

THE DIGITAL GROUP
Z-80 DOCUMENTATION

DZ8-0-R1



po box 6528 denver, colorado 80206 (303)861-1686

Z-80 OPERATING SYSTEM for the Digital Group Z-80 CPU Card

General Design

This programming system provides five key programs and many supporting subroutines. The user is able to enter his programming, check out his programming, and finally run his programming under the control of these five included programs.

The first program is a cassette reading program, almost completely contained on the Eraseable Read Only Memory (EROM). A frequency shifting data cassette is converted from serial data to parallel data and loaded into memory. The default data rate is 1100 BPS, and the default start and stop addresses are 001 000 and 007 377 respectively.

The next program is a cassette writing program which allows storing the contents of memory on a low-cost audio cassette recorder. The default data rate and addresses are the same as for cassette reading.

A storage dump program uses the CRT readout board and a TV set to display several items necessary to ease programming. The 14 internal registers of the Z-80 CPU are interpreted and displayed exactly as they were immediately prior to calling the TV storage dump program. The two internal Z-80 status flags are also dumped and interpreted as are the stack pointer address and return address. The return address is only valid should the TV storage dump occur during a subroutine. The full contents of memory are then displayed, 96 bytes at a time, except for every 3rd display which culminates a page boundary. The initial address for each line is displayed at the left of each line, and six sequential bytes are displayed to the right. The two 16 bit indeces are also dumped, as well as the I (Interrupt) and R (Refresh) registers. The current interrupt mode (0,1, or 2) is displayed also. The TV dump will be in Octal if option 3 is selected, or in Hex if option 5 is selected.

A keyboard programming capability allows entering octal code directly from the system keyboard. The default address is 006 000. Programming may be entered at any available address, but programming below 006 000 runs the risk of destroying key portions of the operating system. The keyboard programming uses Octal if option 4 is selected. Option 6 allows Hex coding to be entered.

The final programming section is an operations monitor. The TV displays a list of up to ten options available to the user. The user then enters the number of the desired operation, and a table lookup selection performs a branch to the desired program.

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Using the Digital Group Z-80 Operating System

Initial Cassette Read:

After turning on the microprocessor, the message "READ Z-80 INITIALIZE Cassette" will appear on the screen. Start the cassette recorder reading the cassette, and when the low tone begins, push the reset button and release. When data begins after the short tone leader, the TV will display the least significant digit of the octal page being currently loaded, byte by byte. Memory is checked byte by byte, and missing or defective memory addresses are indicated by a "." being printed instead of the page. When the tone stops, the operations monitor assumes control, and the program loops awaiting a keyboard entry of the desired selection.

Storage Dump:

The typical first entry will be a request to view storage to find some free area where some additional user supplied programming may be placed. Pressing a "3" will result in a display of the registers, indeces, flags, and stack data in Octal. A "5" will produce a Hex display.

Successively pressing the "Space" key will page through memory, 96 bytes at a time. To set storage immediately to a desired page rather than having to successively page up to it, enter an "S" (either upper or lower case is fine on entries) and the three digits (Most Significant, Middle, then Least Significant) which make up the desired page. "S" and two digits are required when in Hex.

Entering a "P" will cause a branch to the keyboard programming routine.

Entering an "R" will Return the control to the operations monitor.

Keyboard Program:

Once available locations in storage have been found, the user can manually enter programming from the keyboard by typing a "4" or "6" if in the operations monitor, or a "P" if in a TV dump. A title will be displayed along with the default address of the tape shipped.

Programming may be entered by merely typing in the desired octal code, MSB through LSB. The results will be displayed on the TV along with some past bytes to insure proper sequencing as well as aid short term entry error detection.

The page (high) and/or (low) address may be preset by entering an "H" and MSB through LSB of the octal address and/or an "L" and the MSB through LSB. The current address is displayed on the TV after entry. Memory is changed only following the third entry of the data byte.

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Use care when entering code below 006 000. Since this is system area, any code or operations can result in an inoperative system with no means of recovery other than re-reading the cassette.

Enter an "R" to return to the Operations Monitor.

Type an "S" to go to the Storage Dump directly from programming. Actual programming typically sees considerable "S" and "P" as entries are made, then viewed.

Cassette Write:

Once the desired programming has been entered, the user may wish to save it for later usage. The user is also advised to save all programming on cassette prior to initial execution to avoid potential programming self-destruction. If self-destruction upon execution occurs, the program may be reloaded and suitable corrections made.

Insert a cassette and start the recorder in record mode. After making sure that the leader on the cassette has passed by the record head, enter a "2" while in the Operations Monitor. The TV will display the message "Writing" until the cassette recording operation is finished about 1/2 minute later, then return to the Operations Monitor. Turn off the recorder, and you have the system and the added programming on the cassette.

Cassette Read:

Cassettes may be read by pressing "1" while in the Operations Monitor, or they can be read when power is applied.

Panic Button:

Pressing the reset button will always return the user to the initial cassette load, or Operations Monitor.

Fine Points of the Z-80 Operating System:

Memory Extent:

The Z-80 Operating System is designed to occupy the lower 1.5K of the Z-80 CPU system. The default read and write high address is preset to 2K. However, the cassettes may be any length up to 64K, but at the read/write speed of 100 bytes per second, the cassette should be no longer than required.

If you have greater than 2K of memory on your system, modify the data at 001 052 (byte) and 001 055 (page) to reflect the memory extent desired on the cassette. Example: You have 10K of Z-80 system, and you wish to write 4K worth of programming. Since the octal equivalent of 4K is 017377, enter 377 at 001 052 and 017 at 001055. The default address is now set to 017 377. The cassette read programming will be automatically modified by the cassette. Cassettes of varying lengths may be interchangeably read with no operator intervention eg. 2K, 32K, 13K, 20K, etc.

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Data Rate:

RAM address 001 027 contains the timing loop constant which controls the resultant cassette baud rate. The normal constant is 037, which results in 1100 baud.

Storage Dump:

The initial page of the TV dump which displays and interprets the registers, flags, and stack pointers can be the most useful part of the whole system when faced with a confusing software problem. Insert an unconditional branch to 003 000 in place of the byte following the point in question. This will display and interpret the registers and flags, generally giving a much better picture of what is happening in that "insolvable problem". Another technique is to use the "Restart 6" as a branch. This then involves inserting a single "367" byte. The "Restart 6" must then be vectored forward to 003 000. The software Operating System cassette included has this feature included, so you may get a storage dump by merely inserting a "367" in your programming.

Interrupts/Restarts 1-7:

The Z-80 has eight restart or interrupt addresses at the low end of storage normally occupied by a ROM to give a power on and go capability. The EROM provided in the Digital Group kits vectors Restarts 1-7 through the EROM to the beginning of page 001 as shown in the software listings. The user may now vector forward these interrupt/restarts as desired, but interrupt level programming is best left to the experts. Restart 7 has the lowest level priority on the Z-80 CPU board system. NMI also enters in the EROM area, and is vectored forward to address 1035.

Interrupt/Restart Ø:

The Reset function on the Z-80 will force programming to begin at address 000 000, as does restart Ø ("307"). The Reset is used to control the Operations Monitor and the initial cassette read operation. It also has the highest priority of the eight interrupts. The EROM has control of Reset/Restart Ø and finally branches it forward to address 005 000 where the Operations Monitor resides.

