6800 OPERATING SYSTEM for the Digital Group 6800 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 Erasable 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 000 000 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 two accumulators and the index of the 6800 CPU are interpreted and displayed exactly as they were immediately prior to calling the TV storage dump program. The internal 6800 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. Memory may be displayed in either Hex or Octal.

A keyboard programming capability allows entering octal code directly from the system keyboard. The default address is 006 300. Programming may be entered at any available address, but programming below 006 300 runs the risk of destroying key portions of the operating system. Addresses 000 040 - 000 377 are also open for user programming. Programming may be entered in either Hex or Octal.

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.

Using the Digital Group 6800 Operating System

Initial Cassette Read:

After turning on the microprocessor, the message "READ 6800 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 register, flag, and stack data in Octal. A "5" will produce Hex listings.

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.

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" if in the operations monitor, or a "P" if in a TV dump. A title will be displayed along with the default address in Octal 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. A "6" will tive the above operation in Hex.

The page (high) and/or byte (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.

Use care when entering code below 006 000 (Octal) or 0600 (Hex). 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 pro-

gramming on cassette prior to initial execution to avoid potential programming self-destruction. If self-destriction 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 "Cassette being written" 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 6800 Operating System:

Memory Extent:

The 6800 Operating System is designed to occupy the lower 1.5K of the 6800 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 001 244 (byte) and 001 240 (page) to reflect the memory extent desired on the cassette. Example: You have 10K of 6800 system, and you wish to write 4K worth of programming. Since the octal equivalent of 4K is 017377, enter 377 at 001 244 and 017 at 001 240 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.

Data Rate:

RAM address 000 013 contains the timing loop constant which controls the resultant cassette baud rate. The normal constant is 105 (Octal), which results in 1100 baud. By making the constant larger, the timing loop is increased, and a baud rate of 393 baud is possible with a constant of 377, for example.

So what? Well, by using these lower data rates, a modem may be attached for inter-hobbyist telephone data transmissions at some standardized rate.

Address 000 013 will have to be preset prior to both Read and Write for proper operation.

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 002 060 in place of the byte following the point in question. This will display and interpret the regusters and flags, generally giving a much better picture of what is happening in that "insolvable problem." An unconditional branch is "176," "002," 060."

Interrupts/$\overline{\text{IRQ}}$, $\overline{\text{NMI}}$, SWI

The 6800 has four reset or interrupt addresses at the high 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 the interrupts through the EROM to the beginning of page 000 as shown in the software listings. The user may now vector forward these interrupts as desired, but interrupt level programming is best left to the experts.

Reset:

The Reset function on the 6800 will force programming to begin at address 377 376. The Reset is used to control the Operations Monitor and the initial cassette read operation. The EROM has control of Reset finally branching it forward to address 005 000 where the Operations Monitor resides.

Operations Monitor:

Page 005 of the 6800 Operating System is dedicated to aiding the user to make his program selections. The title area used bytes 005 124 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 005 313 - 005 377 can be used to enter a set of titles in a special 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 "5 Go" to the Operations Monitor message.

Address	Data	Explanation
005 313	267	"7"
005 314	001	1 space
005 315	307	"G"
005 316	357	"o"
005 317	000	End of message.

The program routing 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 odd address boundary, and the page portion on the even address.

Example: You have designed the above program "Go" to execute from address 006 300. Since you also wish to branch to "Go" from a "7" entry when in the Operations Monitor, place an "006" at address 005 116 and a "300" 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:

Subroutine	Address	Operations and Comments
TV	377 322	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	377 320	Prints a space (blank position) on the TV. Accumulator need not be preset. Accumulator will return cleared.
Home Erase	377 261	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 cleared at end.
TV Editor	002 000	Previously described during Operations Monitor Operations. Preset 000 026 (high) and 000 027 (low) to the address of initial byte of the message prior to calling. Accumulator and index are cleared or changed when subroutine ends.
Keyboard	001 000	This subroutine loops until an MSB keypressed strobe bit goes high. The program another loop until the MSB returns to low level. The Accumulator A will have the input character.

