people are finding they can sell their complete systems without much resistance or disinclination on the part of their customers to use the 416 and 516 computers, either price or performance wise. (Philips are selling computer packs with complete support on software and maintenance, and Philips does have a reputation both in Holland and the rest of the world.)

Consequently, my last few meetings and discussions with Philips representatives have been most discouraging. Even those system engineers at Philips favourably disposed towards our computers are back-tracking now, as they find the software group at Philips unwilling to support any but 416 or 516-based systems. I have even offered software assistance to a group attempting to computerize a liquid scintillation analyzer at Philips, because I want them to start using our computers at some place in Philips. For the present however, Philips stubbornly refuses to work with other computers and intend to maintain the status quo and go on using the 3C computers.

At my last meeting, you were present too and we have opened up on the PDP-11 to a few of Philips representatives. This was with the intention of confusing the issue for Philips, as some of their decision-making people at the lower technical level have the 12-bit bogey. But I doubt if this is going to help us.

-/2

digital EQUIPMENT
BENELUX OFFICE
THE HAGUE

INTEROFFICE MEMO

SUBJECT PHILIPS

DATE

TO

FROM

Sheet 2.

In summary the door which was opening our way at Philips in January has been closed again. This does not mean that we have lost out completely, but our chances today are only slight. Another decision is due around May 1st regarding the choice of computers, i.e. whether Philips will use any but Honeywell's computers in their systems. Meanwhile I hope to bring up this point at a higher level at Philips when Ken Olsen is in Eindhoven to meet one of their vice-presidents. Of course, the medical apparatus division at Philips is firm in its decision to use our computers in their medical systems, but this division still has to develop within Philips, as a major computer users. The industrial and scientific instrumentation division is the big fish and it will not bite yet. We will have to see that the mdical division succeed notoriously and significantly with the use of our computers, but their first system is easily 6 to 12 months away.

Bobby

digital INTEROFFICE MEMORANDUM

DATE: April 8, 1969

SUBJECT: The 16-bit PDP-8/M (Macro)

TO: Bill Long
Ken Olsen
Nick Mazzarese

FROM: Rick Merrill

cc: Don White
Tom Stockebrand

A 16-bit PDP-8

I. Need

Customers need an inexpensive 16-bit computer for numerical control and laboratory data acquisition/analysis. The toughest cases arise when both accuracy and speed requirements give the edge to a single or double precision 16-bit word over a comparable double or triple 12-bit word.

II. Requirements

A. Compatibility

The computer is program compatible with the PDP-8. This means that the machine is fully usable with a minimum of programming effort. In fact, only the assembly, debugging, loading, and MAINDEC programs are 40% rewritten since these are intimately concerned with the logic of machine. All other programs such as FOCAL are only reassembled and debugged. Certain device oriented programs like the Disk Monitor require minor corrections.

B. Quick and Simple

The machine architecture is as simple as possible to design, manufacture, learn, and use. The instruction set is streamlined yet relevant and builds upon that of the PDP-8.

C. Data

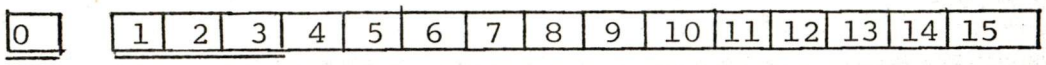
A number that is to contain information on the order of one part in a million needs 20-bits of data (1,048,576); but to retain that accuracy through several operations requires four or five bits more. This is borderline for two 12-bit words but just fine for two 16-bit words. Thus, the argument for increased

accuracy bear the most force.

D. Multi-level Indirect

Indirect references use bit zero to Defer indirect chains. This provides a powerful facility whose need is often felt in programming the PDP-8:

Indirect word address



0 - 32K

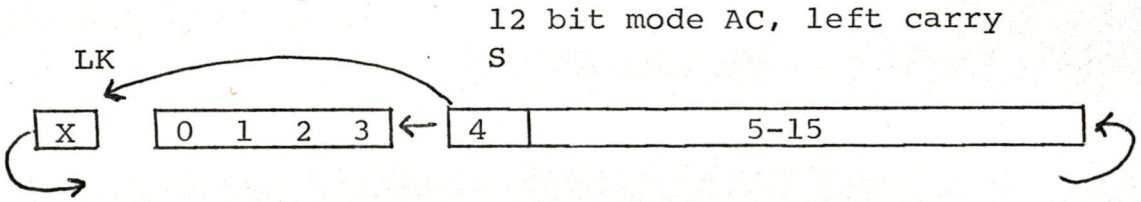
This also eliminates the need for the awkward and space consuming manipulation of instruction and data fields.

Multi-level indirect actually means that nearly all paging problems are taken care of by the assembler. The Defer bit is only interpreted once so that negative data may be used.

III. The AC

A. Alternative #1

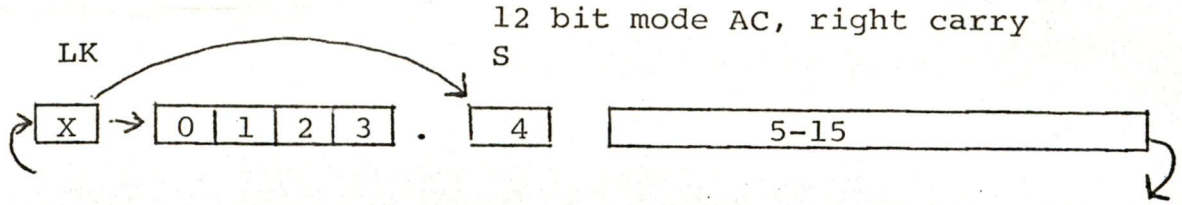
Variable Length AC



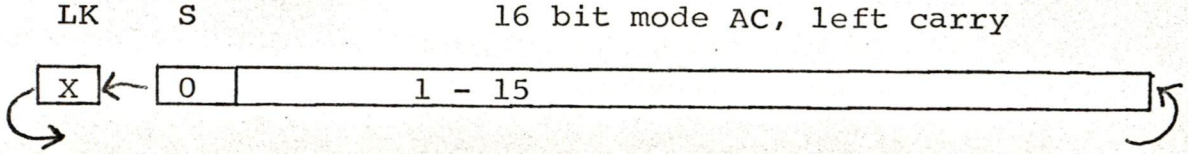
LK indicates the link bit, S the sign bit, and the arrows the left-hand carry in 12-bit mode. This scheme will work for:

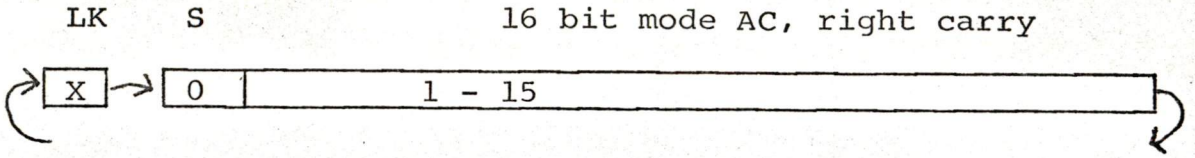
(a) normal addition (TAD) in two's complement,
(b) 12 bit testing,
(c) address computation regardless of negative numbers, octal constants, and masks,
(d) left rotates, and
(e) nearly all instruction formations.