Operations Monitor:

Page 005 of the Z-80 Operating System is dedicated to aiding the user to make his program selections. The title area uses bytes 005 165 through 005 377. Up to 10 (0-9) different program start locations may be specified by putting the high and low addresses at the proper place between 005 100 and 005 123.

The user can title his program by inserting the ASCII characters desired in the format required. Here is the secret: A special subroutine called TV Editor controls the messages displayed on the TV screen. This subroutine is entered from the Operations Monitor to put the message on the TV. Address 005 360 - 005 377 (and into page 6 if needed) can be used to enter a set of titles in a spec-

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ial machine code. "377" = Erase the screen, "376" - "200" are ASCII characters, "177" - "001" are the octal number of spaces, and "000" means the end of the message.

Example: You wish to add "7 Go" to the Operations Monitor message.

<u>Address</u>	<u>Data</u>	<u>Explanation</u>
005 360	016	Insert 14 blanks from last character
005 361	267	"7"
005 362	240	Space
005 363	307	"G"
005 364	357	"o"
005 365	000	End of message.

The program routine portion of the Operations Monitor is located between 005 100 and 005 123 as shown by the listings. The byte portion of the branch address is placed on the even address boundary, and the page portion on the odd address.

Example: You have designed the above program "Go" to execute from address 006 000. Since you also wish to branch to "Go" from a "7" entry when in the Operations Monitor, place an "000" at address 005 116 and an "006" at address 005 117.

Typing a "7" when in the Operations Monitor will now result in execution of "Go".

Subroutines you may wish to call for your own programming:

<u>Subroutine</u>	<u>Address</u>	<u>Operation and Comments</u>
TV	000 372	Prints a character on the TV through the Digital Group CRT readout attached to Port Ø. Load accumulator with character prior to calling. Accumulator returned cleared to "000".
Space	000 370	Prints a space (blank position) on the TV. Accumulator need not be preset. Accumulator will return cleared.
Home Erase	000 346	Prints 512 spaces on the TV, with the cursor set so that the next character entry will appear at the upper left of the screen. Accumulator, B, and C are cleared at end.
TV Editor	002 000	Previously described during Operations Monitor Operation. Preset H & L regs to address of initial byte of the message prior to calling. Accumulator, B, C, E, H & L are cleared or changed when subroutine ends.
Keyboard	001 250	This subroutine loops until an MSB keypressed strobe bit goes high. The program enters another (continued on next page)...

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<u>Subroutine</u>	<u>Address</u>	<u>Operation and Comments</u>
		loop until the MSB returns to low level. The Accumulator will have the input character.
Octal Char- acter	001 267	TV Storage Dump and Keyboard Program use this subroutine to produce three numbers on the TV representing the octal notation of an 8 bit byte. The desired byte is loaded into the E register. The octal characters will be printed and only the accumulator returned cleared.
Hex Char- acter	002 041	Same as above, only Hex results.
ASCII - Oc- tal Conv	004 075	This subroutine allows the operator to enter three numbers (left to right) in- dicating the octal representation on an 8 bit byte. The numbers are displayed on the TV when entered. The Accumulator will contain the data byte. The B&C re- gisters are returned cleared. 001247 must not have a 31 ⁰ (C8).
ASCII - Hex Conv	004 075	As above, only Hex is used. Providing 001247 has been preset to 310 ₈ (C8) _H
1/10 Seconds	001 173	Preset Accumulator to the number of 1/10 seconds to elapse before returning. Ac- cumulator, C, and D registers are cleared.

Some suggested practice programs for those new to a Z-80 microprocessor:

1. Clear the screen and write an "A":

<u>Address</u>	<u>Data</u>	<u>Explanation</u>
006 000	315	Call the subroutine "Home Erase"
006 001	021	
006 002	002	
006 003	076	Load the Accumulator with the ASCII code for "A"
006 004	301	
006 005	315	Print the "A" on the screen
006 006	372	
006 007	000	
006 010	166	Halt and rejoice!
005 116	000	Modify the Operations Monitor to execute the above program at 006 000.
005 117	006	

Push "Reset" and then typing a "7" should run the program. Push
"Reset" to return to the Operations Monitor after execution.

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2. Modify the above program to print an "a".
3. Print your name.
4. Print your name in the middle of the screen using "TV Editor".
5. Print your name in the middle of the screen, Flashing on and off.
(Hint - Use two "Seconds" subroutines and an unconditional branch to program beginning loop).
6. Print only the 128 possible characters on the screen and stop, using less than 20 bytes (Hint - Load Accum, Save, Print, Restore and Modify, loop not end).

Score: Over 100 bytes = HA!
Over 30 bytes = Fair
20-25 bytes = Good
15-19 bytes = Giant

(Can be done in 11 bytes or less)

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DZ8S1-7-R0

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PROGRAM: Z-80 Operating System - EROM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
Begin	000 000	303		(Reset/Restart 0)
	000 001	063		
	000 002	000		
Message	000 003	322	R	
	000 004	345	e	.
	000 005	341	a	
	000 006	344	d	
	000 007	240		
Restart 1	000 010	303	Jump Uncondx	
	000 011	002		
	000 012	001		
	000 013	332	z	
	000 014	255	-	
	000 015	270	8	
	000 016	260	0	
	000 017	240		
Restart 2	000 020	303	Jump Uncondx	
	000 021	005		
	000 022	001		
	000 023	311	I	
	000 024	316	N	
	000 025	311	I	
	000 026	324	T	
	000 027	311	l	
Restart 3	000 030	303	Jump Uncondx	
	000 031	010		
	000 032	001		
	000 033	301	A	
	000 034	314	L	
	000 035	311	l	
	000 036	332	Z	
	000 037	305	E	
Restart 4	000 040	303	Jump Uncondx	
	000 041	013		
	000 042	001		
	000 043	240		
	000 044	303	C	
	000 045	341	a	
	000 046	363	s	
	000 047	363	s	
Restart 5	000 050	303	Jump Uncondx	
	000 051	016		
	000 052	001		
	000 053	345	e	
	000 054	364	t	
	000 055	364	t	
	000 056	345	e	
	000 057	240		
Restart 6	000 060	303	Jump Uncondx	

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DZ8S2-1-R1

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PROGRAM: Z-80 OPERATING SYSTEM - EROM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
Init Chk	000 061	021		
	000 062	001		
	000 063	041		Load L&H
	000 064	000		
	000 065	001		
	000 066	030		Jump Rel
	000 067	003		
Restart 7	000 070	303		Jump Uncondx
	000 071	024		
	000 072	001		
	000 073	176		Load A w Mem
	000 074	376		Comp A w 123
	000 075	123		
	000 076	040		Jump Rel n Equal
	000 077	007		
	000 100	054		Inc L
	000 101	176		Load A w Mem
	000 102	376		Comp A w 123
	000 103	123		
	000 104	312		Jump if equal
	000 105	000		
000 106	005			
Pointer Set	000 107	061		Set Stack Pointer
	000 110	000		(top of page 1)
	000 111	002		
Wr Message	000 112	315		Call (Clear TV)
	000 113	346		
	000 114	000		
	000 115	041		Load L&H
	000 116	003		(Message Area)
	000 117	000		
	000 120	006		Load B w 006
	000 121	006		(6 Blocks)
	000 122	016		Load C w 005
	000 123	005		
(3)	000 124	176		Load A w M
	000 125	315		Call (TV)
	000 126	372		
	000 127	000		
	000 130	054		Inc L
	000 131	015		Dec C
	000 132	040		Jump Rel n Zero
	000 133	370		(2)
	000 134	054		Inc L
	000 135	054		Inc L
000 136	054		Inc L	
000 137	020		Dec B, Jump Rel n Zero	
000 140	361		(3)	