Some suggested practice programs for those new to a 6800 micro-processor:

1. Clear the screen and write an "A"

Address	Data	Explanation
006 300	275	Call the subroutine "Home Erase"
006 301	377	
006 302	261	
006 303	206	Load Accumulator with the ASCII code for "A"
006 304	301	
006 305	275	Print the "A" on the screen
006 306	377	
006 307	322	
006 310	076	Halt & rejoice!
005 116	006	Modify the Operations Monitor to
005 117	300	execute the above program at 006 300

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

2. Modify the above program to print an "a".

3. Print your name.

4. Print your hame in the middle of the screen using "TV editor."

5. Print only the 128 possible characters on the screen and stop, using less than 20 bytes (Hint -- Load accum, Save, Print, Restore & Modify, Loop not end.)

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

PROGRAM: 6800 Operating System

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
	000 000			Unused
	000 001			"
	000 002	7E 176		User defined area for IRQ servicing
	000 003	*H		" " " " " "
	000 004	*L		" " " " " "
	000 005	7E 176		User defined area for NMI servicing
	000 006	*H		" " " " " "
	000 007	*L		" " " " " "
	000 010	7E 176		User defined area for SWI servicing
	000 011	*H		" " " " " "
	000 012	*L		" " " " " "
	000 013	45 105		Read Speed Constant
	000 014	*H		Cassette Start Address
	000 015	*L		" " "
	000 016	*H		Cassette Stop Address
	000 017	*L		" " "
	000 020	*		Reserved for Cassette Title Writer
	000 021	*		
	000 022	*		
	000 023	*		
	000 024			
	000 025			
	000 026			
	000 027			
	000 030			
	000 031			Reserved for pseudo Registers of
	000 032			Op System
	000 033			
	000 034			
	000 035			
	000 036			
	000 037			
	000 040			
	000 041			
	000 042			
	000 043			
	000 044			
	000 045			
	000 046			
	000 047			Reserved for Pseudo Registers at
	000 050			User's Option
	000 051			
	000 052			
	000 053			
	000 054			
	000 055			
	000 056			
	000 057			

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LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
	000 060			
	000 061			
	000 062			
	000 063			
	000 064			
	000 065			
	000 066			
	000 067			
	000 070			
	000 071			
	000 072			Area Open to User's "Zero Page" programming
	000 073			
	000 074			
	000 075			
	000 076			
	000 077			
	⋮	⋮		
	000 375			
	000 376	53 123		Cassette Initialized constant
	000 377	53 123		"

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LABEL	OCTAL ADDRESS	HEX CODE	OCTAL CODE	MNEMONIC	COMMENTS
Keyboard	001 000	86	266	In Ø *Improved* 176	Get the keyboard Input from Port Ø
	001 001	FE	376	006	
	001 002	ØØ	000	300	
	001 003	2A	052		Loop until a keypressed strobe arrive:
	001 004	FB	373		
	001 005	97	227		Save data in "Z24" Psuedo Reg.
	001 006	14	024		
	001 007	B6	266	In Ø	Get the keyboard again
	001 010	FE	376		
	001 011	ØØ	000		
	001 012	2B	053		Loop until the strobe ends
	001 013	FB	373		
	001 014	B6	226		Restore Data from "Z24"
	001 015	14	024		
	001 016	39	071		Return
(2)100 μs timer	001 017	86	206		Load Accum A with 015
	001 020	ØD	015		
(1)	001 021	4A	112		Decrement Accum A
	001 022	26	046		Loop not zero (1)
	001 023	FD	375		
	001 024	7A	172		Decrement "Z25"
	001 025	ØØ	000		
	001 026	15	025		
	001 027	26	046		Loop not zero (2)
	001 030	F6	366		
	001 031	39	071		Return
(3)10 ms timer	001 032	86	206		Load Accum A with 144
012 →	001 033	64	144		(10,000 microseconds)
1 ms	001 034	97	227		Transfer Accum to "Z25"
	001 035	15	025		
	001 036	BD	275		Call (microsecond timer)
	001 037	Øl	001		
	001 040	ØF	017		
	001 041	7A	172		Decrement "Z26"
	001 042	ØØ	000		
	001 043	16	026		
	001 044	26	046		Loop not zero (3)
	001 045	F4	364		
	001 046	39	071		Return
(4)Seconds timer	001 047	86	206		Load Accum A with 144
	001 050	64	144		(1000 microseconds)
	001 051	97	227		Transfer Accum to "Z26"
	001 052	16	026		
	001 053	BD	275		Call (Microseconds timer)
	001 054	Øl	001		
	001 055	lA	032		
	001 056	7A	172		Decrement "Z27"
	001 057	ØØ	000		

