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DIGITAL EQUIPMENT CORPORATION

DATA PROCESSOR  
PDP-7





**PROGRAMMED DATA PROCESSOR-7 (PDP-7)** is a general purpose, solid state, digital computer designed for high speed data handling in the scientific laboratory, the computing center, or the real time process control system. PDP-7 is a single address, fixed 18-bit word length, binary computer using 1's complement arithmetic, and 2's complement arithmetic to facilitate multi-precision arithmetic. A random access magnetic core memory with a complete cycle time of 1.75 microseconds is used to achieve a computation rate of 285,000 additions per second. Other features of the basic PDP-7 system include:

**INTEGRATED CIRCUITS** are basic elements of the low cost, newly designed silicon FLIP CHIP modules used throughout PDP-7. Cost of spares is reduced.

**FIELD TESTED SOFTWARE** includes an advanced FORTRAN compiler, a symbolic assembler, floating point arithmetic, and program compatibility with the field tested PDP-4 program library.

**MODULAR DESIGN** permits the addition of peripheral devices simply by plugging in modules and cables.

**COMPREHENSIVE I/O CONTROL**, as supplied, connects to 64 input and output devices and includes an Input/Output Control, a Program Interrupt, Data Interrupt, I/O Trap, I/O Status, I/O Skip and Real Time Clock. Easily expandable to any size.

**I/O TRAP** hardware supplied to permit the programming of a time-shared system.

**MULTIPLE AUTO-INDEXING** using eight memory locations simplifies programming and increases the speed of table look-up and other routines.

**FULLY PARALLEL** internal operations simplify maintenance and increase reliability.

**DATA INTERRUPT** at data transfer rates up to 570,000 words per second with direct access to core memory and without disturbing arithmetic registers.

**PROGRAM INTERRUPT** frees processor from time-dependency on external devices.

**ENVIRONMENTAL TOLERANCE** permits computer and peripheral equipment to operate without air conditioning on 115  $\pm$ 10 volts AC, 60  $\pm$ 0.5 cps.

**ASCII STANDARD 8-bit CODE** is used with Model 33KSR teleprinter.

**ECONOMICAL MEMORY EXPANSION** up to 32,768 words is provided for.

**READ-IN SWITCH** loads a block of words from binary paper tape into memory and initiates program execution.

**HIGH SPEED OPERATION** with a memory cycle time of 1.75 microseconds and add time of 3.5 microseconds.

**PROGRAMMED TAPE CONTROL** permits program control of punch power.

**INDIRECT ADDRESSING** simplifies subroutine linkage.

**MICROPROGRAMMING** saves program execution and preparation time by coding instructions capable of multiple operations.

Parallel operation and parallel data flow using integrated circuit modules assure the highest degree of computer reliability possible. All modules, sub assemblies and then the final computer are given a thorough test and check-out before being released.

Built into each PDP-7 is a network for marginal test of computer sub-sections. Two features of the marginal test system make routine checks fast and accurate: The marginal check voltage is continuously variable, and all working registers are displayed simultaneously on the console lights.