PROGRAM: Z-80 OPERATING SYSTEM - EROM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
	000 141	041		Load L&H
	000 142	027		
	000 143	001		
	000 144	030		Jump Rel
	000 145	003		(4)
NMI	000 146	303		Jump Uncondx
	000 147	035		
	000 150	001		
(4)	000 151	066		Store
	000 152	037		(Read Speed Constant)
	000 153	054		Inc L
	000 154	066		Store 000 @ 1030
	000 155	000		
	000 156	054		Inc L
	000 157	066		Store 001 @ 1031
	000 160	001		
	000 161	054		Inc L
	000 162	066		Store 377 @ 1032
	000 163	377		
	000 164	054		Inc L
	000 165	066		Store 007 @ 1033
	000 166	007		
Start Read	000 167	355		Load E&D w Start Addr
	000 170	133		
	000 171	030		
	000 172	001		
(7)	000 173	315		Call (Byte Read)
	000 174	234		
	000 175	000		
	000 176	174		Load A w H
	000 177	022		Load M w A using E&D
	000 200	032		Load A w M, using E&D
	000 201	274		Comp A w H
	000 202	050		Jump Rel if equal
	000 203	004		(5)
	000 204	076		Load A w "."
	000 205	256		
	000 206	030		Jump Rel
	000 207	005		(6)
(5)	000 210	172		Load A w D
	000 211	346		AND A w 007
	000 212	007		
	000 213	366		OR A w 260
	000 214	260		
(6)	000 215	315		Call (TV)
	000 216	372		
	000 217	000		
	000 220	052		Load L&H w Mem, Direct
	000 221	032		

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PROGRAM: Z-80 OPERATING SYSTEM - EROM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
	000 222	001		
	000 223	043		Inc L&H
	000 224	023		Inc E&D
	000 225	355		Sub E&D from L&H
	000 226	122		
	000 227	040		Jump Rel N equal
	000 230	342		(7)
	000 231	303		Jump Uncondx
	000 232	000		(Op Monitor)
	000 233	005		
Byte Rd	000 234	056		Load L w 010
	000 235	010		
(8)	000 236	006		Load B w 003
	000 237	003		
(9)	000 240	333		In l (Cassette)
	000 241	001		
	000 242	313		Test Bit Ø, A
	000 243	107		
	000 244	040		Jump Rel n Zero
	000 245	370		(8)
	000 246	020		Dec B, Jump Ret n Z
	000 247	370		(9)
	000 250	315		Call (Integrate Start)
	000 251	264		
	000 252	000		
	000 253	046		Load A w 000
	000 254	000		
(10)	000 255	315		Call (Integrate)
	000 256	273		
	000 257	000		
	000 260	055		Dec L
	000 261	040		Jump Rel n Zero
	000 262	372		(10)
	000 263	311		Return
Integrate Start	000 264	072		Load A w Mem, Direct
	000 265	027		
	000 266	001		
	000 267	326		Sub 006 from A
	000 270	006		
	000 271	030		
	000 272	003		Jump Rel
Integrate	000 273	072		(LDB)
	000 274	027		Load A w Mem, Direct
	000 275	001		
LDB	000 276	107		Load B w A
	000 277	016		Load C w 200
	000 300	200		
(13)	000 301	333		In 2
	000 302	001		
	000 303	313		Test Bit Ø, A

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PROGRAM: Z-80 OPERATING SYSTEM - EROM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
	000 304	107		
	000 305	302	Jump n Zero	
	000 306	314	(11)	
	000 307	000		
	000 310	014	Inc C	
	000 311	303	Jump Uncondx	
	000 312	320	(12)	
	000 313	000		
(11)	000 314	015	Dec C	
	000 315	303	Jump Uncondx	
	000 316	320	(12)	
	000 317	000		
(12)	000 320	020	Dec B, Jump Rel n Z	
	000 321	357	(13)	
	000 322	313	Test Bit 7, C	
	000 323	171		
	000 324	302	Jump n Zero	
	000 325	334	(14)	
	000 326	000		
	000 327	076	Load A w 001	
	000 330	001		
	000 331	303	Jump Uncondx	
	000 332	341	(15)	
	000 333	000		
(14)	000 334	076	Load A w 000	
	000 335	000		
	000 336	303	Jump Uncondx	
	000 337	341	(15)	
	000 340	000		
(15)	000 341	204	ADD H to A	
	000 342	017	Rot Right Circ	
	000 343	147	Load H w A	
	000 344	311		
	000 345			
ERASE	000 346	076	Load A w 377	
	000 347	377		
	000 350	315	Call (TV)	
	000 351	372		
	000 352	000		
	000 353	006	Load B w 000	
	000 354	000		
(16)	000 355	016	Load C w 002	
	000 356	002		
(17)	000 357	315	Call (Space)	
	000 360	370		
	000 361	000		
	000 362	015	Dec C	
	000 363	040	Jump Rel n Zero	
	000 364	372	(17)	
	000 365	020	Dec B, Jump Rel n Z	
	000 366	366	(16)	

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PROGRAM: Z-80 OPERATING SYSTEM - EROM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
Space	000 367	311		Return
	000 370	076		Load A w "blank"
	000 371	240		
TV	000 372	323		Out Ø
	000 373	000		
	000 374	257		Clear A
	000 375	323		Out Ø
	000 376	000		
	000 377	311		Return

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LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
	001 000	123		
	001 001	123		
	001 002	303		010 Restart
	001 003			
	001 004			
	001 005	303		020 Restart
	001 006			
	001 007			
	001 010	303		030 Restart
	001 011			
	001 012			
	001 013	303		040 Restart
	001 014			
	001 015			
	001 016	303		050 Restart
	001 017			
	001 020			
	001 021	303		060 Restart
	001 022			
	001 023			
	001 024	303		070 Restart
	001 025			
	001 026			
	001 027	037		Cassette Speed Constant
	001 030	000		L Starting Addr
	001 031	001		H }
	001 032	377		L Ending Address
	001 033	007		H }
	001 034			Reserved - Undefined
	001 035	303		NMI Restart
	001 036			
	001 037			
2K WRITE	001 040	041		Load L&H
	001 041	030		
	001 042	001		
	001 043	066		Store 000 @ 1030
	001 044	000		
	001 045	054		Inc L
	001 046	066		Store 001 @ 1031
	001 047	001		
	001 050	054		Inc L
	001 051	066		Store 377 @ 1032
	001 052	377		
	001 053	054		Inc L
	001 054	066		Store 007 @ 1033
	001 055	007		
	001 056	041		Load L&H
	001 057	214		(Write message area)
	001 060	001		

