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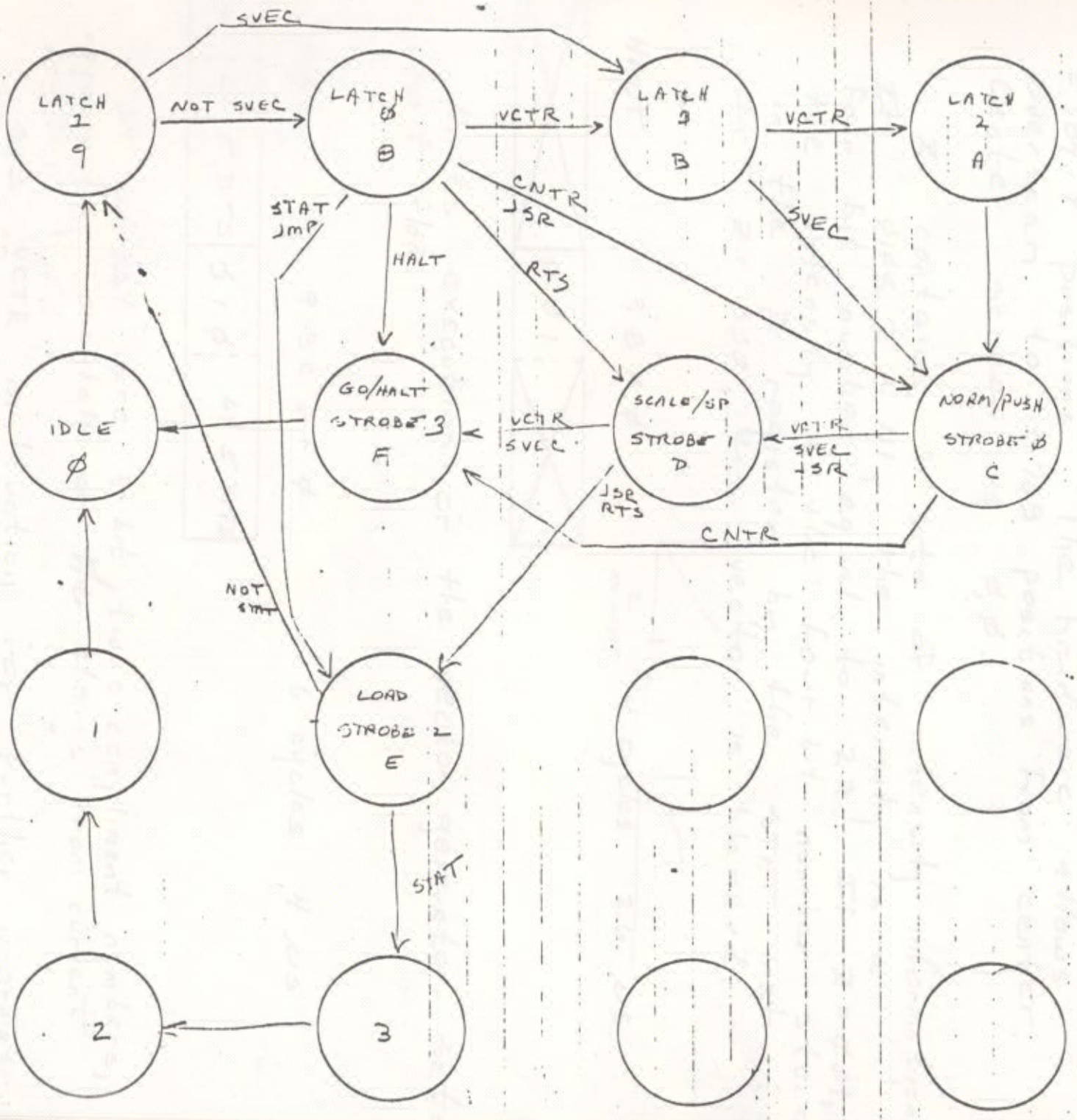
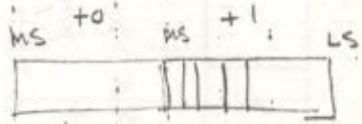
A V G

OCTOBER'80

Confidential





	BYTES
0 0 0 X VCTR	4
0 0 1 X HALT	2
0 1 0 X SVEC	
0 1 1 0 STAT	
0 1 1 1 SCAL	
1 0 0 X CENTER	
1 0 1 X JSR	
1 1 0 X RTS	
1 1 1 X JMP	

Analog Vector Generator

Terry 9/3/82

MORGAN

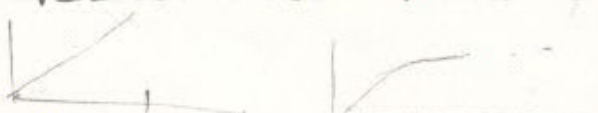
VCTR 9 8 B A C D F Ø 8 cycles 5.3 μS

ΔY 8 LSBs	Ø Ø Ø ΔY 5 MSBs	ΔX 8 LSBs	Z ΔX 5 MSBs

2's comp.

ΔX and ΔY are 13 bit two's compliment numbers representing the change from current location. The screen contains ±512 X positions and ±384 Y positions. The hardware allows overscan to ±768 positions from center. Center screen is Ø, Ø.

Z contains 3 bits of intensity information. If Ø1Ø ≤ Z ≤ 111, the intensity is a four bit number equal to 2Z. If Z = ØØ1, the intensity is the four bit number stored in the Z register by the STAT instruction. If Z = ØØØ, the vector is blanked.