## BASIC PDP-7

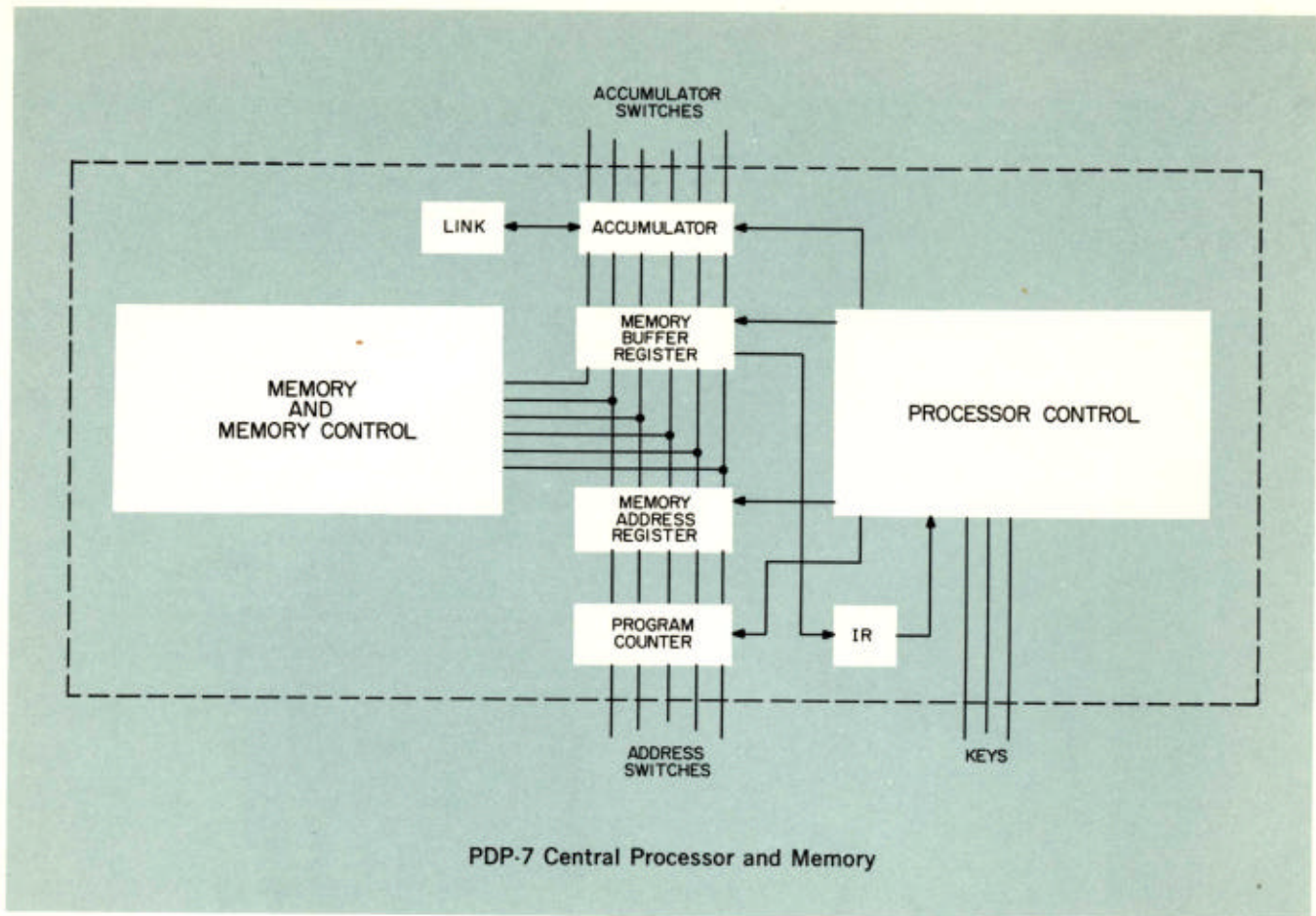


*The basic PDP-7 is a highly effective system in a minimum configuration. The basic PDP-7 includes:*

*Central Processor and Control Console  
4096 Word Core Memory  
Input/Output Control with  
Device Selector (up to 64 I/O connections)  
Information Collector (seven 18-bit channels)  
Information Distributor (six 18-bit channels)  
Program Interrupt  
Data Interrupt  
I/O Trap  
I/O Skip Facility  
I/O Status Check  
Real Time Clock*

*High Speed Paper Tape Reader (300 cps)  
High Speed Paper Tape Punch (63.3 cps)  
KSR 33 Teleprinter (10 cps)*

*Programming Aids  
FORTRAN Compiler  
Symbolic Assembler  
Editor  
Debugging System  
Maintenance Routines  
Library*



## PROCESSOR

The processor performs logical and arithmetic functions, provides access to and from memory and controls the flow of data to and from the computer. It consists of the processor control, the memory, memory control and six other active registers (see diagram).

**ACCUMULATOR (AC)** is an 18-bit register which performs arithmetic and logical operations on the data and acts as a transfer register through which data passes to and from the I/O buffer registers.

**LINK (L)** is a 1-bit register used to extend the arithmetic facility of the accumulator.

**MEMORY ADDRESS REGISTER (MA)** is a 13-bit register which holds the address of the core memory cell currently being used.

**MEMORY BUFFER REGISTER (MB)** is an 18-bit register which acts as a buffer for all information sent to or received from memory.

**INSTRUCTION REGISTER (IR)** is a 4-bit register which holds the operation code of the program instruction currently being performed.

**PROGRAM COUNTER (PC)** is a 13-bit register which holds the address of the next memory cell from which an instruction is to be taken.