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PROGRAM: Z-80 OPERATING SYSTEM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
	001 061	315		Call (TV Editor)
	001 062	000		
	001 063	002		
WRITE	001 064	076		Load A w 145
	001 065	145		(10 Seconds)
	001 066	323		Out 1
	001 067	001		(Mark tone Leader)
	001 070	315		Call (seconds)
	001 071	173		
	001 072	001		
	001 073	355		Load E&D w Start Addr
	001 074	133		
	001 075	030		
	001 076	001		
(1)	001 077	315		Call (Byte Write)
	001 100	124		
	001 101	001		
	001 102	052		Load L&H w M, Direct
	001 103	032		(Ending Address)
	001 104	001		
	001 105	043		Inc L&H
	001 106	023		Inc E&D
	001 107	257		Clear Carry Bit
	001 110	355		
	001 111	122		
	001 112	040		Jump Rel n Equal
	001 113	363		(1)
	001 114	076		Load A w 062
	001 115	062		
	001 116	315		Call (1/10 seconds)
	001 117	173		
	001 120	001		
	001 121	303		Jump Uncondx
	001 122	000		(Op Monitor)
	001 123	005		
BYTE WRITE	001 124	046		Load H w 011
	001 125	011		
	001 126	257		Clear A & Carry
	001 127	032		Load A w M, using E&D
	001 130	027		Rotate Left through Carry
(2)	001 131	323		Out 1
	001 132	001		
	001 133	315		Call (Time Delay)
	001 134	155		
	001 135	001		
	001 136	037		Rotate A Right
	001 137	045		Dec H
	001 140	040		Jump Rel n Zero

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DZ8S2-8-RO

po box 6528, denver, colorado 80206 (303) 861-1686

PROGRAM: Z-80 OPERATING SYSTEM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
	001 141	367		(2)
	001 142	076		Load A w 001
	001 143	001		
	001 144	323		Out 1
	001 145	001		
	001 146	315		Call (Time Delay)
	001 147	155		
	001 150	001		
	001 151	315		Call (Time Delay)
	001 152	155		
	001 153	001		
	001 154	311		Return
Time Delay	001 155	365		Push A
	001 156	072		Load A w M, Direct
	001 157	027		(Get Speed Const.)
	001 160	001		
	001 161	207		ADD A to A
	001 162	207		ADD A to A
	001 163	107		Load B w A
	001 164	345		Push H&L (Dummy Op)
(4)	001 165	000		NOP (Dummy Op)
	001 166	020		Dec B, Jump rel not zero
	001 167	375		(4)
	001 170	341		Pop H&L (Dummy Op)
	001 171	361		Pop A
	001 172	311		Return
(8)	001 173	026		Load D w 031
	001 174	031		
(7)	001 175	001		Load C&B
	001 176	003		
	001 177	000		
(5)	001 200	020		Dec B, Jump Rel not zero
	001 201	376		(5)
	001 202	015		Dec C
	001 203	040		Jump Rel n Zero
	001 204	373		(5)
	001 205	025		Dec D
	001 206	040		Jump Rel not Zero
	001 207	365		(7)
	001 210	075		Dec A
	001 211	040		Jump Rel not Zero
	001 212	360		(8)
	001 213	311		Return
	001 214	377		(Home Erase)
	001 215	154		(Spaces)
	001 216	327		W

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DZ8S2-9-R0

po box 6528, denver, colorado 80206 (303) 861-1686

PROGRAM: Z-80 OPERATING SYSTEM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
	001 217	362	r	
	001 220	351	i	
	001 221	364	t	
	001 222	351	i	
	001 223	356	n	
	001 224	347	g	
	001 225	000	(Return)	
	001 226	076	Load A w "?"	
	001 227	277		
	001 230	303	Jump Uncondx	
	001 231	124		
	001 232	005		
	001 233	007	Rotate Left	
	001 234	107	Load B w A	
	001 235	315	Call (Hexer)	
	001 236	172		
	001 237	004		
	001 240	260	ADD B to A	
	001 241	311	Return	
	001 242			
	001 243			
	001 244			
	001 245			
	001 246	***	(Interrupt Level Indicator)	
Keyboard	001 247	***	(Octal/Hex Constant)	
	001 250	333	In Ø	
	001 251	000		
	001 252	313	Test Bit 7,A	
	001 253	177		
	001 254	050	Jump Rel if zero	
	001 255	372	(keyboard)	
	001 256	365	Push A	
(10)	001 257	333	In Ø	
	001 260	000		
	001 261	313	Test Bit 7,A	
	001 262	177		
	001 263	040	Jump Rel not Zero	
	001 264	372	(10)	
	001 265	361	Pop A	
Octal Char	001 266	311	Return	
	001 267	173	Load A w E	
	001 270	267	Or A w A	
	001 271	036	Load E w 003	
	001 272	003		
(11)	001 273	027	Rotate Left thru Carry	
	001 274	027	"	
	001 275	027	"	
	001 276	365	Push A	
	001 277	346	And A w 007	

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DZ8S2-10-RO po box 6528, denver, colorado 80206 (303) 861-1686

PROGRAM: Z-80 OPERATING SYSTEM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
001	300	007		
001	301	315		Call (ASCII TV)
001	302	077		
001	303	002		
001	304	361		Pop A
001	305	035		Dec E
001	306	040		Jump Rel not Zero
001	307	363		(11)
001	310	311		Return
001	311			^
001	312			
001	313			
001	314			
001	315			
001	316			
001	317			
001	320			
001	321			
001	322			
001	323			
001	324			
001	325			
001	326			
001	327			
001	330			
001	331			
001	332			
001	333			User - Stack
001	334			System - Stack
001	335			
001	336			^
001	337			
001	340			
001	341			
001	342			
001	343			
001	344			
001	345			
001	346			
001	347			
001	350			
001	351			
001	352			
001	353			
001	354			
001	355			Reserved for Stack
001	356			
001	357			
001	360			
001	361			

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DZ8S2-11-RO

po box 6528, denver, colorado 80206 (303) 861-1686

PROGRAM: Z-80 OPERATING SYSTEM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
	001 362			
	001 363			
	001 364			
	001 365			
	001 366			
	001 367			
	001 370			Reserved for Stack
	001 371			
	001 372			
	001 373			
	001 374			
	001 375			
	001 376			
	001 377			
TV Editor	002 000	176	Load A with Mem	
	002 001	376	Compare A w "Home Erase"	
	002 002	377		
	002 003	040	Jump Rel not Equal	
	002 004	005	(1)	
	002 005	315	Call (Erase)	
	002 006	346		
	002 007	000		
	002 010	030	Jump Rel	
	002 011	024	(2)	
(1)	002 012	313	Test Bit 7,A	
	002 013	177		
	002 014	050	Jump Rel if zero	
	002 015	005	(3)	
	002 016	315	Call (TV)	
	002 017	372		
	002 020	000		
	002 021	030	Jump Rel	
	002 022	013	(2)	
(3)	002 023	376	Compare A with 000	
	002 024	000		
	002 025	310	Return if equal	
(4)	002 026	365	Push A	
	002 027	315	Call (Space)	
	002 030	370		
	002 031	000		
	002 032	361	Pop A	
	002 033	075	Dec A	
	002 034	040	Jump Rel not zero	
	002 035	370	(4)	
(2)	002 036	043	Inc L&H	
	002 037	030	Jump Rel	
	002 040	337	(TV Editor)	
HEX Char	002 041	315	Call (Space)	

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DZ8S2-12-RO po box 6528, denver, colorado 80206 (303) 861-1686

