Whirlwind

si	pqr	00000	select input-output equipment *1
bi	x	00010	block input to x *2 *3
rd	*4	00011	read. one word transferred from *1 to the AC
bo	x	00100	block output from x *3
rc	*4	00101	record. one word transferred from the AC to *1
sd	x	00110	sum digits. $AC_i \oplus x_i$ goes to AC_i (i is a digit position from 0 to 15 inclusive)#
ts	x	01000	transfer the AC to storage
td	x	01001	transfer digits 5—15 of the AC to the same digits in storage
ta	x	01010	transfer digits 5—15(address) of the AR to the same digits in storage *5
ck	x	01011	stop on check-register alarm if AC≠x
ab	x	01100	add BR. BR+x goes to AC and x
ex	x	01101	exchange AC and x
cp	x	01110	transfer control to conditional program if AC negative
sp	x	01111	transfer control to sub-program
ca	x	10000	clear the AC and add x *6
cs	x	10001	clear the AC and subtract x *6
ad	x	10010	add x
su	x	10011	subtract x
cm	x	10100	clear the AC and add the Magnitude of x *6
sa	x	10101	special add *6a
ao	x	10110	add one. 1+x goes to AC and x
dm	x	10111	difference of magnitudes.)AC(-)x(goes to AC
mr	x	11000	multiply and round off *7
mh	x	11001	multiply and hold the 30-digit product in AC and BR, combined
dv	x	11010	divide. store sign of quotient in AC and absolute value in BR
slr	n	110110	shift left and round AC *7 *8
slh	n	110111	shift left and hold AC & BR together
srr	n	111000	shift right and round AC *7
srh	n	111001	shift right and hold AC & BR together
sf	x	11101	scale factor(normalize)AC & BR together. store amount of shift in x and AR *9
clc	n	111100	cycle left and clear(BR after the cycling)AC & BR together
clh	n	111101	cycle left and hold AC & BR together
md	x	11111	multiply digits. (see #. function is ⊗, not ⊕)

*1 list of pqr values on other side
*2 x means an address in core storage from 0000 to 3777_8 or 2047_{10}
*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 SAMx2^{-15}. see *6a
*6a overflow is impossible because it is delivered to the SpecialAddMemory(SAM)
*7 roundoff is equal to 2^{-15}xBR_0. after it is accomplished, BR is cleared
*8 n means an amount of shift from 000 to 511_{10}(777_8)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 rc or bo after si.
*1c*only addresses $10,000_8$ to $37,777_8$ on the B drum can be used.
*2 tape is punched or read as follows:first line=AC_{0-4}, second=AC_{5-9}, third=AC_{10-15}.
*1 AC_{0-5} is what to pri/punch. AC_6=T(7-hole wanted). AC_7=T(for punch).
*6 reading is done into AC_{10-15}.
*4 pri/punch from AC_{0-5}.
*5 the Y coordinate is in AC_{0-10}. the X coordinates are supplied by any number of rc.
*6

TYPICAL INSTRUCTION: si 963

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

see other side for notes

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	
91	see si 64—71. same thing. tape 3a or 3b, whichever is connected
92	
93	
94	
95	
118	tape 2, record forward for later output *1
126	tape 3a or 3b, record forward for delayed(later)output *1
128	MechanichalTapeReader, line by line *6
130	" , word by word *2
132	punch, line by line, no 7-hole *4
133	" , " " " , " *4
134	" , word " wword, no " *2
135	" , " " " , " *2
149	typewriter *4*
384	oscilloscope *5*
408	deselect(disconnect)everything
963	read A drum *1a*
967	record on A drum *1b*
971	read B drum *1a**1c*
973	record on B drum *1b**1c*
137	PhotoElectricTapeReader, line by line *6
139	" , word by word *2

si

address	select			
967	A drum record	wda		
975	B " "	wdb		
963	A " read	rda		
971	B " "	rdb		
70 78 86 94	tape $\overset{0}{2}$ $\overset{1}{3}$ record forward		wtf	
71 79 87 95	" " " reverse		wtb	
68 76 84 92	" " erase a bit forward, reverse, and deselect		wef	
69 77 85 93	" " " " " reverse, go forward, " "		web	
66 74 82 90	" " read forward		rtf	
67 75 83 91	" " " reverse		rtb	
408	deselect everything		des	
149	typewriter		wty	←
64 72 80 88	tape $\overset{0}{2}$ $\overset{1}{3}$ record after block mark		wfb	
65 73 81 89	" " " reverse " " "		wbb	
4	home camera film		cff	
364	oscilloscope		dis	←
137	paper tape read, line by line	PETR	rpl	←
139	" " " , word by word		rpw	←
128	like 137. other reader.	MTR	rml	
130	" 139. " " ,		rmw	
132	punch, line by line, no 7-hole		w6l	←
133	" , " " " , 7-hole		w7l	←
134	" , word " word, no 7-hole		w6w	←
135	" , " " " , 7-hole		w7w	←
118	tape 2, record, delayed output		wtd 2	

126	tape 3, record, delayed output	wtd 3
0	stop computer	hlt ←
1	" " if "STOP ON si 1" switch on	brk ←

notes

967 975 963 971	any number rc, can be bo. AC selects initial addr. on drum AC writes reads info. only 1 rd or bi. AC selects init. drum addr.
134, 135, 130 139	punched or read 5,5,6 digits from or to AC at a time.
118 126	AC_{0-5}, character to be printed punched. AC_6, T (7-hole wanted), AC_7, T (for punch)

132 149, 133	print or punch from AC_{0-5}
384	y coord in AC_{0-10} x supplied by ca rc
128 137	reading into AC_{10-15}