

August 29, 1967

PRELIMINARY DESCRIPTION OF THE DISPLAY PROCESSOR

by William Weiher

ABSTRACT: This is a preliminary description of the display processor. It describes the programming of the display processor and its interface to the PDP-6. It does not describe the use of the display from the time-sharing system.

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1. DISPLAY INSTRUCTIONS

Test, Set and Skip

0	7	8	15	16	23	31	32	34	35
Reset		Set		Test		I	101		∅

A skip condition is generated if any of the eight flags is on and the corresponding bit in the TEST field is on. If the exclusive or if the skip condition and bit 31 is true, the next instruction is skipped. The flags are then set or reset according to the set and reset field. If both a set and reset bit are on, the corresponding flag is complemented. The flags are as follows:

BITS	FLAG
0,8,16	Control bit. This bit may be set, reset, and tested but has no other meaning to the processor.
1,9,17	Light pen flag. Bit is set if the light pen is seen.
2,10,18	Edge overflow flag. Bit is set if the beam is ever positioned off screen by any means.
3,11,19	Wrap-around flag. Bit is set if overflow occurs in incremental vector mode.
4,12,20	Not running mask. If this bit is on, the processor will interrupt if a halt is executed.
5,13,21	Light pen mask. If this bit is on, the processor will interrupt if the light pen is seen.

6,14,22 Edge overflow mask. If this bit is on, the processor will interrupt if the edge overflow flag comes on.

7,15,23 Wrap-around mask. If this bit is on, the processor will interrupt if wrap-around occurs.

Long Vector Word

0	10	11	21	22	24	25	27	28	29	30	31	32	34	35
X	Y		BRT		SIZE				M	T	ø11		ø	

The long vector word draws one vector with mode, type, and brightness as specified by the M, T, and BRT fields respectively. A 0 in the BRT field indicates no change in brightness. 1 is the dimmest intensity and 7 the brightest. The brightness affects all vectors and characters until reset by another long vector word.

Mode- 0 indicates relative mode and 1 absolute. In absolute mode, the new position is given by the X and Y components taken relative to the center of the screen. In relative mode the components are added to the current position to give the new position.

Type-

0-visible

1-end point

2-invisible

3-undefined--currently end point

A visible vector is drawn from the current position to the new position; the invisible vector moves the beam to the new position without displaying; the end point vector moves the beam to the new position and then displays a point.

1. The first part of the document is a letter from the author to the editor, dated 10/10/1954. The letter discusses the author's interest in the subject of the journal and the possibility of publishing a paper on the topic.

2. The second part of the document is a letter from the editor to the author, dated 10/15/1954. The editor expresses interest in the author's work and suggests that the author submit a paper for consideration.

3. The third part of the document is a letter from the author to the editor, dated 10/20/1954. The author responds to the editor's letter and expresses interest in the editor's suggestions.

4. The fourth part of the document is a letter from the editor to the author, dated 10/25/1954. The editor expresses interest in the author's work and suggests that the author submit a paper for consideration.

5. The fifth part of the document is a letter from the author to the editor, dated 10/30/1954. The author responds to the editor's letter and expresses interest in the editor's suggestions.

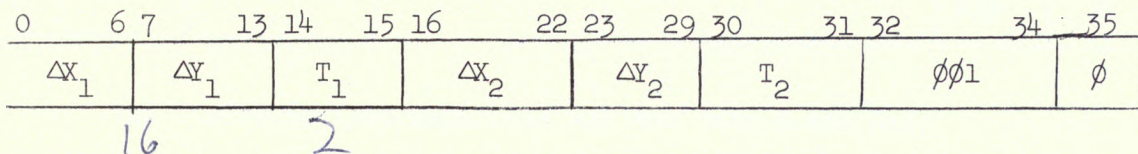
6. The sixth part of the document is a letter from the editor to the author, dated 11/5/1954. The editor expresses interest in the author's work and suggests that the author submit a paper for consideration.

7. The seventh part of the document is a letter from the author to the editor, dated 11/10/1954. The author responds to the editor's letter and expresses interest in the editor's suggestions.

The size fields sets the character size. The selected size is used for all characters until reset by another long vector word. The sizes are:

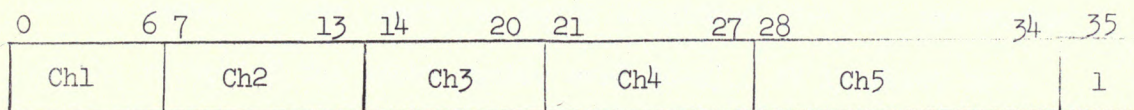
		Characters/line	Lines/screen
0	no change		
1	smallest	128	64
2		96	48
3		64	32
4		48	24
5		32	16
6		24	12
7	largest	16	8

Short Vector Word



The short vector word always draws two vectors in relative mode. The type of each vector is specified by the corresponding T field. The high order bits of the ΔX and ΔY fields are spread left to give 11-bit quantities.