PROGRAM: Z-80 OPERATING SYSTEM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
HEX Out	002 042	370		
	002 043	000		
	002 044	173	Load A w E	
	002 045	017	Rotate Right	
	002 046	017	"	
	002 047	017	"	
	002 050	017	"	
	002 051	315	Call (Hex Out)	
	002 052	061		
	002 053	002		
	002 054	173	Load A w E	
	002 055	315	Call (Hex Out)	
	002 056	061		
	002 057	002		
	002 060	311	Return	
	002 061	346	And A w 017	
	002 062	017		
	002 063	376	Compare A w 012	
(6)	002 064	012		
	002 065	070	Jump Rel if less	
	002 066	010	(6)	
	002 067	326	Subtract 011	
	002 070	011		
	002 071	366	Or A w 300	
	002 072	300		
	002 073	315	Call (TV)	
	002 074	372		
	002 075	000		
	002 076	311	Return	
Character	002 077	366	Or A w 260	
	002 100	260		
	002 101	315	Call (TV)	
	002 102	372		
	002 103	000		
	002 104	311	Return	
	002 105	136	Load E w Mem	
	002 106	072	Load A w Mem, Direct	
	002 107	247		
	002 110	001		
	002 111	376	Compare A w "H"	
	002 112	310		
	002 113	312	Jump if equal	
	002 114	041	(Hex Char)	
	002 115	002		
	002 116	303	Jump Uncondx	
	002 117	267	(Octal Char)	

PROGRAM: Z-80 OPERATING SYSTEM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
	002 120	001		
	002 121	377		(Home Erase)
	002 122	010		(Spaces)
	002 123	324	T	
	002 124	326	V	
	002 125	240		
	002 126	323	S	
	002 127	324	T	
	002 130	317	O	
	002 131	322	R	
	002 132	301	A	
	002 133	307	G	
	002 134	305	E	
	002 135	240		
	002 136	304	D	
	002 137	325	U	
	002 140	315	M	
	002 141	320	P	
	002 142	011	(Spaces)	
	002 143	322	R	
	002 144	345	e	
	002 145	347	g	
	002 146	351	i	
	002 147	363	s	
	002 150	364	t	
	002 151	345	e	
	002 152	362	r	
	002 153	363	s	
	002 154	272	:	
	002 155	031	(Spaces)	
	002 156	301	A	
	002 157	003		
	002 160	302	B	
	002 161	003		
	002 162	303	C	
	002 163	003		
	002 164	304	D	
	002 165	003		
	002 166	305	E	
	002 167	003		
	002 170	310	H	
	002 171	003		
	002 172	314	L	
	002 173	006	(Spaces)	
	002 174	000	(Return)	
	002 175	006	(Spaces)	
	002 176	301	A	
	002 177	247	'	

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DZ8S2-14-RO po box 6528, denver, colorado 80206 (303) 861-1686

PROGRAM: Z-80 OPERATING SYSTEM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
	002 200	002		
	002 201	302		B
	002 202	247		'
	002 203	002		
	002 204	303		C
	002 205	247		'
	002 206	002		
	002 207	304		D
	002 210	247		'
	002 211	002		
	002 212	305		E
	002 213	247		'
	002 214	002		
	002 215	310		H
	002 216	247		'
	002 217	002		
	002 220	314		L
	002 221	247		'
	002 222	005		(Spaces)
	002 223	000		(Return)
	002 224	043		(Spaces)
	002 225	306		F
	002 226	354		l
	002 227	341		a
	002 230	347		g
	002 231	363		s
	002 232	272		:
	002 233	034		(Spaces)
	002 234	323		S
	002 235	240		
	002 236	332		Z
	002 237	240		
	002 240	310		H
	002 241	240		
	002 242	320		P
	002 243	240		
	002 244	316		N
	002 245	240		
	002 246	303		C
	002 247	004		(Spaces)
	002 250	323		S
	002 251	247		'
	002 252	332		Z
	002 253	247		'
	002 254	310		H
	002 255	247		'
	002 256	320		P
	002 257	247		'
	002 260	316		N
	002 261	247		'
	002 262	303		C
	002 263	247		'

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DZ8S2-15-R0

po box 6528, denver, colorado 80206 (303) 861-1686

PROGRAM: Z-80 OPERATING SYSTEM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
	002 264	005		
	002 265	000		(Return)
	002 266			
	002 267			
	002 270			
	002 271			
	002 272			
	002 273	040		(Spaces)
	002 274	330		X
	002 275	240		
	002 276	311		I
	002 277	356		n
	002 300	344		d
	002 301	345		e
	002 302	370		x
	002 303	002		(Spaces)
	002 304	331		Y
	002 305	240		
	002 306	311		I
	002 307	356		n
	002 310	344		d
	002 311	345		e
	002 312	370		x
	002 313	003		(Spaces)
	002 314	311		I
	002 315	240		
	002 316	322		R
	002 317	345		e
	002 320	347		g
	002 321	003		(Spaces)
	002 322	322		R
	002 323	240		
	002 324	322		R
	002 325	345		e
	002 326	347		g
	002 327	001		(Spaces)
	002 330	000		(Return)
	002 331	041		(Spaces)
	002 332	323		S
	002 333	364		t
	002 334	341		a
	002 335	343		c
	002 336	353		k
	002 337	004		(Spaces)
	002 340	322		R
	002 341	345		e
	002 342	364		t
	002 343	365		u
	002 344	362		r
	002 345	356		n
	002 346	277		?

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DZ8S2-16-RO

po box 6528, denver, colorado 80206 (303) 861-1686

PROGRAM: Z-80 OPERATING SYSTEM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
	002 347	004		(Spaces)
	002 350	311		I
	002 351	356		n
	002 352	364		t
	002 353	345		er
	002 354	362		r
	002 355	362		r
	002 356	365		w
	002 357	360		p
	002 360	364		t
	002 361	003		
	002 362	000		(Return)
	002 363	377		(Home Erase)
	002 364	305		E
	002 365	356		n
	002 366	364		t
	002 367	345		e
	002 370	362		r
	002 371	240		
	002 372	320		P
	002 373	341		a
	002 374	347		g
	002 375	345		e
	002 376	240		
	002 377	000		(Return)
TV Dump	003 000	365	Push A & Flags	
	003 001	305	Push B&C	
	003 002	325	Push D&E	
	003 003	345	Push H&L	
	003 004	010	Ex A & Flags w A' & Flags'	
	003 005	331	Ex B-L w B'-L'	
	003 006	365	Push A' & Flags'	
	003 007	305	Push B'&C'	
	003 010	325	Push D'& E'	
	003 011	345	Push H' & L'	
	003 012	010	Ex A' & Flags' w A & Flags	
	003 013	331	Ex B'-L' w B&L	
	003 014	335	Push X	
	003 015	345		
	003 016	375	Push Y	
	003 017	345		
	003 020	355	Load A w I	
	003 021	127		
	003 022	107	Load B w A	
	003 023	355	Load A w R	
	003 024	137		
	003 025	117	Load C w A	
	003 026	305	Push B&C	
	003 027	041	Clear L&H	
	003 030	000		

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DZ8S2-17-RO po box 6528, denver, colorado 80206 (303) 861-1686