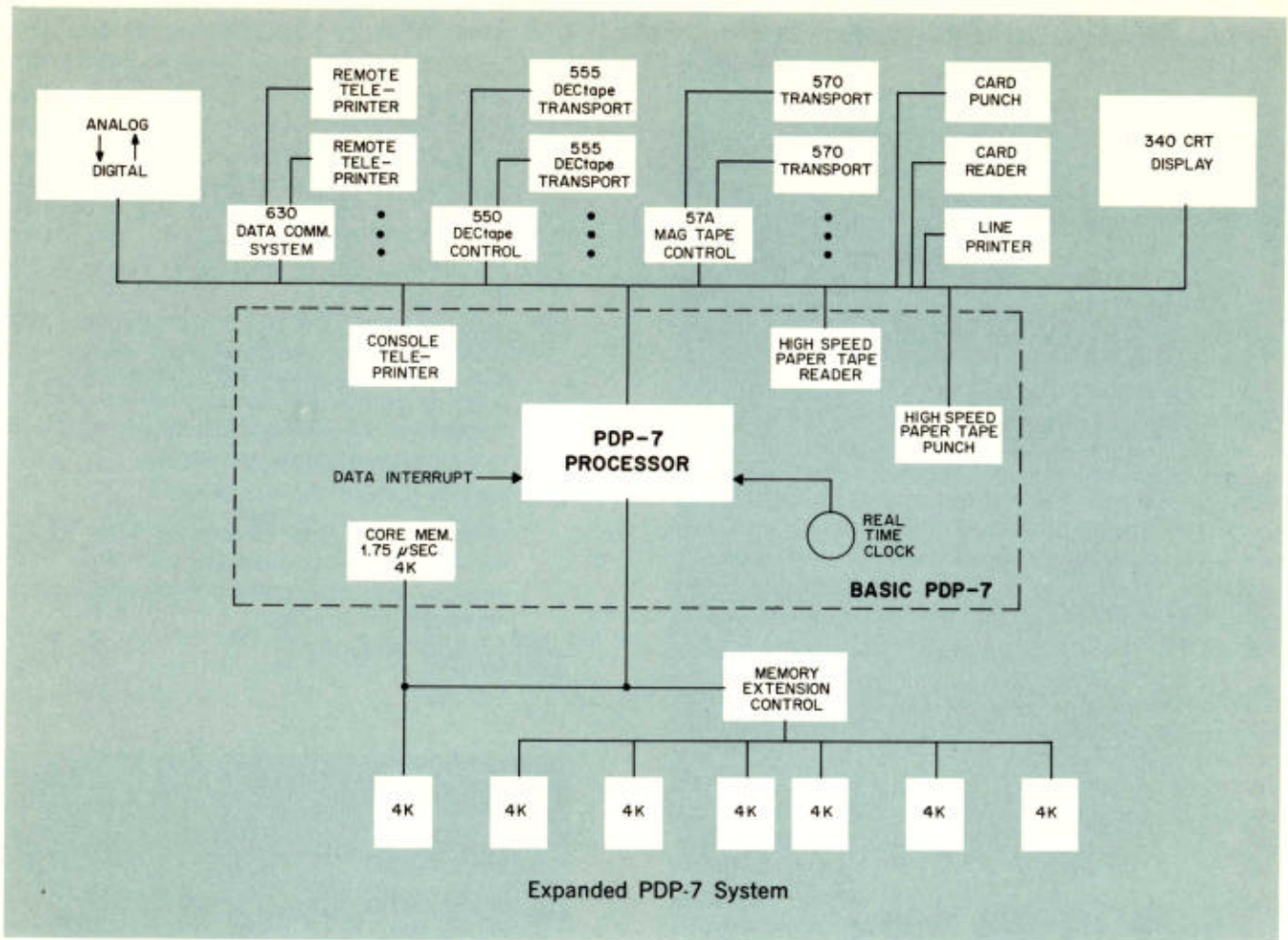
## MEMORY

The high speed random access memory is a 4096 word coincident-current core module with a cycle time of 1.75 microseconds. In one cycle the memory control retrieves an 18-bit word stored in the memory cell specified by the memory address register, writes the word by a parallel transfer into the memory buffer register, and rewrites the word into the same memory cell.

## INPUT/OUTPUT CONTROL

The I/O control links up to 64 input and output stations by lines to the central processor, calls the stations, and collects and distributes the input/output data. It also controls the interleaving of data during a data interrupt, senses the status of I/O devices and skips instructions based on this status, traps IOT (input-output-transfer) instructions initiating a program break, and generates real time signal pulses for use by external peripheral equipment.





## CENTRAL PROCESSOR OPTIONS

*Core Memory Module Type 147* extends the memory capacity of the PDP-7 from 4096 words to 8192 words.

*Core Memory Extension Control Type 148* allows the expansion of the PDP-7 memory from 8192 to 32,768 words in increments of either 4096 or 8192 words, using the Type 149 Memory Modules. The Type 148 includes an Extended Program Counter, an Extended Memory Address Register, and an Extend Mode Control.

*Extended Arithmetic Element Type 177* is a standard option for the PDP-7 which facilitates high-speed multiplication, division, shifting, and register manipulation. Installation of the EAE adds an 18-bit register, the Multiplier Quotient Register (MQ) to the computer as well as a 6-bit step counter register. The contents of the MQ register are continuously displayed on the operator's console just below the accumulator indicators.

The Type 177 and the basic computer cycle operate asynchronously, permitting computations to be performed in the minimum possible time. Further, since

the EAE instructions are microcoded, several operations can be performed by one instruction, thus simplifying associated programming. Average multiplication time is 6.1  $\mu\text{sec}$ , average division time is 9.1  $\mu\text{sec}$ .

*Automatic Priority Interrupt Type 172* increases the capacity of the PDP-7 to handle transfers of information to and from input/output devices. The 172 identifies an interrupting device directly, without the need for flag searching. Multi-level interrupts are permissible where a device of higher priority supersedes an interrupt already in process. These functions increase the speed of the input/output system and simplify the programming. More and faster devices can therefore be serviced efficiently.

The Type 172 contains 16 automatic interrupt channels arranged in a priority chain so that channel 0 has the highest priority and channel 17 has the lowest priority. The priority chain guarantees that if two or more in-out devices request an interrupt concurrently, the system grants the interrupt to the device with the highest priority. The other interrupts will be serviced afterwards in priority order.