HALT 9 B F Ø 4 cycles 2.6 μS

XXXXXXXXXXXX	Ø Ø 1 XXXXXXXXXXXX

Halts execution of the vector generator. Sets halt flag.

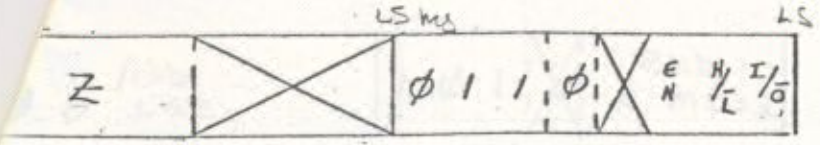
SVEC 9 B C D F Ø 6 cycles 4 μS

Z	ΔX 5 BITS	Ø 1 Ø	ΔY 5 BITS

ΔX and ΔY are 5 bit two's compliment numbers, representing one-half of the change from current location.

See VCTR instruction for further information.

STAT 98E3210 7 cycles 4.6 μs

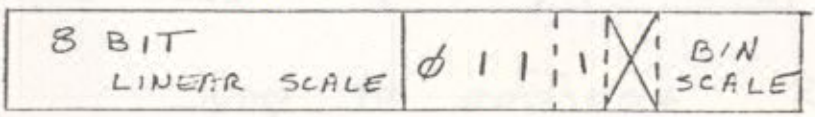


0 LOADS Z REG
1 SETS WINDOW.

Z is a 4 bit number which is stored in the intensity register. This value is used for the vector intensity whenever the 3 bit Z code in a VCTR or SVEC instruction is ØØ1. All 16 codes are permissible

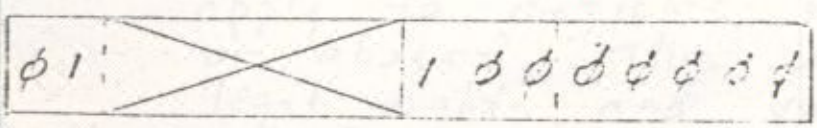
EN, when set to 1, loads the window circuit. This circuit blanks vectors either within the window ($I/\bar{O}=1$) or outside ($I/\bar{O}=Ø$). H/L determines whether the current location is the upper bound or the lower bound. A complete window is defined by using the instruction twice. Since the limits are stored in an analog manner, the values should be refreshed at least one per frame.

SCAL 98E 3 cycles 2 μs



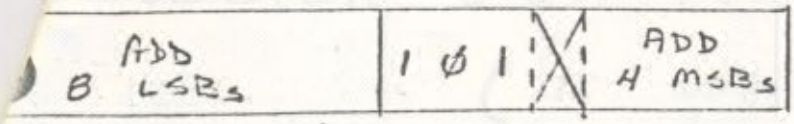
BIN SCALE is a 3 bit number, B, which multiplies all lengths by 2^{-B}. LINEAR SCALE is an 8 bit number, L, which multiplies all lengths by $1 - L/2^8$; i.e. ØØ is full size, 4Ø is 3/4 size, 8Ø is half size. For optimum display performance, L should not exceed 8Ø.

CNTR 93CFØ 5 cycles + 84.7 μs 88 μs



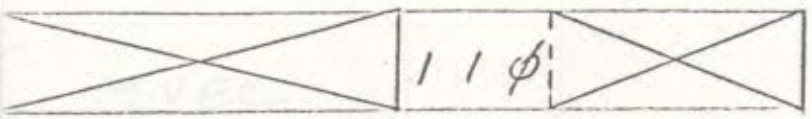
Center beam on screen

JSR 98CDE 5 cycles 3.3 μs



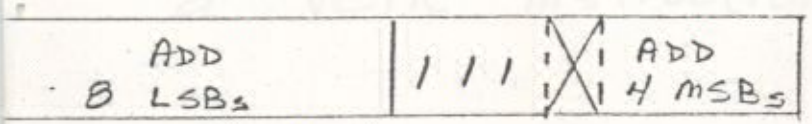
Jump to subroutine at address 2* ADD. The address of the next main-line instruction is save in a four level stack.

RTS 98DE 4 cycles 2.6 μs



Return from subroutine. The address at the top of the stack is moved to the program counter.

JMP 98E 3 cycles 2 μs



Jump to address 2* ADD & continue executing.

NOTE: All information contained herein is subject to change (and no doubt will) at any time, without warning or notice. The engineer warrants that these instructions are real instructions at this time. This warranty is expressed in lieu of all other warranties, expressed or implied, including the implied warranty of fitness for a particular purpose. This warranty shall not apply to articles which have been altered or abused. This warranty gives you specific legal rights, and you may have other rights which vary from state to state.

ADDENDUM & ERRATA TO ANALOG VECTOR GENERATOR INSTRUCTIONS

(I WARNED YOU)

4/29/80

VCTR

The hardware allows overscan to ±1024. It always has — no mods required.

SVEC

A dot ($\Delta X = 0, \Delta Y = 0$) is not allowed. Use either the VCTR instruction ($\Delta X = 0$ $\Delta Y = 0$ is OK) or use a SVEC of length 2. A vector of length 2 is not noticable as anything but a dot. The vector macros will generate a VCTR instruction when $\Delta X = 0, \Delta Y = 0$.

SCAL

Change to read: "BIN SCALE is a 3 bit number, B which multiplies all lengths by 2^{1-B}. This means that a scale factor of 1 is full scale. A scale factor of 0 is double size. A scale factor of 2 is half size, etc.