Whirlwind

1. pqr 00000  select input-output equipment *1
2. b1 x 0010  block input to x *2 *3
3. rd *4 00011  read, one word transferred from *1 to the AC
4. bo x 00100  block output from x *3
5. rc *4 00101  record, one word transferred from the AC to *1
6. sd x 00110  sum digits. AC0 x i goes to AC1 (i is a digit position from 0 to 15 inclusive)#
7. ts x 01000  transfer the AC to storage
8. td x 01001  transfer digits 5-15 of the AC to the same digits in storage
9. ta x 01010  transfer digits 5-15 (addresses) of the AC to the same digits in storage *5
10. ok x 01011  stop on check-register alarm if AC=0
11. sb x 01100  add BR, BR×x goes to AC and x
12. ex x 01101  exchange AC and x
13. cp x 01110  transfer control to conditional program if AC negative
14. sp x 01111  transfer control to sub-program
15. ca x 10000  clear the AC and add x *6
16. cs x 10001  clear the AC and subtract x *6
17. ad x 10100  add x
18. su x 10101  subtract x
19. cm x 10100  clear the AC and add the magnitude of x *6
20. sa x 10101  special add *6a
21. ao x 10110  add one, 1+ x goes to AC and x
22. dm x 10111  difference of magnitudes, AC(-1)x goes to AC
23. mr x 11000  multiply and round off *7
24. mh x 11001  multiply and hold the 30-digit product in AC and BR, combined
25. dv x 11010  divide, store sign of quotient in AC and absolute value in BR
26. slr n 110110  shift left and round AC *7 *8
27. slh n 110111  shift left and hold AC & BR together
28. srr n 111000  shift right and round AC *7
29. srr n 111000  shift right and hold AC & BR together
30. sf x 111011  scale factor (normalize) AC & BR together, store amount of shift in x and AR *9
31. clc n 111100  cycle left and clear (BR after the cycling) AC & BR together
32. clh n 111101  cycle left and hold AC & BR together
33. md x 111111  multiply digits. (see #. function is 2, not 0)

*1 list of pqr values on other side
*2 x means an address in core storage from 0000 to 37778 or 204710
*3 AC holds the number of words to be read or written
*4 address obviously immaterial
*5 the AR always holds the location+1 of the latest successful transfer and thus can be used as a pathfinder
*6 also adds 8×2-15. see *6a
*6a overflow is impossible because it is delivered to the SpecialAddMemory (SAM)
*7 roundoff is equal to 2-15×BR0, after it is accomplished, BR is cleared
*8 n means an amount of shift from 080 to 51110 (7778) interpreted modulo 32
*9 if AC=BR=0, AR=x=33

Notes for other side

1a· AC selects drum address where reading is to begin. only 1 rd or bi after si.
1b· AC selects drum address where recording is to begin. any number rd or bo after si.
1c· only addresses 10,0008 to 37,7778 on the B drum can be used.
2· tape is punched or read as follows: first line=AC0-4, second=AC5-9, third=AC10-15.
1· AC5-6 is what to pri/punch. AC6=T(7-hole wanted). AC7=T(for punch).
6· reading is done into AC10-15.
4· pri/punch from AC0-5.
3· the Y coordinate is in AC0-10. the X coordinates are supplied by any number of rd.

16-bit words including sign binary programming or alpha-numerical processed by compiler

Typical Instructions: si 963 permanently
si address decimal
0 stops the computer
1 stops the computer if "stop on si 1" switch is down
4 home film in oscilloscope camera
64 tape 0 record after finding block mark
65 " " reverse " " "
66 " " read forward
67 " " reverse
68 " " go forward 14.4 ms erasing, back up 14.3 ms, and deselect
69 " " go backward " ms " go"forward" ms, " "
70 " " record forward
71 " " reverse

72 73 74

75 see si 64—71, same thing, tape 1
76 77 78

79

80 81 82

83 see si 64—71, same thing, tape 2
84 85 86

87 88 89

90 see si 64—71, same thing, tape 3a or 3b, whichever is connected
92 93 94

95

96 tape 2, record forward for later output *1
97 tape 3a or 3b, record forward for delayed(later)output *1
98 MechanicalTapeReader, line by line *6
99 " " word by word *2
100 punch, line by line, no 7-hole *4
101 " " " " " " *4
102 " " word " wword, no " *2
103 " " " " " " *2
104 typewriter *4*
105 oscilloscope *5*
106 107 deselected(disconnect)everything
108 109 read A drum *1a*
110 111 record on A drum *1b*
112 113 read B drum *1a**1b*
114 115 record on B drum *1b**1c*
116 117 PhotoElectricTapeReader, line by line *6
118 " " word by word *2
<table>
<thead>
<tr>
<th>Address</th>
<th>Select</th>
<th>Function</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>967</td>
<td>A</td>
<td>drum record</td>
<td>wda</td>
</tr>
<tr>
<td>975</td>
<td>B</td>
<td></td>
<td>wdb</td>
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<td>963</td>
<td>A</td>
<td>read</td>
<td>rda</td>
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<td>B</td>
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<td>rdb</td>
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<td>86 78</td>
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<td>tape 2 record forward</td>
<td>wtf</td>
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<td>87 95</td>
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<td>68 76</td>
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<td>erase, bit forward and deselect</td>
<td>wef</td>
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<tr>
<td>84 92</td>
<td></td>
<td>reverse</td>
<td>web</td>
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<td>69 77</td>
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<td>deselect everything</td>
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<td>wty</td>
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<td>80 88</td>
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<tr>
<td>65 73</td>
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<td>reverse</td>
<td>wbb</td>
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<td>81 89</td>
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<td>word by word, reverse</td>
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<td>like 137, other reader, MTR</td>
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<td>rmw</td>
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<td>punch, line by line, no 7-hole</td>
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<td>w7l</td>
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<td>word, word, no 7-hole</td>
<td>w6w</td>
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<td></td>
<td>w7w</td>
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<tr>
<td>118</td>
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<td>tape 2 record, delayed output</td>
<td>wtd</td>
</tr>
</tbody>
</table>
taped record delayed output

stop computer

if "STOP ON si'1" switch on

notes

any number of rc can be bo. AC selects initial addr. on drum writes
only 1 rd or ri. AC selects init. drum addr.
AC reads info.
punched, read 5, 5, 6 digits from AC at a time.

ACo-5, character to be printed, AC6, T (7-hole wanted). AC7, T (for punch)

print from ACo-5

y coord in ACo-10 x supplied by ca rc

reading into AC10-15