LABEL	OCTAL ADDRESS	HEX	OCTAL CODE	MNEMONIC	COMMENTS
	001 060	17	027		
	001 061	26	046		Loop not zero (4)
	001 062	F4	364		
	001 063	39	071		Return
(5)Minutes timer	001 064	86	206		Load Accum A with 074
	001 065	3C	074		(60 seconds)
	001 066	97	227		Transfer Accum to "Z27"
	001 067	17	027		
	001 070	BD	275		Call (Seconds)
	001 071	01	001		
	001 072	27	047		
	001 073	5A	132		Decrement Accum B
	001 074	26	046		Loop not zero (5)
	001 075	F6	366		
	001 076	39	071		Return
	001 077	00	000		
Write Cassette	001 100	0F	017		Disable Interrputs
	001 101	8E	216		Load Stack Pointer
	001 102	01	001		
	001 103	FF	377		
Leader	001 104	86	206		Load Accum A with 001
	001 105	01	001		
	001 106	B7	267	Out 1	Put out the "mark tone"
	001 107	FE	376		
	001 110	01	001		
	001 111	86	206		Load Accum A with 005
	001 112	05	005		(Set up a 5 second delay)
	001 113	97	227		Transfer Accum to "Z27"
	001 114	17	027		
	001 115	BD	275		Call (Seconds timer)
	001 116	01	001		
	001 117	27	047		
Start	001 120	DE	336		Load Index with start address
	001 121	0C	014		(Z14=H, Z15-L)
(15)Byte Write	001 122	86	206		Load Accum A with 011
	001 123	09	011		
	001 124	97	227		Transfer Accum to "Z24"
	001 125	14	024		
	001 126	48	110		Clear Carry by shifting Left
	001 127	A6	246		Load Accum with mem,indexed
	001 130	00	000		
(2)	001 131	49	111		Rotate Accum Left
	001 132	B7	267	Out 1	Send Start Bit,then 8 data bits
	001 133	FE	376		
	001 134	01	001		
	001 135	97	227		Transfer Accum to "Z25"
	001 136	15	025		
	001 137	C6	306		Load Accum B with 002

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LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	001 140	02 002		
	001 141	8D 275		Call (EROM Delay Loop)
	001 142	FF 377		
	001 143	A5 245		
EROM Read	001 144	C6 306		Load Accum B with 004
timing equalize	001 145	04 004		
(1)	001 146	5A 132		Decrement B
	001 147	26 046		Loop not zero (1)
	001 150	FD 375		
	001 151	96 226		Transfer "Z25" back to Accum
	001 152	15 025		
	001 153	7A 172		Decrement "Z24"
	001 154	00 000		
	001 155	14 024		
	001 156	26 046		Branch not zero (2)
	001 157	E9 351		
Stop Bit	001 160	86 206		Load Accum with 001
	001 161	01 001		
	001 162	B7 267	Out 1	(Send Stop Bit)
	001 163	FE 376		
	001 164	01 001		
	001 165	C6 306		Load Accum B with 004
	001 166	04 004		
	001 167	BD 275		Call (EROM Delay Loop)
	001 170	FF 377		
	001 171	AF 245		
End of Write[2]	001 172	96 226		Load Accum with "Z17"
	001 173	0F 017		(Stop byte address)
	001 174	91 221		Compare Accum with "Z15"
	001 175	0D 015		(Present byte address)
	001 176	26 046		Branch not equal (3)
	001 177	09 011		(not end yet)
	001 200	96 226		Load Accum with "Z16"
	001 201	0E 016		(Stop Page Address)
	001 202	91 221		Compare Accum with "Z14"
	001 203	0C 014		(Present Page Address)
	001 204	26 046		Branch not equal
	001 205	03 003		(not end yet)
	001 206	7E 176		Branch uncondx
	001 207	01 001		(Write trailer tone)
	001 210	8F 217		
not end yet	001 211	08 010		Increment X Index
	001 212	DF 337		Load "Z14" and "Z15"with X Index
	001 213	0C 014		(update address)
	001 214	7E 176		Branch Uncondx (15)
	001 215	01 001		(Byte Write)
	001 216	52 122		
End Tone	001 217	86 206		Load Accum with 005