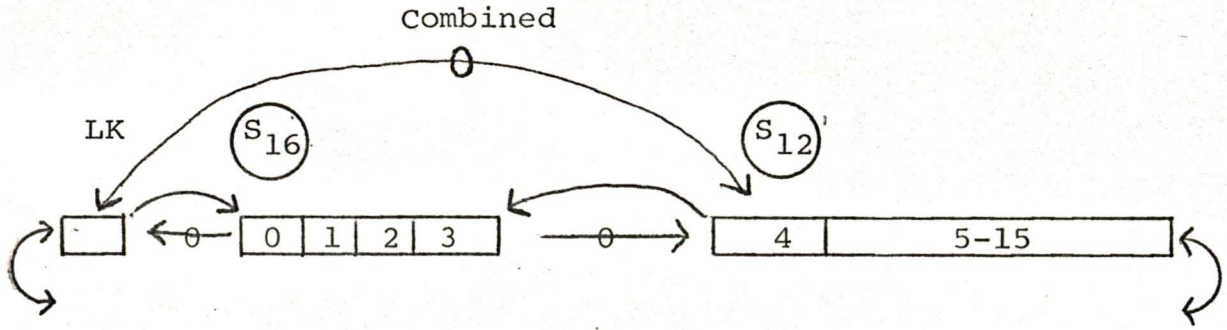
The latter are a rare and questionable practice and since they are usually formed by adding a constant to an existing instruction there should be few problems of this kind.



For right rotates there should be no difficulty at all.







Only the circled paths and the sign bit definitions are controlled by the 12/16 mode setting.

The 12/16 function could be controled either by an instruction bit or by a mode control.

The Variable Length AC achieves maximum possible program compatibility with only minor changes to the M220 major register cards.

B. AC Alternative #2 - Dual AC's

There could be two different accumulators - one 12-bits and one 16-bits. Selection would be controlled by an instruction bit. This scheme gives us the advantages of multiple accumulators for programming ease and 12/16 compatibility.

This would require elimination of the MQ and more extensive changes to the M220 card than would alternative #1.

C. AC Alternative #3 - 16 bit AC

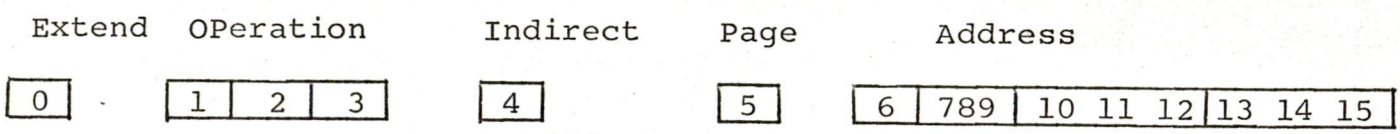
A single 16-bit AC requires no changes to the M220 and results in the clearest machine architecture. Although it gives the least programming compatibility, it is my opinion that this is the best alternative.

The remainder of this document is based on a 16-bit AC.

IV. Address Field

Two requirements must be met by the address field: (1) a common data area and transfer vector from a good sized page zero, and (2) a large relative page. With multi-level indirect paging is not a programming impedance, and paging does improve the efficiency of core utilization. The page size will be 1024 (decimal) words. This means that many important subroutines may be stored in page zero.

The resultant instruction format is

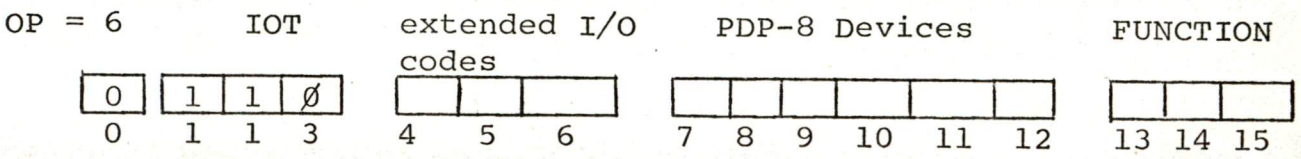


V. Instruction Set

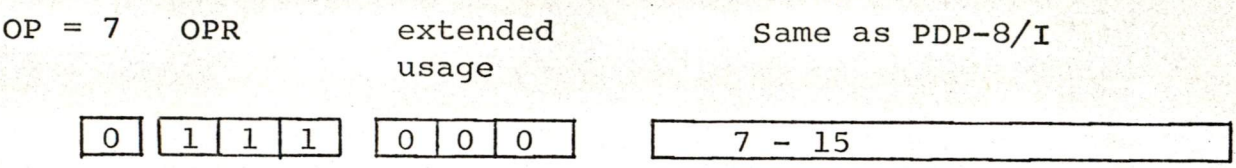
A. Basic PDP-8 Memory Reference Instructions

OP = 0	AND	-	logical AND
1	TAD	-	Two's complement ADd
2	ISZ	-	Increment and Skip if Zero
3	DCA	-	Deposit and Clear Accumulator
4	JMS	-	Jump to Subroutine
5	JMP	-	Jump

B. Basic PDP-8/I I/O devices,



C. Basic PDP-8/I operate groups plus extended operate codes (See Section V.E.)

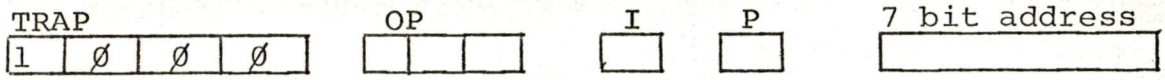


D. Extended Memory Reference Codes

OP=1Ø TRAP - used to simulate nonexistant MRI codes that may be desired for a special application. This is similar to the PDP-9 CAL code, and it causes a JMS indirect location one. Location one is reserved for use with this code.

It is by means of this instruction that we achieve program compatibility with old PDP-8 programs!