# PROGRAMMING SYSTEM

The PDP-7 Programming System includes an advanced FORTRAN Compiler, a Symbolic Assembler, Editor, DDT Debugging System, Maintenance routines and a library of arithmetic, utility and programming aids developed on the program-compatible PDP-4. Both the Editor and DDT are designed to allow symbolic debugging and computer-aided editing to replace the tedious manual equivalent. New and updated programs are being developed continuously in the applied programming department.

*Symbolic Assembler* lets the programmer code instructions in a symbolic language. The assembler used on the PDP-7 allows mnemonic symbols to be used for instruction codes and addresses. Constant and variable storage registers can be automatically assigned. The assembler produces a binary object tape and lists a symbol table with memory allocations and useful diagnostic messages.

*Digital Debugging Tape (DDT)* speeds program debugging by communicating with the user in the address symbols of the source language program. Program debugging time is further shortened when using DDT because program execution and modification are controlled from the teleprinter keyboard. For example, to branch to a new location in the program it is only necessary to type the symbolic location name on the keyboard followed by the character, single quote ('). The same symbol followed by the character, slash (/), causes the contents of that location to be typed. By using DDT to insert break points in a program, the programmer can make corrections or insert patches and try them out immediately. Working corrections can be punched out on the spot in the form of loadable patch tapes, eliminating the necessity of creating new symbolic tapes and reassembling each time an error is found.

*Symbolic Editor* permits the editing of source language programs by adding or deleting lines of text. All modification, reading, punching, etc., is controlled by symbols typed at the keyboard. The editor reads parts or all of a symbolic tape into memory where it is available for immediate examination, correction, and relisting.

*FORTRAN Compiler* used with the PDP-7 is based on the field-proven FORTRAN II used with PDP-4 and is designed for programming flexibility and operating efficiency. FORTRAN permits the PDP-7 user with little knowledge of the computer's organization and machine language to write effective programs. Programs are written in a language of familiar English words and mathematical symbols. Compilation of the original FORTRAN source program is performed separately from the compilation of associated subroutines.

Thus when errors in FORTRAN coding are detected by the compiler diagnostic, only the erroneous program need be recompiled. *PDP-FORTRAN* features include the following:

#### *FIXED POINT CONSTANTS:*

1-6 decimal digits absolute value  $\leq 131,071$

#### *FLOATING POINT CONSTANTS:*

10 decimal digits precision. Exponent range  $2^{17}-1$  to  $-2^{17}-1$ .

#### *SUBSCRIPTS:*

Any arithmetic expression representing an integer quantity: Variables in a subscript may themselves be subscripted to any depth. N dimensional arrays are permitted.

#### *STATEMENTS:*

Mixed expressions containing both fixed and floating point variables are permitted. A maximum of 300 characters are allowed (statement numbers not counted).

#### *STATEMENT NUMBERS:*

1-99999





### FUNCTIONS AND SUBROUTINES:

Subroutines not contained in the FORTRAN library may be compiled by the use of Function and Subroutine statements. Functions and subroutines may be fixed or floating point values as defined by initial letter of F-type function convention. Arguments may be arbitrary arithmetic expressions, including functions.

### INPUT AND OUTPUT:

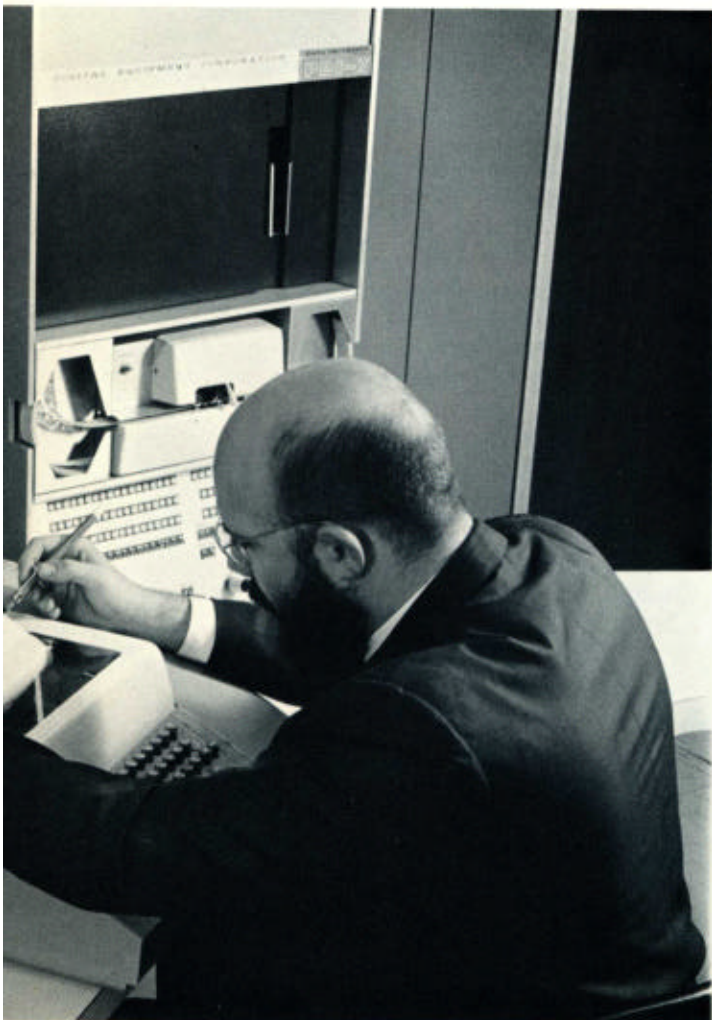
DECTape (Digital's Microtape system), magnetic tape, paper tape, teletype, display. Format may be specified by use of a FORMAT statement.