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LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	001 220	05 005		(Set up a 5 sec. delay)
	001 221	97 227		Transfer Accum to "Z27"
	001 222	17 027		
	001 223	BD 275		Call (Seconds)
	001 224	01 001		
	001 225	27 047		
	001 226	7E 176		Branch uncondx
	001 227	05 005		(Finished - Return to Operations Mo
	001 230	00 000		
2K Write	001 231	86 206		Load Accum with 000
	001 232	00 000		
	001 233	97 227		Transfer Accum to "Z14"
	001 234	0C 014		
	001 235	97 227		Transfer Accum to "Z15"
	001 236	0D 015		
	001 237	86 206		Load Accum with 007
	001 240	07 007	*	
	001 241	97 227		Transfer Accum to "Z16"
	001 242	0E 016		
	001 243	86 206		Load Accum with 377
	001 244	FF 377		
	001 245	97 227		Transfer Accum to "217"
	001 246	0F 017		
Write message	001 247	86 206		Load Accum with 265
	001 250	B5 265		
	001 251	97 227		Transfer Accum to "Z27"
	001 252	17 027		
	001 253	86 206		Load Accum with 001
	001 254	01 001		
	001 255	97 227		Transfer Accum to "Z26"
	001 256	16 026		
	001 257	BD 275		Call (TV Editor)
	001 260	02 002		
	001 261	00 000		
	001 262	7E 176		Branch Uncondx
	001 263	01 001		(Write Cassette)
	001 264	40 100		
Edit message	001 265	FF 377		(Home Erase)
	001 266	144		(Spaces)
	001 267	303		C
	001 270	341		a
	001 271	363		s
	001 272	363		s
	001 273	345		e
	001 274	364		t
	001 275	364		t
	001 276	345		e
	001 277	240		

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LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	001 300	342		b
	001 301	345		e
	001 302	351		i
	001 303	356		n
	001 304	347		g
	001 305	240		
	001 306	367		w
	001 307	362		r
	001 310	351		i
	001 311	364		t
	001 312	364		t
	001 313	345		e
	001 314	356		n
	001 315	000		(Return)
	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			
	001 334			
	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			
	001 356			
	001 357			

Reserved for stack

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LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	001 360			
	001 361			
	001 362			
	001 363			
	001 364			
	001 365			
	001 366			
	001 367			Reserved for stack
	001 370			
	001 371			
	001 372			
	001 373			
	001 374			
	001 375			
	001 376			
	001 377			

PROGRAM: 6800 Operating System

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
TV Editor	002 000	336		Load X Index with Start Address
	002 001	026		(Z26 has H, Z27 has L)
(1) Char Cont.	002 002	246		Load Accum with Mem, Indexed
	002 003	000		
	002 004	201		Compare Accum with 377
	002 005	377		
	002 006	046		Branch not equal (2)
	002 007	006		
	002 010	275		Call (Home Erase)
	002 011	377		
	002 012	261		
	002 013	176		Branch Uncondx (3)
	002 014	002		
	002 015	041		
(2)	002 016	204		AND Accum with 377
	002 017	377		(Character to be printed?)
	002 020	052		Branch if plus (4)
	002 021	006		
	002 022	275		Call (EROM TV)
	002 023	377		
	002 024	322		
	002 025	176		Branch Uncondx (3)
	002 026	002		
	002 027	041		
(4)	002 030	201		Compare Accum with OOO
	002 031	000		
	002 032	047		Branch if Equal (5)
	002 033	011		
	002 034	227		Transfer Accum to Z25
	002 035	025		
	002 036	275		Call (Spacer)
	002 037	377		
	002 040	307		
(3)	002 041	010		Increment Index
	002 042	176		Branch Uncondx (1)
	002 043	002		
	002 044	002		
(5)	002 045	071		Return
	002 046			Accum A
	002 047			Accum B
	002 050			Index H
	002 051		Reserved	Index L
	002 052		for	Status Flags
	002 053		TV Dump	Stack Pointer H
	002 054			Stack Pointer L
	002 055			Return Address H
	002 056			Return Address L
	002 057			Hex/Octal Char Select