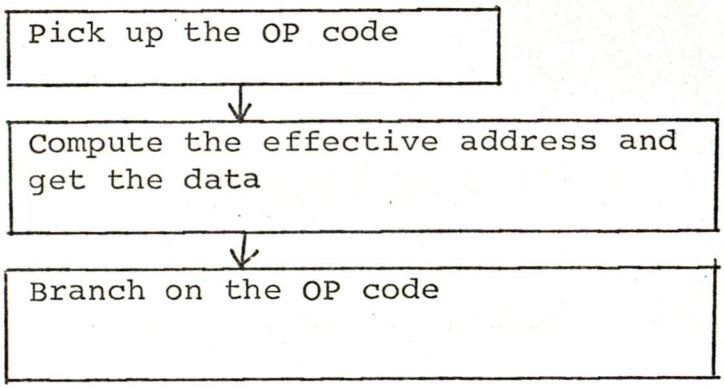
The assembler recognizes a SIZE pseudo-operation so that "SIZE 16" all basic-8 instructions are assembled normally. For a "SIZE 12" all basic-8 instructions are assembled as



just as they would be on a PDP-8/I with a trap code prefixed to them.

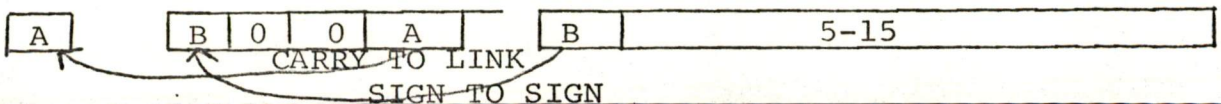
When the TRAP code (10) causes an effective JNS 2Ø a program interpreter simulates the operation given as though we had a 12-bit mode accumulator as outlined in AC Alternative #1, thus achieving 99% program compatability at a slower speed.

The interpreter performs as follows:



IOT, AND, DCA, JMS, JMP - just execute them
ISZ - execute and test low order bits
TAD - mask out lower bits of the operands, add, save result, rotate carry and sign into link and AC bit Ø, restore 12 bit result.

LK



OPR group 2 = execute

OPR EAE = simulate if desired

OPR group 1 = NOP, CLA, CLL, CMA, CML, IAC = execute

RAR, RAL, RTR, RTL = simulate

OP=11 CAM Compare AC amd Memory

- /AC < MEM
- /AC = MEM
- /AC > MEM

This a true, signed arithmetic compare and branch instruction. If the AC is numerically less than the memory cell contents, the next instruction is executed. If the AC is identical to the data, the one location is skipped. If the AC is greater than the data, then two locations are skipped.

The contents of the AC is unaffected by this instruction.

In the ordinary PDP-8 a time arithmetic compare takes 15 instructions.

OP = 12 EXC Execute

This instruction is used in two important ways. One of these is to execute instructions following subroutine calls for the purpose of retrieving arguments and creating economical macros.[1] The second major use is in creating pure proceedures[2] despite the need for certain types of instruction modifications[3].

OP = 13 PUSHJ Push the return address and Jump to subroutine. This is a powerful instruction used to create reentrant[4] subroutines. Location seven is reserved for use with this instruction. Location seven contains a pointer to the stack or push-down-list[5] which is to be used.

(15) - 1 → (15)

(PC)+2 → ((15))

(EA) → (PC)

FETCH

Normal

15 → MA

EXECUTE

PC → LIST

PC-1 → MA

FETCH[1]

MB → PC

OP = 14 ADE Add Effective Address

This is an immediate instruction taking only 1 usec to execute (unless an indirect or auto-index cycle is required). The number added is the effective address that results from the bw order 12 bits. This instruction is really useful when dealing with list[6] data. In is also used for 10-bit constants so that core is saved by requiring only the instruction and no data cell!

OP = 15 SBE Subtract Effective Address

Similar in use to ADE, this instruction is also used to create the negative of 10 bit constants. These two instructions are especially useful in creating short and speedy radix conversion[7] routines.

OP = 16 MUL Multiply

OP = 17 DIV Divide

These two codes are reserved for special hardware to execute high speed data reduction in real time. If the hardware is not present execution of these instructions causes a JMS I 2. Location 2 should contain a link to a program that simulates the MUL and DIV functions.

V. E. Extended Operate Codes

OP = 070XXX = identical to PDP-8/I

OP = 071UUU = POPJ

((15)) → (PC)

(15)+1 → (15)

This instruction causes an exit from a recursive routine by executing the opposite of PUSHJ. (This instruction does not require decoding of an effective address). Unused bits in the OP are ignored.

OP = 072UUU = PUSHA
(15)-1 → (15)
(AC) → ((15))

This instruction causes the contents of the accumulator to be stored on the push-down-list. This operation is used to save considerable storage area by using the list as a scratch area.[8]

OP = 073UUU = POPA
((15)) → (AC)
(15)+1 → (15)

This instruction restores the contents of the AC from the list.

OP = 074UUU LBC - Load Byte Controls

This instruction loads the AC with the logical OR of the AC and the states of the four byte flip-flop controls. (See SBC Instruction).

OP = 0750XY SBC - Set Byte Controls

The Byte flip-flops are set to XY. (There are four extra flip-flops on the card containing the IR. These are used to create a powerful byte facility). The first two (X-bits) enable the byte mode for auto-index registers 16 and 17 (chosen as bit least frequently used for other purposes). The second two (Y-bits) set the initial states. If the byte modes are enabled then every AND, TAD, ISZ, DCA, and CAM instruction that does an indirect operation via the auto-index locations 16 or 17 becomes a byte instruction. When the accumulator is involved only the low order eight bits are used. No sign extension is used for TAD but the carry will propagate into the high order bits.

If a TAD I 16 is executed and 16 has not been enabled the one is added to the contents of 16 before it is used to compute an effective address.

If 16 has been enabled then the flip-flop for 16 is complemented and 16 is incremented if the state becomes one.

Note: If the byte auto flip-flop is enabled, then bit zero is ignored (i.e. no further indirect cycles are allowed in byte mode).

If the flop state is zero then the low order or right half of the data is used. If the flip state is one, then the high order or left half is used.

List=.

1	2
3	4
5	6
7	8

(SBC 20)

1 ø

```
TAD (LIST-1)
DCA 16
SBC 20
TAD I 16
```

Merely by setting the byte controls a subroutine can be used to operate on either words or bytes.

```
OP = 0761UU  ION  Interrupt On (Enable)
OP = 0762UU  IOF  Interrupt Off (disable)
OP = 0764UU  SKI  Skip if interrupt on
    SKON = 075500 Skip if interrupt on and turn it on
    SKOF = 075600 Skip if interrupt on and turn it off.
```

OP = 0772UU - NOR

This instruction is used to normalize the AC and is used primarily with MUL and DIV. If the MUL/DIV hardware is not present, the execution of these OP codes causes a JMS I 2.