Character Word



The characters are displayed in order from left to right with automatic spacing. All characters are displayed as printed on the line printer with the following exceptions:

CODE	PRINTS AS
011	ignored
013	↓
014	±
177	\

THE UNIVERSITY OF CHICAGO
DEPARTMENT OF CHEMISTRY

DATE	INITIALS	REMARKS
1/15
1/16
1/17
1/18
1/19
1/20
1/21
1/22
1/23
1/24
1/25

EXPERIMENTAL PROCEDURE

The following procedure was used for the synthesis of the compound...

The reaction mixture was stirred at room temperature for 24 hours...

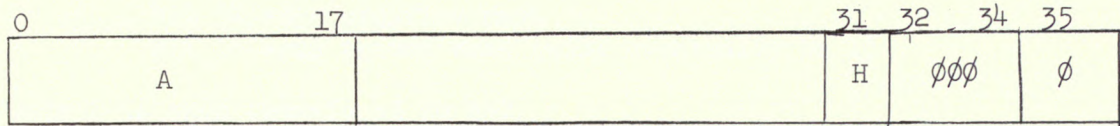
ANALYSIS

Elemental analysis for C₁₀H₁₀O₂ (170.19): Calcd. C, 76.61%; H, 5.94%; O, 17.45%.

The compound was purified by distillation and its boiling point was found to be 170-172°C at 1 mm Hg.

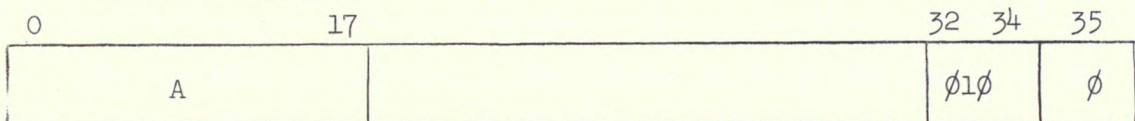
IR (KBr): 1715 (C=O), 1640 (C=C), 1610 (C=C), 1580 (C=C), 1540 (C=C), 1490 (C=C), 1450 (C=C), 1410 (C=C), 1370 (C=C), 1330 (C=C), 1290 (C=C), 1250 (C=C), 1210 (C=C), 1170 (C=C), 1130 (C=C), 1090 (C=C), 1050 (C=C), 1010 (C=C), 970 (C=C), 930 (C=C), 890 (C=C), 850 (C=C), 810 (C=C), 770 (C=C), 730 (C=C), 690 (C=C), 650 (C=C), 610 (C=C), 570 (C=C), 530 (C=C), 490 (C=C), 450 (C=C), 410 (C=C), 370 (C=C), 330 (C=C), 290 (C=C), 250 (C=C), 210 (C=C), 170 (C=C), 130 (C=C).

Jump or Halt

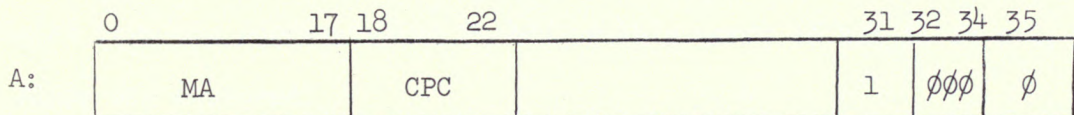


If H = 1, control is transferred to location A. If H = 0, the processor stops with the MA pointing to the location following the HALT.

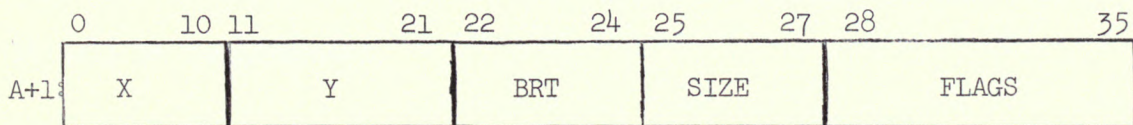
Jump to Subroutine



The following information is written into A and A+1:



CPC: The contents of the CPC buffer register. This register is loaded whenever the processor discovers an interrupt condition while processing a character word or short vector word. It is set to the number of the character being displayed (0-4) or the number of the vector of the short vector word (0-1). It is reset by a CONO 430, with the clear flags bit.



The following are the flag bits:

- bit 28-control bit
- bit 29-light pen flag
- bit 30-edge overflow flag
- bit 31-wrap around flag

--	--	--	--	--

The following table shows the results of the experiment. The data is presented in a clear and concise manner, allowing for easy comparison of the different conditions.

--	--	--	--	--

The results of the experiment are summarized in the table below. The data shows that the different conditions have a significant impact on the outcome of the experiment.