PROGRAM: Z-80 OPERATING SYSTEM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
	003 031	000		
	003 032	071		ADD Stack Pointer to H&L
	003 033	006		Load B with 030
	003 034	030		
	003 035	043		Inc L&H
	003 036	020		Dec B, Jump Rel n Zero
	003 037	375		
	003 040	345		Push L&H (Push SP)
	003 041	116		Load C w Mem
	003 042	043		Inc L&H
	003 043	106		Load B w Mem
	003 044	305		Push B&C
	003 045	053		Dec L&H
	003 046	053		"
	003 047	053		"
	003 050	053		"
	003 051	345		Push L&H
	003 052	041		Load L&H
	003 053	121		(Title & Regs)
	003 054	002		
	003 055	315		Call (TV Ed)
	003 056	000		
	003 057	002		
	003 060	341		Pop L&H
	003 061	315		Call (Reg Print)
	003 062	240		
	003 063	003		
	003 064	345		Push L&H
	003 065	041		Load L&H
	003 066	175		(Regs')
	003 067	002		
	003 070	315		Call (TV Ed)
	003 071	000		
	003 072	002		
	003 073	341		Pop L&H
	003 074	315		Call (Reg Print)
	003 075	240		
	003 076	003		
	003 077	353		Ex D&E w H&L
	003 100	041		Load L&H
	003 101	224		(Flags)
	003 102	002		
	003 103	315		Call (TV Ed)
	003 104	000		
	003 105	002		
	003 106	006		Load B w 017
	003 107	017		
	003 110	023		Inc D&E
	003 111	020		Dec B, Jump Rel n Zero
	003 112	375		
	003 113	315		Call (Flag Print)

PROGRAM: Z-80 OPERATING SYSTEM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
	003 114	262		
	003 115	003		
	003 116	006		Load B w 010
	003 117	010		
	003 120	033		Dec D&E
	003 121	020		Dec B, Jump Rel n Zero
	003 122	375		
	003 123	315		Call (Flag Print)
	003 124	262		
	003 125	003		
	003 126	041		Load L&H (Indeces, I&R)
	003 127	273		
	003 130	002		
	003 131	315		Call (TV Editor)
	003 132	000		
	003 133	002		
	003 134	006		Load B w 006
	003 135	007		
	003 136	033		Dec D&E
	003 137	020		Dec B, Jump Rel n Zero
	003 140	375		
	003 141	353		Exchange D&E w H&L
	003 142	315		Call (Dump Char Short)
	003 143	341		
	003 144	003		
	003 145	315		Call (Dump Char Short)
	003 146	341		
	003 147	003		
	003 150	006		Load B with
	003 151	003		
	003 152	315		Call (Dump Char)
	003 153	334		
	003 154	003		
	003 155	315		Call (Dump Char Short)
	003 156	341		
	003 157	003		
	003 160	006		Load B with
	003 161	004		
	003 162	315		Call (Dump Char)
	003 163	334		
	003 164	003		
	003 165	006		Load B with
	003 166	005		
	003 167	315		Call (Dump Char)
	003 170	334		
	003 171	003		
	003 172	345		Push L&H
	003 173	041		Load L&H
	003 174	331		(Stack)
	003 175	002		
	003 176	315		Call (TV Ed)
	003 177	000		

PROGRAM: Z-80 OPERATING SYSTEM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
	003 200	002		
	003 201	341		Pop L&H
	003 202	315		Call (Dump Char Short)
	003 203	341		
	003 204	003		
	003 205	315		Call (Dump Char Short)
	003 206	341		
	003 207	003		
	003 210	006		Load B w 003
	003 211	003		
	003 212	315		Call (Dump Char)
	003 213	334		
	003 214	003		
	003 215	315		Call (Dump Char Short)
	003 216	341		
	003 217	003		
	003 220	006		Load B w 011
	003 221	011		
	003 222	315		Call(Space)
	003 223	370		
	003 224	000		
	003 225	020		Dec B, Jump Rel n Zero
	003 226	373		
	003 227	072		Load A w Mem, Direct
	003 230	246		
	003 231	001		
	003 232	315		Call (TV)
	003 233	372		
	003 234	000		
	003 235	303		Jump Uncondx
	003 236	346		(Storage)
	003 237	003		
	003 240	136		Load E w Mem
	003 241	315		Call (Char)
	003 242	106		
	003 243	002		
	003 244	053		Dec L&H
	003 245	006		Load B w 006
	003 246	006		
	003 247	315		Call (Space)
	003 250	370		
	003 251	000		
	003 252	053		Dec L&H
	003 253	315		Call (Char)
	003 254	105		
	003 255	002		

PROGRAM: Z-80 OPERATING SYSTEM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
Flag Print	003 256	020		Dec B, Jump Rel n Zero
	003 257	367		
	003 260	053		Dec L&H
	003 261	311		Return
	003 262	032		Load A w Mem, Using D&E
	003 263	315		Call (Flag Short)
	003 264	316		
	003 265	003		
	003 266	315		Call (Flag Short)
	003 267	316		
	003 270	003		
	003 271	315		Call (Flag Long)
	003 272	315		
	003 273	003		
	003 274	315		Call (Flag Long)
	003 275	315		
	003 276	003		
	003 277	315		Call (Flag Short)
Flag Long	003 300	316		
	003 301	003		
	003 302	315		Call (Flag Short)
	003 303	316		
	003 304	003		
	003 305	006		Load B w 003
	003 306	003		
	003 307	315		Call (Space)
	003 310	370		
	003 311	000		
Flag Short	003 312	020		Dec B, Jump Rel n Zero
	003 313	373		
	003 314	311		Return
	003 315	007		Rotate Left
	003 316	007		Rotate Left
	003 317	117		
	003 320	346		Load C w A
	003 321	001		And A w 001
	003 322	366		
	003 323	260		Or A w 260
	003 324	315		
	003 325	372		
	003 326	000		
	003 327	315		Call (TV)
	003 330	370		
	003 331	000		
	003 332	171		Load A w C
	003 333	311		Return

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DZ8S2-21-R0

po box 6528, denver, colorado 80206 (303) 861-1686

PROGRAM: Z-80 OPERATING SYSTEM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
Dump Char	003 334	315		Call (Space)
	003 335	370		
	003 336	000		
	003 337	020		Dec B, Jump Rel n Zero
	003 340	373		
	003 341	315		Call (Char)
	003 342	105		
	003 343	002		
	003 344	053		Dec L&H
	003 345	311		Return
Dump Storage	003 346	061		Load Stack Pointer
	003 347	000		
	003 350	002		
	003 351	041		Load L&H
	003 352	000		
	003 353	000		
(3)	003 354	315		Call (Keyboard)
	003 355	250		
	003 356	001		
	003 357	346		And A w 337
	003 360	337		
	003 361	376		Compare A w "Space"
	003 362	200		
	003 363	050		Jump Rel if Equal
	003 364	034		Dump Conv
	003 365	376		Compare A w "S"
	003 366	323		(Enter Page)
	003 367	050		Jump Rel if Equal
	003 370	014		(Page Preset)
	003 371	376		Compare A w "P"
	003 372	320		
	003 373	312		Jump if Equal
	003 374	221		
	003 375	004		(Keyboard Program)
	003 376	376		Compare A w "R"
	003 377	322		
	004 000	312		Jump if Equal
	004 001	000		
	004 002	005		(Op Monitor)
	004 003	030		Jump Rel
	004 004	347		(3) (not valid code)
Page Preset	004 005	041		Load L&H
	004 006	363		
	004 007	002		
	004 010	315		Call (TV Editor)