### STATEMENTS AVAILABLE:

Arithmetic statements, I/O statements with FORMAT, DO, Dimension, Common, IF, GOTO, Assign, Continue, Call, Subroutine, Function, Return.

### TYPE DECLARATIONS:

Variables may be declared as real, integer, and FORTRAN. Variable names are 1-6 alphanumeric characters.



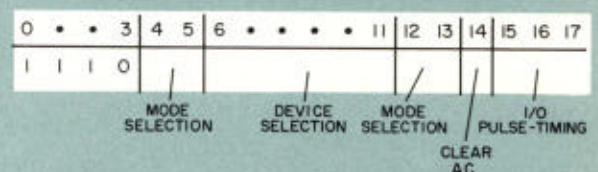
## INSTRUCTIONS

*Memory Reference Instructions* include arithmetic, logical, data handling, and program control instructions. A memory address (bits 5-17) is specified as part of a memory reference instruction. The contents of this memory address are used by the processor in executing the instruction. Bits 0-3 contain the instruction code and bit 4 signifies that the address is to be indirect. Most memory reference instructions require two computer cycles (3.5 microseconds). The first cycle fetches the instruction itself. The second cycle fetches the data addressed and executes the instruction. All memory reference instructions can be executed indirectly.

*Operate Class Instructions* are microcoded instructions used to shift, skip, and complement. Bits 5-17 specify which operation the processor is to perform when executing the instruction. Each bit location represents a unique operation. For example, a 1 in bit location 5 is the code to clear the accumulator during the execution of the operate instruction. A number of different operations can be performed simultaneously by coding (selecting) several bits in the same instruction.

*The Law Instruction* loads itself into the accumulator. It provides a means of loading a negative constant without the need of a memory reference to get a stored constant. Two common uses of law are setting up word counts in mag tape transfers and presetting the clock.

*IOT (input/output & transfer) Instructions* enable the PDP-7 to communicate with external devices, sending control information and transferring data. Certain central processor commands, such as the clock instructions, are also in the IOT class. The IOT instruction is microcoded to simplify programming for I/O transfers. For example, clearing the AC and loading a device buffer are done in one instruction. The ten bits used for device and mode selection provide 1024 possibilities. The format of the instruction is as follows:





## MEMORY REFERENCE INSTRUCTIONS

MNEMONIC	OPERATION
cal Y	call subroutine. Y is ignored
jms 20	if bit 4 = 0, jms i 20 if bit 4 = 1.
dac Y	deposit AC. $C(AC) = > C(Y)$
jms Y	jump to subroutine. $C(PC) = > C(Y_{17})$ , $C(L) = > C(Y_0)$ , $Y + 1 = > C(PC)$
dzm Y	deposit zero in memory. $0 = > C(Y)$
lac Y	load AC. $C(Y) = > C(AC)$
xor Y	exclusive OR. $C(AC) \vee C(Y) = > C(AC)$
add Y	add (1's complement). $C(AC) + C(Y) = > C(AC)$
tad Y	2's complement add. $C(AC) + C(Y) = > C(AC)$
xct Y	execute.
isz Y	index and skip if 0. $C(Y) + 1 = > C(Y)$ , if $C(Y) + 1 = 0$ , then $C(PC) + 1 = > C(PC)$
and Y	AND. $C(AC) \wedge C(Y) = > C(AC)$
sad Y	skip if AC and Y differ. If $C(AC) \neq C(Y)$ , then $C(PC) + 1 = > C(PC)$
jmp Y	jump. $Y = > C(PC)$