OP = 0774XX = ROT

Similar to NOR for extended arithmetic hardware, the rightmost bits are used to indicate a log positive or negative rotate.

OP = 0776XX - SHF

Similar to ROT, the rightmost bits are used to indicate a signed arithmetic shift.

VI. Core Layout

SIZE 12: The assembler assumes all addresses and paging in like that of the PDP-8.

SIZE 16:

OCTAL LOCATION

Ø	A JMS I Ø and IOF is executed when an interrupt occurs. Should be loaded with the address of the interrupt handler.
1	A JMS I 1 is executed when a TRAP instruction code is encountered. Should contain the trap handler.
2	A JMS I 2 is executed when an extended instruction is encountered but the hardware is not reset. Should contain the address of the Extended Instruction Set (EIS) Simulator.
3, 4, 5, 6, 7	Reserved generally for Monitor Program links, etc.
10, 11, 12, 13, 14	Auto-index registers
15	Push-down-list Pointer used by PUSHJ, POPJ, PUSHA, POPA.
16, 17	Byte Auto-index registers
20 - 37	Usually reserved for use by the Floating Point Package
40- 177	Page Zero in PDP-8/I
200 - 1777	Expanded Page Zero
2000 - 3777	Page One
4000 - 5777	Page Two
6000 - 7777	Page Three
MEMORY EXTENSION 1	
10000 - 11777	Page Four
12000 - 13777	Page Five
14000 - 15777	Page Six
16000 - 17777	Page Seven

MEMORY EXTENTIONS

20000 - 177777 Page Eight to Eleven

VII. Instruction Summary

A. Memory Reference Class

OP = 00	AND	OP = 10	TRAP
01	TAD	11	CAM
02	ISZ	12	EXC
03	DCA	13	PUSHJ
04	JMS	14	ADE
05	SMP	15	SBE
		16	MUL (Optional)
		17	DIV (Optional)

B. Input-Output Codes

OP = 060 (Similar to PDP-8/I)
OP = 06X Line String Codes

C. Operate Codes

OP = 070	(See PDP-8/I)	
071	POPJ	
072	PUSHA	
073	POPA	
074	LBC	
075	SBC	
OP = 0761	ION	
0762	IOF	
0764	SKI	
OP = 0772	NOR	(Optional)
0774	ROT	(Optional)
0776	SHF	(Optional)

Advantages of 16-bit PDP-8/M

A) The paging problem is gone.

B) 64K addressable.

C) Multi-level indirect.

D) 1024 common registers.

E) Half word instructions.

F) Double precision accuracy better than one part in a million.

G. Program compatible with PDP-8/I.

Advantage of the DEC-16

The machine is as simple as possible to design and manufacture and easy to learn and to use. The instruction set is streamlined yet relevant and builds upon that of the PDP-8

digital INTEROFFICE MEMORANDUM

DATE: April 9, 1969

SUBJECT: DINING AREA FOR VISITORS

TO: Operations Committee

FROM: Ted Johnson

cc: Alan Hanson

It seems to me that we could derive (1) savings in key time, and (2) greatly increased effectiveness in managing the visits of senior people, if we had an executive/visitor dining area. This could be an off-shoot of the main dining area. I suggest table cloths, enough help to keep clean ash trays, serve dessert and coffee, but it could be serve-yourself.

mr

Al Hanson

Please peruse this.

Ken

Committee of all, John Murphy & Jack Fiske working on this. 6-11

Presented to Operations Comm. on 6-30-69

digital INTEROFFICE MEMORANDUM

DATE: April 11, 1969

SUBJECT: PDP-8/VR12

TO: Ken Olsen
Bob Collings

FROM: R. L. Lane

We are taking advantage of a "special system" display for Munich to promote our VR12 type display for the 8 Family. Most of the engineering costs will be accumulated against the special system.

Nick, Bill Long, Brad Vachon, John Larkin and myself met on Tuesday, April 8, 1969 to discuss the "what, when, how much and by who" of the proposed display.

The weakest element of this "graphics terminal" is actually the VR12. As it currently stands it is not suitable for our purpose. John plans to experiment further with it on the Munich system.

You are invited to attend our next session scheduled for 3:00 p.m. Tuesday, April 29, 1969.

Bill and John will have made some further evaluations and by then we will have a better definition of the display and more of an appreciation for the VR12.

The VR12 should not be considered complete just because PDP-12 has accepted it. It must be finished and put into production in accordance to the original, or at least to a compromised set of specifications. I am attaching a copy of those obtained from Klaus.

el
Encl.

BOB LANE

VR-12 Display

Description:

The VR-12 is a compact, low-cost display with self-contained power supply. Viewing area is 6 3/4" x 9" from a 12" C.R.T. High resolution and contrast makes possible a comfortable viewing of densely displayed information.

The deflection amplifiers, using a sampling control technique, features high speed, although low power consumption.

All modular plug-in concept gives the VR-12 maximum flexibility.

By merely clamping or adding a plug-in module, the following options can be incorporated:

Light-pen

8 level brightness controlled by a 3-bit binary input

~~Wide band linear amplifier for Z axis~~

~~T.V. monitor convertion~~

The front panel features screw-type adjustments for position and gain, and two knobs for brightness control and channel selection.

Various optical filters can be slid in front of the C.R.T. face-plate for any particular application. The VR-12 is suitable for either rack-~~memory~~ mounting or bench use.

Specifications:

X-Y Amplifiers:

Sensitivity: 4 inch/volt (high sensitivity)
1.5 inch/volt (low —"—)

Drift: <50 mills/hour

~~Bandwidth: DC to 10 MHz~~

Rise time + settling*: to 40 mills deflection: 400 nsec
to 80 " " 1 μsec
Full screen deflection: 15 μsec

*Settling is defined to within 4 mills at final position.

Input Inpedance: ~~1500 Ω resistive~~, balanced or unbalanced inputs. > 6.5kΩ (high sensitivity) > 20kΩ (low —"—).

Linearity: ± 1%

Z Amplifier:

One shot Intensification pulse generator, triggered by +3V to GND input ~~level~~ transient. ~~Built-in delay adjustable from 50 nsec to 300 nsec.~~ DIRECT INPUT (AC coupled to GRID OF CRT) requires 30V positive INTENSITY PULSE.

C.R.T.:

Accelerating potential: 12 KV

Spot size: Less than 15 mills throughout viewing area. (shrinking raster)

Phosphor: ~~P7~~ P31 standard, any other registered available on request.