PROGRAM: Z-80 OPERATING SYSTEM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
	004 011	000		
	004 012	002		
	004 013	315		Call (ASCII Conv)
	004 014	075		
	004 015	004		
	004 016	147		Load H w L
	004 017	056		Load L w 000
	004 020	000		
Dump Conv	004 021	315		Call (Erase)
	004 022	346		
	004 023	000		
(6)	004 024	134		Load E w H
	004 025	315		Call (Char)
	004 026	106		
	004 027	002		
	004 030	135		Load E w L
	004 031	315		Call (Char)
	004 032	106		
	004 033	002		
	004 034	315		Call (Space)
	004 035	370		
	004 036	000		
	004 037	315		Call (Space)
	004 040	370		
	004 041	000		
	004 042	006		Load B w 006
	004 043	006		
(5)	004 044	315		Call (Space)
	004 045	370		
	004 046	000		
	004 047	136		Load E w Mem
	004 050	315		Call (Char)
	004 051	106		
	004 052	002		
	004 053	043		Inc L&H
	004 054	175		Load A w L
	004 055	376		Compare A w 140
	004 056	140		(end of 1st TV page)
	004 057	050		Jump Rel if equal
	004 060	273		(3)
	004 061	376		Compare A w 300
	004 062	300		(end of 2nd TV page)
	004 063	050		Jump Rel if equal
	004 064	267		(3)
	004 065	376		Compare A w 000
	004 066	000		(end or 3rd TV page)
	004 067	050		Jump Rel if equal
	004 070	263		(3)

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DZ8S2-23-RO po box 6528, denver, colorado 80206 (303) 861-1686

PROGRAM: Z-80 OPERATING SYSTEM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
ASCII Conv	004 071	020		Dec B, Jump Rel n Zero (5)
	004 072	351		Jump Rel (6)
	004 073	030		
	004 074	327		
	004 075	315	Call	(Keyboard)
	004 076	250		
	004 077	001		
	004 100	107	Load B w A	
	004 101	072	Load A w Mem, Direct	
	004 102	247		
ASCII-OCTAL	004 103	001		
	004 104	376	Compare A w "H"	
	004 105	310		
	004 106	170	Load A w B	
	004 107	050	Jump Rel if equal	
	004 110	044	(ASCII- HEX)	
	004 111	315	Call	(TV)
	004 112	372		
	004 113	000		
	004 114	170	Load A w B	
	004 115	017	Rotate Right	
	004 116	017	Rotate Right	
	004 177	346	And A w 300	
	004 120	300		
	004 121	117	Load C w A	
	004 122	315	Call	(Keyboard)
	004 123	250		
	004 124	001		
	004 125	107	Load B w A	
	004 126	315	Call	(TV)
	004 127	372		
	004 130	000		
	004 131	170	Load A w B	
	004 132	007	Rotate Left	
	004 133	007	Rotate Left	
	004 134	007	Rotate Left	
	004 135	346	And A w 070	
	004 136	070		
	004 137	201	Add C to A	
	004 140	117	Load C w A	
	004 141	315	Call	(Keyboard)
	004 142	250		
	004 143	001		
	004 144	107	Load B w A	
	004 145	315	Call	(TV)
	004 146	372		

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DZ8S2-24-RO

po box 6528, denver, colorado 80206 (303) 861-1686

PROGRAM: Z-80 OPERATING SYSTEM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
ASCII-HEX	004 147	000		
	004 150	170		Load A w B
	004 151	346		And A w 007
	004 152	007		
	004 153	201		Add C to A
	004 154	311		Return
	004 155	315		Call (Space)
	004 156	370		
	004 157	000		
	004 160	170		Load A w B
	004 161	315		Call (Hexer Short)
	004 162	175		
	004 163	004		
	004 164	007		Rotate Left
	004 165	007		Rotate Left
	004 166	007		Rotate Left
	004 167	303		Jump Uncondx
	004 170	233		
	004 171	001		
	004 172	315		Call (Keyboard)
	004 173	250		
(1)	004 174	001		
	004 175	376		Compare A w 340
	004 176	340		
	004 177	070		Jump Rel if less
	004 200	002		(1)
	004 201	326		Subtract 040
	004 202	040		(Convert to Upper Case)
	004 203	365		Push A
	004 204	315		Call (TV)
	004 205	372		
	004 206	000		
(2)	004 207	361		Pop A
	004 210	376		Compare A w 272
	004 211	272		
	004 212	070		Jump Rel if less
	004 213	002		(2)
	004 214	326		Subtract 007
	004 215	007		
	004 216	326		Subtract 260
	004 217	260		
Keybd. Prog.	004 220	311		Return
	004 221	041		Load L&H
	004 222	165		
	004 223	005		
	004 224	315		Call (TV Editor)
	004 225	000		
	004 226	002		

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PROGRAM: Z-80 OPERATING SYSTEM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
	004 227	041		
	004 230	000		Load L&H (Programming Default)
	004 231	006		
(4)	004 232	134		Load E w H
	004 233	315		Call (Char)
	004 234	106		
	004 235	002		
	004 236	135		Load E w L
	004 237	315		Call (Char)
	004 240	106		
	004 241	002		
	004 242	315		Call (Keyboard)
	004 243	250		
	004 244	001		
	004 245	346		And A w 337 (Conv to upper)
	004 246	337		
	004 247	376		Compare w "H"
	004 250	310		
	004 251	040		Jump Rel n Equal (3)
	004 252	021		
	004 253	315		Call (Home Erase)
	004 254	346		
	004 255	000		
	004 256	076		Load A w "H"
	004 257	310		
	004 260	315		Call (TV)
	004 261	372		
	004 262	000		
	004 263	315		Call (ASCII Conv)
	004 264	075		
	004 265	004		
	004 266	147		Load H w A
(6)	004 267	315		Call (Erase)
	004 270	346		
	004 271	000		
	004 272	030		Jump Rel (4)
	004 273	336		
(3)	004 274	376		Compare A w "L"
	004 275	314		
	004 276	040		Jump Rel n Equal (5)
	004 277	016		
	004 300	315		Call (Home Erase)
	004 301	346		
	004 302	000		
	004 303	076		Load A w "L"
	004 304	314		
	004 305	315		Call (TV)
	004 306	372		
	004 307	000		
	004 310	315		Call (ASCII Conv)

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DZ8S2-26-R0

po box 6528, denver, colorado 80206 (303) 861-1686

PROGRAM: Z-80 OPERATING SYSTEM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
	004 311	075		
	004 312	004		
	004 313	157		Load L w A
	004 314	030		Jump Rel
	004 315	351		(6)
(5)	004 316	376		Compare A w "S"
	004 317	323		
	004 320	312		Jump if Equal
	004 321	000		
	004 322	003		
	004 323	376		Compare A w "R"
	004 324	322		
	004 325	312		Jump if Equal
	004 326	000		
	004 327	005		
	004 330	366		Or a with 040
	004 331	040		
	004 332	365		Push A
	004 333	006		Load B with 010
	004 334	010		
(7)	004 335	053		Dec L&H
	004 336	020		Dec B, Jump Rel n Z
	004 337	375		(7)
	004 340	315		Call (Home Erase)
	004 341	346		
	004 342	000		
	004 343	006		Load B w 010
	004 344	010		
(8)	004 345	315		Call (H&L List)
	004 346	140		
	004 247	005		
	004 350	315		Call (Mem List)
	004 351	132		
	004 352	005		
	004 353	043		Inc L&H
	004 354	020		Dec B, Jump Rel n Zero
	004 355	367		(8)
	004 356	315		Call (H&L List)
	004 357	140		
	004 360	005		
	004 361	361		Pop A
	004 362	315		Call (ASCII Conv Short)
	004 363	100		
	004 364	004		
	004 365	167		Load M w A
	004 366	315		Call (24 Space)
	004 367	154		
	004 370	005		
	004 371	043		Inc L&H