--	--	--	--	--

The data presented in the table above indicates that the different conditions have a significant impact on the outcome of the experiment. The results are consistent across the different trials.

The following table shows the results of the experiment. The data is presented in a clear and concise manner, allowing for easy comparison of the different conditions.

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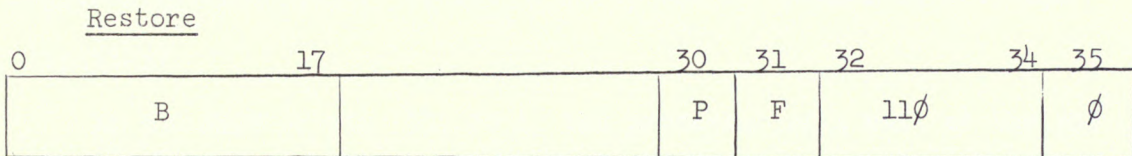
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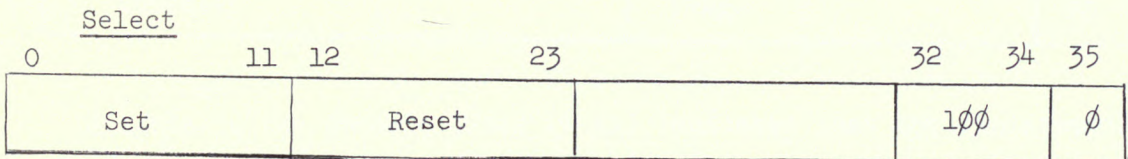
bit 32-not running mask (will be wrap around mask)
 bit 33-light pen mask
 bit 34-edge overflow mask
 bit 35-wrap around mask (will eventually be 1)

Control is then transferred to A+2.

Note that A is in the form of a jump instruction. This permits subroutine exit to be done by jumping to A.

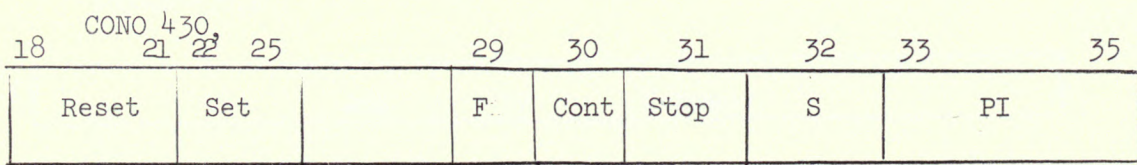


The contents of location B are assumed to be in the format of the word stored in location A+1 by a Jump to subroutine. If bit 30 is a 1, the X and Y position registers and the size and brightness registers are reloaded from the corresponding fields of this word; if bit 31 is a 1, the flags are restored.



If any of bits 0-11 are 1, the corresponding consoles are selected. If any of bits 12-23 are 1, the consoles are deselected. If both the select and deselect bits are on the state of selection of that console it will be complemented.

2. PDP-6 CONTROL OF DISPLAY PROCESSOR



1. The first part of the document discusses the importance of maintaining accurate records of all transactions.

2. It is essential to ensure that all entries are supported by appropriate documentation and receipts.

3. Regular audits should be conducted to verify the accuracy of the records and to identify any discrepancies.

4. The second part of the document outlines the procedures for handling cash and credit transactions.

5. All cash receipts should be recorded immediately and deposited in a secure bank account.

6. Credit sales should be recorded on an accrual basis, and accounts receivable should be monitored closely.

7. The third part of the document provides a detailed breakdown of the company's expenses.

8. These expenses are categorized into operating expenses, depreciation, and interest on loans.

9. The fourth part of the document contains a summary of the company's financial performance for the period.

10. This summary includes the profit and loss statement, the balance sheet, and the cash flow statement.

11. The fifth part of the document discusses the company's future financial outlook and projections.

12. These projections are based on current market conditions and the company's strategic plan.

13. The sixth part of the document provides a list of references and sources used in the preparation of this report.

14. Finally, the seventh part of the document contains the conclusions and recommendations of the audit.

15. The audit concludes that the company's financial records are accurate and reliable.

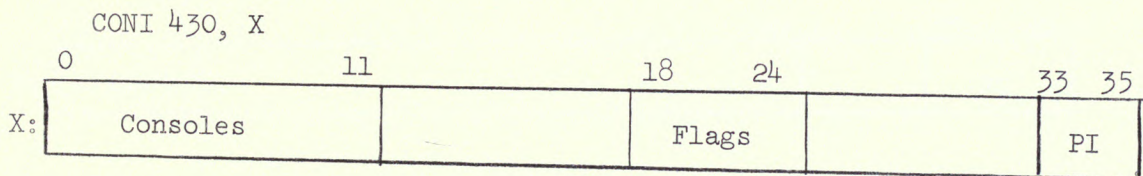
16. It is recommended that the company continue to maintain high standards of financial reporting.