Controls: Front panel: X-Y gain and position (screw-type) brightness control and channel selector (2 Z-channels)

Top: focus and brightness (fine)
Rear: X-Y polarity ~~switches~~ & sensitivity switches

General:

Size: 19" wide
10 1/2" high
17" deep

Weight: 43 lbs.

Power: 80 Watts 110-220V / 50-60 Hz

digital INTEROFFICE MEMORANDUM

DATE: April 14, 1969

SUBJECT: ACQUISITION OF MTI

TO: Ken Olsen
c.c. Stan Olsen

FROM: John Holzer

Stan and I talked of my conversation with John Marino of MTI. Marino is willing to talk acquisition. Here is my assessment of the MTI acquisition possibility.

1. The Benefits of Acquiring MTI

a. Freezing out competition

According to Fred Gould, 3C's has recently completed the financial analysis of a product to compete with the PDP-14. The result: 3C's is building a PDP-14 class machine. I have heard rumors that Square-D, G. E., and Sundstrand are getting into the PDP-14 business.

If we could acquire MTI, we could tie up the only proven vendor of a Transformer-type ROM. MTI may have some patents pending that could help us.

However, the acquisition opportunity will not exist forever: if MTI gets a contract from one of our competitors (e.g. Honeywell), they will not be in the mood for a marriage to DEC.

b. Getting control over ROM production

Right now, we have no second source for MTI--not even Pete Kaufmann. Tom Stockebrand is contemplating making a commitment to develop an in-house capability to weave PDP-14 and PDP-11 ROMs.

If we are lucky, it will take six months to develop an in-house ROM-weaving capability----after we decide to do it.

Clearly, acquiring MTI will give us ROM security six months to a year earlier than we could otherwise obtain it - unless there is a corporate crash program to develop an ROM braid-making machine.

c. Obtaining two outstanding people

(1) John Marino is a first class manager.
(2) John Sirota is a top notch ROM memory designer.

2. The Cost of Acquiring MTI

??? ARD owns 50%. An extra 1% is all we need.

mf

digital INTEROFFICE MEMORANDUM

DATE: April 14, 1969

SUBJECT: FIELD SERVICE INSTALLATION REPORT

TO: Ken Olsen FROM: Jack Shields

cc: Jim Cudmore

Ken, I am afraid there is still some confusion about the Field Service Installation report. We had recently instituted a new short form installation report and are presently trying to use this report as a basis for establishing the shipping quality of our products. However, we only use this report for domestic installations. This is because of the time factor (feedback loop) and does not include any options or systems which are to be installed by our customers. I think Jim Cudmore's data is based on the old long form which we are no longer using.

I am enclosing a report which shows the returns based on a shipment number which includes only U.S. installations and DEC installed equipment. As you can see, the returns for this report are still not what we want. We know that some people still don't understand how to use the short forms and, in fact, a few offices are still using the old report. We are working on rectifying this problem.

In the future, we will send this report on a monthly basis to the Operations Committee direct from the Product Acceptance Group.

JJS:ned
Enclosure

digital INTEROFFICE MEMORANDUM

DATE: March 11, 1969

SUBJECT: SHORT FORM FIELD SERVICE INSTALLATION REPORT

TO: J. SHIELDS
REGIONAL F.S. MGRS.
DISTRICT F.S. MGRS.

FROM: PAUL GADAIRE

This is the first report on the use of the short version Field Service Installation Report. The short form was issued for shipments beginning January 6th. We did have quite a few reports come back for December.

We will report on fiscal months, therefore, this report covers shipments for January 6th through January 26th. 60 days later or February 28th, all cards for January shipments should have been returned. We will make a 60 day report on each months' shipments.

The following is the month of January's.

Total shipments/domestic	200
Total expected short forms	187
Short form received	75
Customer to install	13
Number of offices, domestic	26
Offices expected to report	24
Offices reporting	22
Percentage reported as of 1/31	10%
Percentage reported as of 2/28	40%

Northeastern Region - 45%
713 - Mayn. - Not available
743 - N.H. - 100%
768 - Roch. - 23%
770 - Camb. - 71%

Mid-Atlantic Region - 36%
704 - D.C. - 25%
709 - Fla. - 100%
714 - Hunt. - 20%
771 - Phil. - 25%
772 - L.I. - 33%
773 - Prin. - 66%
775 - N.Y. - 30%
781 - Atl. -Nothin sent

Central Region - 26%
706 - Pitt. - 0%(6)
707 - Chic. - 7%
708 - An. Ar. - 71%
712 - Houst. - 33%
731 - Minn. - 50%
732 - Dall.-15%
733 - Clev. - 0%(1)
734 - Dayt. - 60%

Western Region - 56%
702 - L.A. - 81%
703 - S.F. - 47%
710 - Denv. - 50%
711 - Seat. - 100%
748 - S.L.C. - 20%
774 - Alb. - 37%

F.S.I.R. Received for month of JANUARY at 60 days Date 3/10/69

PRODUCT LINE		REPORTED OK	REPORTED WITH PROBLEMS	PROBLEM BREAKDOWN					
				DEFECTIVE		MISSING		DAMAGED	
				hardware	software	hardware	software	hardware	software
PDP- 8	ADD-ON	7	1	1			1		
	SYSTEM	3	0						
PDP- 8I	ADD-ON	9	1	1			1		
	SYSTEM	13	7	1	1	2	2	2	
PDP- 8L	ADD-ON	1	0						
	SYSTEM	19	2	1			1		
PDP- 8S	ADD-ON	1	2	1		1	1		
	SYSTEM	1	1			1			
LINC- 8	ADD-ON	0	0						
	SYSTEM	1	0						
PDP- 9	ADD-ON	1	2	1	1	2			
	SYSTEM	0	1			1			
PDP- 9L	ADD-ON	0	0						
	SYSTEM	0	1	1					
PDP- 10	ADD-ON	1	0						
	SYSTEM	0	0						
	ADD-ONS	20	6	4	1	3	3	0	0
TOTAL	SYSTEMS	37	12	3	1	4	3	2	0
75	COMBINED	57	18 \ 24%			24			