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DZ8S2-27-RO

po box 6528, denver, colorado 80206 (303) 861-1686

PROGRAM: Z-80 OPERATING SYSTEM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
	004 372	315		Call (H&L List)
	004 373	140		
	004 374	005		
	004 375	303		Jump Uncondx
	004 376	226		
	004 377	001		
OP Monitor	005 000	061		Load Stack Pointer
	005 001	000		
	005 002	002		
	005 003	355		Set Interrupt Mode Ø (8080 identical)
	005 004	106		
	005 005	076		Load A w "Ø"
	005 006	260		
	005 007	062		Load Mem w A, Direct
	005 010	246		
	005 011	001		
	005 012	373		Enable Interrupt
	005 013	041		Load L&H
	005 014	225		
	005 015	005		
	005 016	315		Call (TV Editor)
	005 017	000		
	005 020	002		
(1)	005 021	315		Call (Keyboard)
	005 022	250		
	005 023	001		
	005 024	376		Compare A w >9
	005 025	272		
	005 026	060		Jump Rel if not Less
	005 027	371		(1)
	005 030	376		Compare A w <Ø
	005 031	260		
	005 032	070		Jump Rel if Less
	005 033	365		(1)
	005 034	007		Shift Left
	005 035	346		And A w 136
	005 036	136		
	005 037	062		Load Mem w A, Direct
	005 040	067		
	005 041	005		
	005 042	376		Compare A w 106
	005 043	106		
	005 044	070		Jump Rel if less
	005 045	020		(2)
	005 046	376		Compare A w 116
	005 047	116		
	005 050	060		Jump Rel if not less
	005 051	014		(2)
	005 052	376		Compare A w 112
	005 053	112		

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DZ8S2-28-RO

po box 6528, denver, colorado 80206 (303) 861-1686

PROGRAM: Z-80 OPERATING SYSTEM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
	005 054	060		Jump Rel if not less
	005 055	003		(3)
	005 056	257		Clear A
	005 057	030		Jump Rel
	005 060	002		(4)
(3)	005 061	076		Load A w "H"
	005 062	310		
(4)	005 063	062		Load M w A, Direct
	005 064	247		
	005 065	001		
(2)	005 066	052		Load H&L, Direct
	005 067	*		
	005 070	005		
	005 071	315		Call (Home Erase)
	005 072	346		
	005 073	000		
	005 074	351		Load Prog Ctr w H&L
	005 075			
	005 076			
	005 077			
	005 100			Ø (User set)
	005 101			
	005 102	167		1 Read
	005 103	000		
	005 104	040		2 Write
	005 105	001		
	005 106	000		3 Octal Dump
	005 107	003		
	005 110	221		4 Octal Program
	005 111	004		
	005 112	000		5 Hex Dump
	005 113	003		
	005 114	221		6 Hex Program
	005 115	004		
	005 116			7 (User Set)
	005 117			
	005 120			8 (User Set)
	005 121			
	005 122			9 (User Set)
	005 123			
	005 124	315		Call (TV)
	005 125	372		
	005 126	000		
	005 127	303		Jump Uncondx
	005 130	242		
	005 131	004		

PROGRAM: Z-80 OPERATING SYSTEM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
Mem List	005 132	136		Load E w Mem
	005 133	315		Call (Char)
	005 134	106		
	005 135	002		
	005 136	030		Jump Rel
	005 137	014		
H&L List	005 140	134		Load E w H
	005 141	315		Call (Char)
	005 142	106		
	005 143	002		
	005 144	135		Load E w L
	005 145	315		Call (Char)
	005 146	106		
	005 147	002		
	005 150	036		Load E w 003
	005 151	003		
	005 152	030		Jump Rel
	005 153	002		
	24 Spaces	005 154	036	
005 155		024		
Spacer	005 156	315		Call (Space)
	005 157	370		
	005 160	000		
	005 161	035		Dec E
	005 162	040		Jump Rel n Zero
	005 163	372		
	005 164	311		Return
	005 165	377		(Home Erase)
	005 166	046		(Spaces)
	005 167	313		K
	005 170	305		E
	005 171	331		Y
	005 172	302		B
	005 173	317		O
	005 174	301		A
	005 175	322		R
	005 176	304		D
	005 177	240		
	005 200	320		P
	005 201	322		R
	005 202	317		O
	005 203	307		G
005 204	322		R	

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DZ8S2-30-R0

po box 6528, denver, colorado 80206 (303) 861-1686

PROGRAM: Z-80 OPERATING SYSTEM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
	005 205	301	A	
	005 206	315	M	
	005 207	315	M	
	005 210	305	E	
	005 211	322	R	
	005 212	147	(Spaces)	
	005 213	301	A	
	005 214	344	d	
	005 215	344	d	
	005 216	362	r	
	005 217	345	e	
	005 220	363	s	
	005 221	363	s	
	005 222	272	:	
	005 223	002	(Spaces)	
	005 224	000	(Return)	
	005 225	377	(Home Erase)	
	005 226	012		
	005 227	332	Z	
	005 230	255	-	
	005 231	270	8	
	005 232	260	O	
	005 233	240		
	005 234	317	O	
	005 235	320	P	
	005 236	240		
	005 237	323	S	
	005 240	331	Y	
	005 241	323	S	
	005 242	013		
	005 243	317	O	
	005 244	360	P	
	005 245	364	t	
	005 246	351	i	
	005 247	357	o	
	005 250	356	n	
	005 251	363	s	
	005 252	272	:	
	005 253	070		
	005 254	261	l	
	005 255	240		
	005 256	322	R	
	005 257	305	E	
	005 260	301	A	
	005 261	304	D	
	005 262	032		
	005 263	262	2	
	005 264	240		
	005 265	327	W	
	005 266	322	R	
	005 267	311	l	
	005 270	324	T	

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DZ8S2-31-R0 po box 6528, denver, colorado 80206 (303) 861-1686

PROGRAM: Z-80 OPERATING SYSTEM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
	005 271	305		E
	005 272	031		
	005 273	263		3
	005 274	240		
	005 275	317		O
	005 276	343		C
	005 277	364		T
	005 300	341		A
	005 301	354		L
	005 302	240		
	005 303	304		D
	005 304	365		U
	005 305	355		M
	005 306	360		P
	005 307	024		
	005 310	264		4
	005 311	240		
	005 312	317		O
	005 313	343		C
	005 314	364		T
	005 315	341		A
	005 316	354		L
	005 317	240		
	005 320	320		P
	005 321	362		R
	005 322	357		O
	005 323	347		G
	005 324	362		R
	005 325	341		A
	005 326	355		M
	005 327	021		
	005 330	265		5
	005 331	240		
	005 332	310		H
	005 333	345		E
	005 334	370		X
	005 335	240		
	005 336	304		D
	005 337	365		U
	005 340	355		M
	005 341	360		P
	005 342	026		
	005 343	266		6
	005 344	240		
	005 345	310		H
	005 346	345		E
	005 347	370		X
	005 350	240		
	005 351	320		P
	005 352	362		R
	005 353	357		O

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DZ8S2-32-RO

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PROGRAM: Z-80 OPERATING SYSTEM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
	005 354	347		a
	005 355	362		r
	005 356	341		a
	005 357	355		m
	005 360	000		(Return)
	005 361			
	005 362			
	005 363			
	005 364			
	005 365			
	005 366			
	005 367			
	005 370			
	005 371			
	005 372			
	005 373	User defined		
	005 374			
	005 375			
	005 376			
	005 377			
			ff	