## OPERATE INSTRUCTIONS

MNEMONIC	OPERATION
opr	operate
nop	no operation
cma	complement, $\overline{C(AC)} = > C(AC)$
cml	complement link, $\overline{C(L)} = > C(L)$
oas	inclusive OR AC switches $C(ACS) \vee C(AC) = > C(AC)$
las	load AC from switches $C(ACS) = > C(AC)$
ral	rotate AC + link left one place $C(AC_j) = > C(AC_{j-1})$ , $C(L) = > C(AC_{17})$ , $C(AC_0) = > C(L)$
rcl	clear link, then ral. $0 = > C(L)$ , then ral
rtl	rotate AC left twice. Same as two ral instructions
rar	rotate AC + link right one place. $C(AC_j) = > C(AC_{j+1})$ , $C(L) = > C(AC_0)$ , $C(AC_{17}) = > C(L)$
rcr	clear link, then rar. $0 = > C(L)$ , then rar
rtr	rotate AC right twice. Same as two rar instructions
hit	halt. $0 = > RUN$
sza	skip on zero AC. Skip if $C(AC) =$ positive zero
sna	skip on non-zero AC. Skip if $C(AC) \neq$ positive zero
spa	skip on positive AC. Skip if $C(AC_0) = 0$
sma	skip on negative AC. Skip if $C(AC_0) = 1$
szl	skip on zero link. Skip if $C(L) = 0$
snl	skip on non-zero link. Skip if $C(L) = 1$
skp	skip, unconditional. Always skip
cli	clear link. $0 = > C(L)$
stl	set the link. $1 = > L$
cla	clear AC. $0 = > C(AC)$
clc	clear and complement AC. $\sim 0 = > C(AC)$
glk	get link. $0 = > C(AC)$ , $C(L) = > C(AC_{17})$
law N	load AC with law N, where N equals a constant. $law\ N = > C(AC)$

## EAE INSTRUCTIONS

MNEMONIC	OPERATION
eae	basic EAE command — no operation
lrs	long right shift
lrss	long right shift, signed
lls	long left shift

## MNEMONIC

## OPERATION

lls	long left shift, signed
als	accumulator left shift
alss	accumulator left shift, signed
norm	normalize: max. shift is 44
norms	normalize, signed
mul	multiply unsigned
mul	multiply signed
div	divide C(AC and MQ) as a 36-bit unsigned number
divs	divide C(AC and MQ) as a 34-bit 1's complement signed number
idiv	integer divide unsigned
idivs	integer divide, signed
frdiv	fraction divide unsigned
frdivs	fraction divide, signed
lacq	replace the C(AC) with the C(MQ)
lacs	replace the C(AC) with the C(SC)
clq	clear MQ
abs	place absolute value of AC in the AC
gsm	place AC sign in link and take absolute value of AC
osc	inclusive OR the SC into the AC
omq	inclusive OR AC with MQ and place results in AC
cmq	complement the MQ

## PRIORITY INTERRUPT INSTRUCTIONS

MNEMONIC	OPERATION
cac	clear and reset all channels
asc	enable selected channel(s)
dsc	disable selected channel(s)
epi	enable automatic priority interrupt system
dpi	disable automatic priority interrupt system
isc	initiate break on selected channel (for maintenance purposes)
dbr	debreak . . . Returns highest priority channel to receptive state