F.S.I.R.-JANUARY

			1			2			3			4			5			6		
			JAN. 30			FEB. 60			MAR. 90			APR. 120			MAY 150			JUN. 180		
			Snt	Rc	C	O.S	Rc	C	O.S	Rc	C	Snt	Rc	C	Snt	Rc	C	Snt	Rc	C
Northeastern Region																				
7	13	Maynard	not	ava	l.															
	43	New Haven	6	2	1	3	3		0											
	68	Rochester	21	1	0	20	4		16											
	70	Cambridge	8	2	1	5	3		2											
		TOTALS-	35	5	2	28	10		18											
Mid-Atlantic Region																				
7	04	Washington D.C.	4	1	0	3	0		3											
	09	Florida	2	0	0	2	2		0											
	14	Huntsville	15	0	0	15	3		12											
	71	Philadelphia	4	0	1	3	1		2											
	72	Long Island	7	0	4	3	1		2											
	73	Princeton	9	1	0	8	5		3											
	75	New York	10	3	0	7	0		7											
	81	Atlanta	0	0	0															
		TOTALS-	50	5	5	41	12		29											
Central Region																				
7	06	Pittsburgh	6	0	0	6	0		6											
	07	Chicago	17	0	3	14	1		13											
	08	Ann Arbor	9	1	2	6	4		2											
	12	Houston	9	1	0	8	2		6											
	31	Minneapolis	2	0	0	2	1		1											
	32	Dallas	13	0	0	13	2		11											
	33	Cleveland	1	0	0	1	0		1											
	34	Dayton	5	0	0	5	3		2											
		TOTALS-	61	2	6	33	13		20											
Western Region																				
7	02	Los Angeles	11	1	0	10	8		2											
	03	San Francisco	17	5	0	12	3		9											
	10	Denver	4	1	0	3	1		2											
	11	Seattle	5	0	0	5	5		0											
	48	Salt Lake City	6	1	1	4	0		4											
	74	Albuquerque	8	0	0	8	3		5											
		TOTALS-	52	8	0	42	20		22											
		GRAND TOTALS-	199	20	13	144	55		89											

digital INTEROFFICE MEMORANDUM

DATE: April 17, 1969

SUBJECT: PDP-9 SOFTWARE STATUS

TO: Bill Segal

FROM: Ken Stone Ken

In answer to your memo on PDP-9 Software, consider the following points:

1. The PDP-9 product line has made a determined effort to up-date software by mailing out a new monitor system on a DECtape at no charge to customers.

2. As far as I know, FOCAL is not "officially" available for the PDP-9, even though "bootleg" copies are in the field.

3. The size of a FORTRAN or MACRO program which can be compiled is very small when going from D.T. to D.T. in 8K. This almost lost us a sale in a pre-sales demo.

4. We have been talking about B/F system for too long before delivery.

5. I would like to see the PDP-15 have a Monitor similar to the PDP-8 Disk Monitor System for small systems. This could be used on the PDP-9 and PDP-9/L.

6. Customers are happy with our software once they become comfortable with it.

dl

digital

INTEROFFICE MEMORANDUM

SUBJECT: DATE: 15th April, 1969.

TO: Bill Segal FROM: Bob Bishop - Sydney

Here are a few notes with respect to PDP-9 software in the field.

1. Customers are generally happy with the current software. System 4B is relatively bug-free, although we haven't received the equivalent for paper-tape systems as yet.

2. I am familiar however, with the following deficiencies in current PDP-9 software. Five of the six systems in Australia are attempting real time data acquisition, with background processing of the data collected. Both interrupt level and mainstream may require I/O, as well as computation. Main problems are that

   (i) Current CAL handler is not reentrant. It is not safe to do I/O at both interrupt and mainstream level.

   (ii) Fortran library is non-reentrant. Computation to be done at interrupt and mainstream level cannot share the one set of arithmetic routines. Arithmetic packages must be loaded twice. All systems in Australia are 8K, and core is too much at a premium to do this.

Here is another deficiency I believe, that exists with respect to the PDP-9 Batch Processor. Consider a user who wishes to

(a) Compile source deck with FORTRAN

(b) Linking Load the binary output and execute.

His card deck would look as follows:-

$ JOB

F4

Source deck

$ JOB

GLOAD

SUBJECT: DATE:

TO: FROM:

If an error occurred during compilation with F4 however, and forced return to the non-resident monitor, the operator can only attempt to continue the remainder of the Batch jobs by striking CTRL/T. But this simply takes him onto the next $JOB card, which in this case is a load and go request GLOAD. At this stage, Batch will attempt to load and execute a file which is known to be bad.

Here is the problem then. $JOB cards simply distinguish sub-jobs within each user deck submitted. We need another control card (i.e.$USER) to separate each user deck from the next. Then, when an error occurs within a particular sub-job of a user, the operator types CTRL T and this takes him onto the next user (next $ USER card) instead of simply the next subjob (next $JOB card). Obviously, a great many errors found in subjobs will invalidate succeeding subjobs in the same user deck. At present there is no alternative but to process these invalidated sub-jobs. Shouldn't our software allow us to skip on to the next user instead?

3. Concerning the PDP-9 manuals that are currently available, I would like to comment on a feature of the FORTRAN 1V manual, Science Library section.

   This comment again has a bearing on the real-time work that people seem to have bought the machine for here in Australia. In critical cases it is important to know the worst possible case times that arithmetic calculations take to execute. However, these times are not available for the Science Library. Instead, we are given "average-to-worst-case times based on arbitrarily chosen values". Let us have much more precise worst-case time figures than these.

4. In summary, if we are really aiming at the real-time market, I believe the following features would be of great asset in upgrading our current PDP-9 software for operation on the PDP-15.

digital

INTEROFFICE MEMORANDUM

continued page 2

SUBJECT: DATE:

TO: FROM:

(i) Reentrant CAL handler on regular Keyboard monitor.

(ii) Reentrant Science Library.

(iii) Conversational (Real-Time) Fortran is a very useful language. It is offered by Honeywell on their 16 bit machines, and is posing much competition in the real-time field.

Of course, our Background/Foreground system offers some relief in all of the areas mentioned above. However, relief could be available to regular Keyboard and I/O monitor users with smaller configurations as well, if the features outlined were implemented with our non Background/Foreground monitors.

Regards, Bob Bishop

BB:BD D 153

from P. Goldstern

PDP-9 Software Wishes.

1. Carole O'Hare Univ. of Cal. San Diego
   a. DDT handle symbols with more than 3 characters
   b. Easy way of adding symbols to Macro≠ DDT
   c. DDT which handles interrupts
   d. UPDATE via scratch back to orginal
   e. Named ↑D
   f. All PIP functions working with system programs
   g. Multifile assemblies (Useful for Macro libraries)

2. J. Ansley General Dynamics, Pomona
   a. PDP-9 assembler for other machines.

3. J. Hansen Information International
   a. Macro assembler 3 years ago
   b. Keyboard inonitor 3 years ago.

4. P. Goldstern, Digital Equipment Corp.
   a. Documentation for all programs espec. current listings
   b. Bulk storage ability to go to head of file without doing .CLOSE ≠ .INIT. c. .WAIT works for .INIT so no hang up.