17. The audit was conducted in accordance with the standards of the Institute of Chartered Accountants.

The not running (18,22), edge overflow (19,23), wrap-around (20,24), and light pen (21,25) mask bits are set and/or reset as indicated by the bits of the set and reset fields. If both set and reset bits are on, the mask bits are complemented. If bit 29 is a 1 the edge overflow, datao ink, wrap-around, the light pen flags are cleared. The CPC buffer register is also reset. If bit 32 is 0, the PI channel is set from bits 33-35.

If the STOP DP bit (31) is 1, the processor will halt at the end of the current instruction. (This will cause an interrupt if the not running mask is set.)

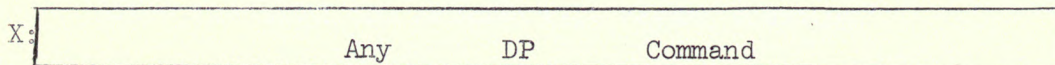
If the CONT DP bit is on (30), the processor will begin executing instructions at the location indicated by its MA.



A 1 bit in the console field (0-11) indicates that the corresponding console is selected. The flags in bits 18-24 are:

- 18-Not running. Processor is halted
- 19-Edge overflow flag
- 20-Wrap-around flag
- 21-Light pen flag
- 22-Control bit
- 23-DATAO INK. PDP-6 gave a DATAO to the processor while it was running.
- 24-Interrupt condition. The processor has requested an interrupt.

DATAO 430, X



1. The first part of the document is a list of names and addresses.

2. The second part of the document is a list of names and addresses.

3. The third part of the document is a list of names and addresses.

4. The fourth part of the document is a list of names and addresses.

5. The fifth part of the document is a list of names and addresses.

6. The sixth part of the document is a list of names and addresses.

7. The seventh part of the document is a list of names and addresses.

8. The eighth part of the document is a list of names and addresses.

9. The ninth part of the document is a list of names and addresses.

10. The tenth part of the document is a list of names and addresses.

11. The eleventh part of the document is a list of names and addresses.

12. The twelfth part of the document is a list of names and addresses.

13. The thirteenth part of the document is a list of names and addresses.

14. The fourteenth part of the document is a list of names and addresses.

15. The fifteenth part of the document is a list of names and addresses.

16. The sixteenth part of the document is a list of names and addresses.

17. The seventeenth part of the document is a list of names and addresses.

18. The eighteenth part of the document is a list of names and addresses.

19. The nineteenth part of the document is a list of names and addresses.

20. The twentieth part of the document is a list of names and addresses.

21. The twenty-first part of the document is a list of names and addresses.

22. The twenty-second part of the document is a list of names and addresses.

23. The twenty-third part of the document is a list of names and addresses.

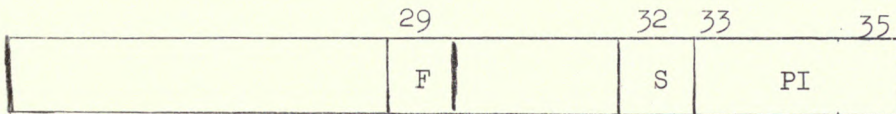
24. The twenty-fourth part of the document is a list of names and addresses.

25. The twenty-fifth part of the document is a list of names and addresses.

The Halt mask is turned off, the indicated instruction executed, and the processor halted. This may set the DATAO INK flag.

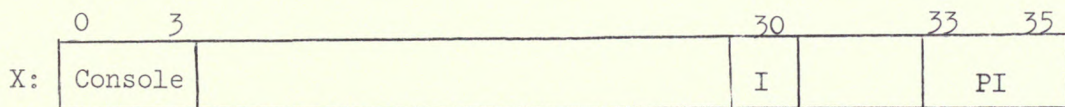
3. KEYBOARD SCANNER

CONO 434,



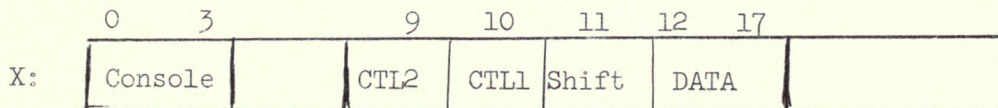
If Bit 32 is a 1, the PI channel will be loaded from bits 33-35. If bit 29 is a 1, the scanner flags will be cleared allowing it to continue scanning.

CONI 434,X



If bit 30 is a 1, the keyboard is waiting for interrupt service. "Console" is the number of the console at which the scanner is looking. The scanner is not released by execution of the CONI. A DATAI must be executed before the scanner will continue after a key has been typed.

DATAI 434,X



After the DATAI the scanner will resume scanning.

1950

1951

1952

1953

1954

1955

1956

1957

1958

1959

1960

1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
------	------	------	------	------	------	------	------	------	------

1971