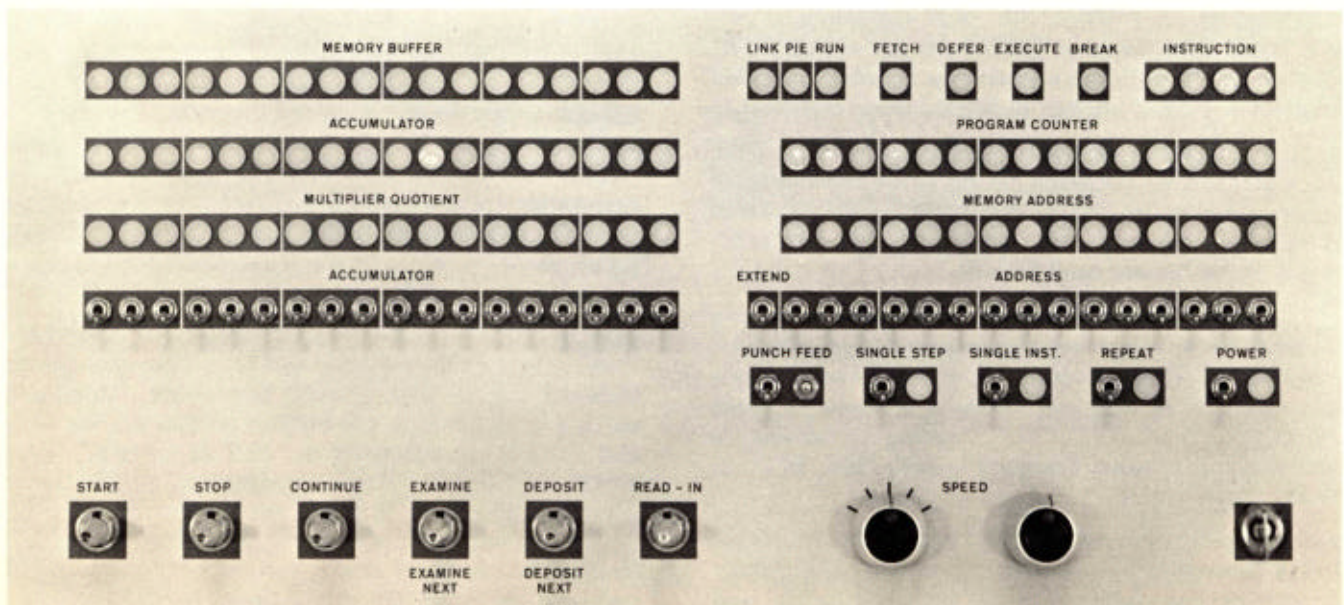
## IOT INSTRUCTIONS

MNEMONIC	OPERATION
Program Interrupt	
iof	turn off interrupt
ion	turn on interrupt
ton	turn on trap, also turns on program interrupt
IO Equipment	
iors	read status of io equipment
Clock	
clsf	skip if clock flag is 1
clof	turn off clock, clear clock flag
clon	turn on clock, clear clock flag
Paper Tape Reader	
rsf	skip if reader flag is a 1
rsa	select reader for alphanumeric, clear reader flag
rsb	select reader for binary, clear reader flag
rrb	read the reader buffer into AC, clear reader flag
Paper Tape Punch	
psf	skip if punch flag is a 1
pls	load punch buffer and select punch, clear punch flag
pcf	clear punch flag
Keyboard Input from Teleprinter	
ksf	skip if keyboard flag is a 1
krb	read the keyboard buffer into the AC, clear keyboard flag



MNEMONIC	OPERATION
<b>Teleprinter</b>	
tsf	skip if teleprinter flag is a 1
tls	load teleprinter buffer and select, clear teleprinter flag
tcf	clear the teleprinter flag
<b>DECTape 551</b>	
mmrd	Read. Transfers one word from mmiob to the AC
mmwr	Write. Transfers one word from the AC to mmiob
mmse	Select. Connects the unit designated to the DECTape control
mmic	Load Control. Sets the DECTape control to the proper mode and direction
mmrs	Read Status. Reads the DECTape status conditions into bits 0-8 of the AC
mmdf	skip on DECTape data flag
mmbf	skip on DECTape block end flag
mmef	skip on DECTape error flag
<b>Tape Control 57A</b>	
mscr	skip if the tape control ready (TCR) level is 1
mcd	disable the TCR flag from the program interrupt and clear command register
mts	disable the TCR flag from the program interrupt, turn off the WCO flag and EOR flag, and select the unit, the mode of parity, and the density from the AC
msur	skip if the tape transport is ready (TTR)
mtc	place AC bits 9-12 in the tape control command register and start tape motion
mnc	terminate the continuous mode (the AC is cleared)
mswf	skip if the WCO flag is a 1
mdwf	disable WCO flag
mcwf	clear WCO flag
mewf	enable WCO flag
miwf	initialize WCO flag
mrc	switch mode from read compare to read
mrđ	switch mode from read to read compare
msef	skip if the EOR flag is a 1

MNEMONIC	OPERATION
mdef	disable ERF
mcef	clear ERF
meef	enable ERF
mief	initialize ERF, clear and enable
mtrs	read tape status bits into the AC
mcc	clear CA and WC
mca	transfer AC bits 5-17 to CA and clear CA and WC
mwc	transfer AC bits 5-17 to WC
mrca	transfer CA bits 5-17 to AC bits 5-17
<b>Display 340</b>	
dse	skip if edge is encountered
dsi	skip on stop interrupt
dsp	skip on light pen interrupt
dra	read display address
drs	clear the light pen flag, restart display
dla	load display address, start display
drc	read x and y registers
dcf	clear all flags
<b>Card Reader 421</b>	
crsf	skip if reader character flag is a 1
crsa	select card reader for alphanumeric
crsb	select card reader for binary
crrb	read card column buffer into AC
<b>Card Punch 40</b>	
cpsf	skip if the card punch flag is a 1
cpse	select a card, set card punch flag
cplr	load row buffer, clear punch flag
cpcf	clear punch flag
<b>Line Printer 647</b>	
lpsf	skip if printing flag is a 1
lpcf	clear printing flag
lpld	load the printing buffer
lpse	select printing, clear printing flag
lssf	skip if spacing flag is a 1
lscf	clear spacing flag
lsls	load spacing buffer and select spacing, clear spacing flag





## INPUT-OUTPUT OPTIONS

**BLOCK TRANSFER DRUM SYSTEM TYPE 24** Drum transfers operate through the computer's data interrupt facility permitting interlaced program and drum transfer operation. Storage capacities of 32,768 words, 65,536 words, or 131,072 words are available.

**PRECISION CRT DISPLAY TYPE 30D** Plots data point by point on a 16-inch cathode ray tube in a raster  $9\frac{3}{8}$  inches square having 1024 points on a side. Separately variable 10-bit X and Y coordinates. Includes program intensity control. Plotting rate is 35 microseconds per point.

**PRECISION INCREMENTAL CRT DISPLAY TYPE 340** Plots points, lines, vectors, and characters on a raster identical to the 30D. Plotting rate is  $1\frac{1}{2}$  microseconds per point in vector, increment, and character modes. Random point plotting is 35 microseconds.