5. H. Taxin, Hughes Aircraft

digital INTEROFFICE MEMORANDUM

DATE: April 21, 1969

SUBJECT: PDP-9/PDP-15 Software

RE: Your memo, dated April 4, 1969.

TO: Bill Segal FROM: Mel Woolsey

I have just returned from a presentation of the PDP-15 System given by John Jones and Evelyn Dow and I find that many of the comments I had to make on modifications and additions to be made to the PDP-9 Software have already been planned for in the PDP-15 Software development. So let me limit myself to those things which are missing from our present plans.

CHAIN in its present form is unacceptable. With our present Chaining Programs, CHAIN and its handlers must be resident therefore the chain you are trying to build can only be as large as the remaining core. On an 8K System this means that the chains are so small that CHAIN is virtually useless and yet this is the system on which chaining is most important. The cure for this would be to have CHAIN executive build the chained program on a bulk storage device directly without assembling the whole program in core. With this approach any program that runs on the system could also be chained to another program if desired. This is not true presently.

We need a Compact Command Language (CCL) for the PDP-15. I think we want to go after the small university computer center market. For this market we need the capability to compile, load and execute a program all with a single command. The user may also have programs that have special DAT slot assignments. If he uses these programs frequently, assigning the DAT slots each time can be tiring. With CCL he could create a file which assigns his DAT slots for him, loads his program and begins execution. Again, all with a single command. We have also seen the "compile, load and go" requirement in several RFQ's.

The Fortran operating systems needs to be made more modular. For instance if you have a program that has simple integer input and output on the teletype you still have to have the whole BCDIO package resident which is about 2K of core.

"Fortran does not make effective use of the EAE', is a comment I have heard from several customers.

Generally the customers are satisfied with our PDP-9 Software after they get over the initial shock of the restrictions that are due to having only 8K. Its unfortunate that some of the features of PDP-9 Software that we market are not readily usable on an 8K System. Several customers we have have been burned by this. The PDP-15 group is attempting to rectify this problem. The one 16K user I have is satisfied with his system and I believe that going to 16K will satisfy most of the other users problems.

The documentation on the PDP-9 Software has been very, very poor. While the information is there, it is very disorganized. To gain an understanding of some

of the software you need to have three different manuals open; and if you can find some information that you vaguely remember reading somewhere you are really lucky. We really need to put some effort into cleaning up this documentation.

I would also like to see us write a text on the PDP-15 similiar to the "Introduction to Programming" on the PDP-8. I think this is a marketable item and it would certainly help us get into the small university computer center. While the PDP-15 with a line printer, a disk, and a card reader would be more expensive than an IBM 1130, it has far more capability initially; and in the long run, much more capability than an expanded IBM 1800. As an added attraction, using the Foreground/Background Monitor, you can have multi-user FOCAL in the foreground and standard processing in the background which is a very desirable operating system in a university computer center.

Regards,

Mel

MW:pac
cc: John Jones
File
Master File

digital INTEROFFICE MEMORANDUM

DATE: 17 April 1969

SUBJECT:

TO: Ken Olsen

FROM: Joe St. Amour

Copy of memo from Jim Jordan attached. Have been talking to him; not sure how well I've reached him. We're probably going to lose him within the next three to five years. Would like your comments.

Joe

√Copy: Pete Kaufmann
L. Prentice

digital INTEROFFICE MEMORANDUM

DATE: March 25, 1969

SUBJECT:

SPECIAL PRODUCTS DEPT.
MAR 26 1969

TO: Joe St. Amour FROM: Jim Jordan

INDEX

Part I - Objectives for the Industrial Design Department

Part II - My Personal Objectives

Part III - Job Description

Part I

During the next five years I see Industrial Design taking on increasing responsibilities in the areas of new product planning and development; human engineering/product safety; exhibit design and space planning.

In the area of new product planning and development the goal is to initiate market sensitive plans for ways in which to utilize and package our products. The product development load increasingly will consist of modifications to existing product lines and the increasing volume of new core products. Core products consist of standard peripherals and computers.

In the area of human engineering and product safety the industrial designer is sensitive to the problems of the man machine interface and tries to provide the safest device possible. At times either through oversight, the pressure of time or what seem to be more important parameters, these considerations assume a secondary status. In the future we will make ourselves more aware through seminar and the literature. We will apply ourselves more explicitly to the task of product engineering and human engineering. In doing so we hope to improve the quality of our products. Initially, Industrial Design should be able to handle both of these areas. Eventually we may wish to consider having human and safety engineering specialists on our staff.

NO

In the area of exhibit design we have been requested by Gabe D'Annunzio to provide design services. We have a charge number and a budget through which to work. Exhibit design will be a corporate function rather than a product line function and will

be approached as part of the total promotional activity.

Finally, in the area of space planning, we want to be able to establish a standard set of standards for setting up sales offices which provide the greatest flexibility and economy. The next step is to apply what we learn in the sales offices to the space in the plant. No space will allow an unmodified application of a standard office. Some group within the plant must make these modifications. Industrial Design should be an active participant in the planning process.

I have enclosed the report I wrote to Loren which outlines the manpower requirements for the next five years. This estimate is based upon an industrial design/exhibit design activity. It includes no manpower for space planning and little in the way of new product planning. If we do not receive another designer immediately we must eliminate all special projects, new product planning, space planning and exhibit design. More importantly we will not be able effectively to carry out our product design obligations. The number of projects will be limited, the number of alternatives we may prepare will be fewer, the quality of the designs as well as the finish of the final product will suffer and the human and safety engineering aspects will receive only a cursory glance.

Part II - Personal Objectives

Ultimately I plan to engage in some form of enteprenureal activity. Until that time I wish to be challenged and learn as much as possible about running a company. Managerial expertise may be obtained in many ways. If I do not believe that I can be challenged and learn at DEC then my options are obvious. Increased mobility, larger responsibilities and a greater variety of responsibilities are an absolute necessity. I greatly enjoy being an Industrial Designer but my capacities and interests are broader than I can exercise in this area. Marketing is intriguing perhaps for the overall approach it has to business. Functional areas such as finance, accounting, production, personnel and purchasing also are interesting.

As you know I am a graduate Industrial Designer, have over six years in the Industrial Design field and am receiving an MBA from Boston University in June. This background does not fit into the conventional mold but it is useful and does have marketability.

My association with DEC during the last four years is one which I believe to be the most fruitful and certainly the happiest of my life. It is a period of time in which I have grown personally, professionally, and economically. I enjoy the people at Digital and I certainly enjoy the New England area. I have enjoyed the opportunity to study at Boston University with the support, both spiritual and economic, of DEC. I would certainly enjoy continuing this relationship.