**HIGH SPEED LIGHT PEN TYPE 370** Uses fiber optic light pipe and photomultiplier system for fast detection and modification of information displayed on the precision CRT display.

**OSCILLOSCOPE DISPLAY TYPE 34** Controls the plotting of data point by point on an X-Y plotting scope such as the Tektronix Model RM 503. Raster size is 1024 x 1024 points.

**INCREMENTAL PLOTTER AND CONTROL TYPE 350** Performs high resolution plotting on paper 12 or 31 inches wide at rates of 12,000 or 18,000 points per minute. Plotting increments are 0.005 and 0.01 inch.

**CARD READER AND CONTROL TYPE 421A, B** Provides on-line reading of standard punched cards at 200 or 800 cards a minute in alphanumeric or binary codes.

**CARD PUNCH CONTROL TYPE 40** Controls 100 or 300 card-per-minute IBM 523 Summary Punch. Buffer holds one 80-bit row.

**AUTOMATIC LINE PRINTER AND CONTROL TYPE 647** Prints 300, 600, or 1000 lines per minute, 120 columns per line, 64 characters per column. Includes single line 120 character buffer.

**DATA COMMUNICATION SYSTEM TYPE 630** Provides a real-time interface for up to 64 remote typewriter stations for on-line inputs and outputs. Used in message switching, data collecting, and data processing in multi-user applications.

**AUTOMATIC MAGNETIC TAPE CONTROL TYPE 57A** Controls up to eight tape transports automatically. Provides information transfer through computer's data interrupt facility, permitting interlaced program and tape operation. Controls reading or writing of tape at various rates compatible with IBM, BCD, or binary parity modes.

**MAGNETIC TAPE TRANSPORT TYPE 570** Tape motion is controlled by pneumatic capstans and brakes, eliminating conventional pinch rollers, clamps, and

mechanical arms. Tape speed is either 75 or 112.5 inches per second. Track density, program-selectable, is 200, 556, and 800 bits per inch. Tape width is one-half inch, with six data tracks and one parity track. Format is IBM compatible. Dual heads permit read-checking while writing.

**MAGNETIC TAPE TRANSPORT TYPE 50** Reads and writes IBM-compatible magnetic tape at transfer rates of 15,000 or 41,700 cps, and 200 or 556 cpi.

**DECTAPE DUAL TRANSPORT TYPE 555** A fixed address magnetic tape facility for high speed loading, readout, and on-line program debugging. Read, write, and search speed is 80 inches a second. Density is 375 bits an inch. The two logically independent transports have a storage capacity of 3 million bits each. Features phase recording, rather than amplitude recording; redundant, nonadjacent data tracks; and a prerecorded timing and mark track.

**DECTAPE CONTROL TYPE 550** Controls up to four Type 555 Dual DECTAPE Transports. Searches in either direction for specified block numbers, then reads or writes data. Units as small as a single word may be addressed.

**18-BIT OUTPUT RELAY BUFFER TYPE 140** 18 spdt relays actuated by computer command for use to directly control or signal external equipment.

**DATA INTERRUPT MULTIPLEXER TYPE 173** Provides multiplex control for simultaneous operation of three high-speed devices such as the Type 57A Tape Control or the Type 24 Drum. Maximum combined transfer rate is 570,000 18-bit words per second.

**ANALOG-TO-DIGITAL CONVERTER TYPE 138** Transforms an analog voltage to a binary number, selectable from 6 to 11 bits. Conversion time varies, depending on the number of bits and the accuracy required. Twenty-one combinations of switching point accuracy and number of bits can be selected on the front panel.

**MULTIPLEXED ANALOG-TO-DIGITAL CONVERTER TYPE 138/139** The Type 139 Multiplexer Control permits up to 64 channels of analog information to be applied singly to the input of the Type 138 Analog-to-Digital Converter. Channels can be selected in sequence or by individual addresses.

**HIGH-SPEED ANALOG-TO-DIGITAL CONVERTER TYPE 142** Transforms an analog voltage to a single, 10-bit binary number in 6 microseconds. Conversion accuracy is  $\pm 0.15\% \pm \frac{1}{2}$  least significant bit.

**ANALOG-DIGITAL-ANALOG CONVERTER SYSTEM TYPE ADA-1** Performs fast, real-time data conversion between digital and analog computers. Maximum sample rate for D/A conversion is 200 kc; for A/D and interlaced conversions, 100 kc. Digital word length is 10 bits. Actual conversion times are 5 microseconds for A/D and 2 microseconds for D/A. Semiautomatic features enable the converter system to perform many of the functions that a computer normally performs for other converter interfaces.





The basic PDP-7 can be easily expanded using the many standard options available. Shown in the above configuration are DECTape transports and control unit along with a high speed graphic and character display Type 340 (2 right-hand cabinets). Such a

system has applications in automated electrical and mechanical drafting, stress analysis, and analog data display. DECTape mass storage provides a medium for load-and-go FORTRAN.



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