Other Thoughts

Reporting

Industrial Design should report to a vice president. Ideally, of course, it would be best to report to the president, but since this is not likely, the next most effective slot is just below a vice president. I believe this is best not because of a feeling of frustration with the present system, but I feel that as the company grows larger the time has come where distinctions in organizational structure are (1) significant value cues to those working within the organization and (2) the numerous layers of management are becoming a barrier to effective communication.

Facilities

Present office facilities are not adequate for Industrial Design. The office in the standard office area is large enough for both Jack and me, but there will soon be additional designers who must be accommodated in a work area. Noise is extremely distracting and virtually destroys a continuous thought process. The paging system is awful. The area is usually too hot for a full effort. Space is extremely restrictive. There is no room for model preparation and study. One of the requirements for a studio area is enough space to set up a system then stand back and look at it; perhaps several projects at one time. The area below the old Production D area appears to be good both from the noise and light standpoint. If the paging system could be eliminated, it would probably be close to ideal. The only drawback is the remoteness from all other activities. I do find that the proximity of Industrial Design to advertising and the various product lines as well as mechanical engineering desirable. At this time, Industrial Design does not require a full time secretary. We do, however, require one on a part time basis. In staffing a department, we must search for the highest quality personnel so that they may assume responsibility for the tasks to which they are assigned and also permit anyone of them to lead the design activity.

III. Job Description

Contract

The Industrial Designer will be responsible for the asthetic design and human factors engineering of products, exhibits and office space.

Component Functions

The Industrial Designer will prepare sketches and models for management to help them visualize the alternatives available to them. He will also follow the engineering process through to manufacturing in order to assist and insure proper execution of

the initial design concept. He will prepare and maintain standards such as finish and color.

Relationship of Industrial Design to Other Components

Formal: Vice President Marketing (or Manufacturing)

Informal: relationships will exist with all functional areas in the company including product lines, advertising, accounting, engineering and manufacturing.

Authority

The Industrial Designer will have the authority to carry out his design function in all phases and will have the authority to authorize expenditures up to $1,000 for models or consultant help on an as-needed basis. The Industrial Designer will also have the authority to hire additional designers as required.

Activities

1. New product development.
2. New materials investigation.
3. Initiation and maintenance of standards.
4. Customer assistance on custom products.
5. Market research for new products.

Actual work load during the past year numbers fourteen major projects or areas of major activity and nine minor projects. Jack Carroll has worked on seven major and three minor projects since he arrived last July. In more detail the breakdown is as follows:

Project	#	Major	Minor	Jack	Jim
Enclosure System	07130	X			X
VR 12 Display	07129	X			X
Classroom Module	07033		X		X
A-D Converters	07135		X		X
Tape Cartridge	07136		X		X
Paper Tape	07137	X		X	X
PDP-8/I		X			X
PDP-8/L	07175	X			X
PDP-9/L	09	X			X
Gaschrome 8	07171		X		X
PDP-12	36	X			X
PDP-15	07150	X		X	X
VT09 Display	07193	X			X
PDP-14	07408		X	X	X
Lab Peripheral	07114		X		X
Exhibits		X		X	X
Space Planning			X	X	X
Quickpoint			X	X	X
TU-79	07028	X			X
TU-55 Repackage			X	X	X
Dual Dectape		X		X	X
Mis. Peripherals		X		X	X
PDP-11	07434			X	X
Graphic Displays	07129	X		X	X

Given these activities plus some time for contingincies, crash projects and advanced planning my estimates are:

Date	Requirement	Comment
1969	1 man	Immediately
1970	2 men, 1 sec.	1, 8 mo.; 1, 1 yr.
1971	1 man	Mid year
1972	1 man	Mid year
1973	2 men	
1974	2 men	

digital INTEROFFICE MEMORANDUM

DATE: February 27, 1969

SUBJECT: MANPOWER REQUIREMENTS FOR THE NEXT FIVE YEARS

TO: Loren Prentice FROM: Jim Jordan

In projecting manpower requirements for the next five years I will assume that:

1. There is a 50% increase in sales each year.

2. Project load increases will anticipate product sales by 2 to 3 years.

3. Therefore, project load will parallel or lead sales on a percentage basis for the next five years.

Example: If product projects number 10 for next year, 15 for the next year and 23 for the following year, we should not only be designing for next year, but the following years as well. At the present time our development schedule for most prodcuts extends to a horizon of 8 months to a year. It should extend at least 2 years. Therefore, we should not be doing 10 projects for next year, but 13; not 15 for the next year, but 20; and so on. We have, in other words, not only the usual percentage gains with which to cope but also some catching up to do.

I see the volume of work increasing exponentially rather than linearly. More and more, our products will be adaptations of standard computers. For each new computer I can visualize ten special packages for particular market segments. Each special package may take almost as much time for packaging(and mechanical engineering) as a computer. If we are to have fast turn arounds I see them occuring more in the special packaging area and less in the "standard peripheral" and computer area.

If we are to participate in exhibition design the number and complexity of shows will necessitate adequate staff.

A further interest of mine and possibly for the future, is space planning. I am currently working with Bill Farnham on developing a standard sales office. The bulk of the work will be contained in the initial effort, but the variations and special cases will require consistant attention.

Ken Olsen

digital INTEROFFICE MEMORANDUM

DATE: April 28, 1969

SUBJECT: PDP-9 Software

TO: Bill Segal FROM: Burr Tupper

As far as I can determine, customers are very happy with the Software on the PDP-9. However, I have only made contact with three PDP-9 customers, so this may not be a valid assumption.

The problems they have specified in many cases are small and they can live with them, only a few major problems have been cited. The most outstanding was United Aircraft who stated that Software support in the past had not lived up to scratch. They are going to mail to me a list of Bugs they have found in the Software. I will send a copy to you and to the appropriate people. I have assured them that they may contact me any time in the future in regards to software Bugs.

mcw

digital INTEROFFICE MEMORANDUM

DATE: 4/29/69

SUBJECT: SPRINGFIELD EXPOSITION
SEPTEMBER 13-22

TO: Ken Olsen

FROM: Gabe d'Annunzio

I am enclosing a portfolio which contains the following information regarding the SPRINGFIELD EXPOSITION:

1. Attendance Record.
2. A brochure highlighting the commercial exhibits building, both from viewpoints of exhibit size and space costs.
3. Two pamphlets stating background information about the EXPOSITION.
4. A 1968 Official Souvenir Guide. (See page 74 for last year's exhibitors.)

jml/

enclosure