PROGRAM: 6800 Operating System

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
TV Dump	002 060	066		Put Accum A on Stack
	002 061	007		Transfer Condition Codes to Accum
	002 062	267		Load Mem with Condition Codes
	002 063	002		
	002 064	052		
	002 065	062		Pull Accum A from Stack
	002 066	267		Load Mem with Accum A
	002 067	002		
	002 070	046		
	002 071	367		Load Mem with Accum B
	002 072	002		
	002 073	047		
	002 074	377		Store Index Register
	002 075	002		
	002 076	050		
	002 077	277		Store Stack Pointer
	002 100	002		
	002 101	053		
	002 102	062		Pull Accum A from Stack
	002 103	267		Load Mem with Accum A
	002 104	002		(Return H Address?)
	002 105	055		
	002 106	062		Pull Accum A from Stack
	002 107	267		Load Mem with Accum A
	002 110	002		(Return L Address?)
	002 111	056		
Regs Display	002 112	216		Load Stack Pointer
	002 113	001		
	002 114	377		
	002 115	206		Load Accum with 003
	002 116	003		
	002 117	227		Transfer Accum to "Z26"
	002 120	026		(H)
	002 121	206		Load Accum with 000
	002 122	000		(L)
	002 123	227		Transfer Accum to "Z27"
	002 124	027		
	002 125	275		Call (TV Editor)
	002 126	002		(Prints Title A, B, X)
	002 127	000		
	002 130	266		Load Accum with Mem
	002 131	002		(Get Accum A)
	002 132	046		
	002 133	275		Call (Dump out)
	002 134	002		
	002 135	266		
	002 136	206		Load Accum with 007
	002 137	011	ᵛ 030	

PROGRAM: 6800 Operating System

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	002 140	227		Transfer Accum to "Z25"
	002 141	025		
	002 142	275		Call (Spacer)
	002 143	377		
	002 144	307		
	002 145	266		Load Accum with Mem
	002 146	002		(Get Accum B)
	002 147	047		
	002 150	275		Call (Dump)
	002 151	002		
	002 152	266		
	002 153	206		Load Accum with 007
	002 154	007 — 026		
	002 155	227		Transfer Accum to "Z25"
	002 156	025		
	002 157	275		Call (Spacer)
	002 160	377		
	002 161	307		
	002 162	266		Load Accum with Mem
	002 163	002		(Get H Index)
	002 164	050		
	002 165	275		Call (Dump)
	002 166	002		
	002 167	266		
	002 170	266		Load Accum with Mem
	002 171	002		(Get L Index)
	002 172	051		
	002 173	275		Call (Dump)
	002 174	002		
	002 175	266		
	002 176	010		Increment X
	002 177	275		Call (TV Editor Cont)
	002 200	002		(Print 3 flag titles)
	002 201	002		
	002 202	275		Call (3 flags)
	002 203	003		(Print Ø or 1 for C,V, and Z)
	002 204	206		
	002 205	010		Increment X
	002 206	275		Call (TV Editor cont)
	002 207	002		(Print 3 more flag titles)
	002 210	002		
	002 211	275		Call (3 flags)
	002 212	003		(Print Ø or 1 for N, I, and H)
	002 213	206		
	002 214	010		Increment X
	002 215	275		Call (TV Editor cont.)
	002 216	002		(Print Stack and return titles)
	002 217	002		

PROGRAM: 6800 Operating System

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	002 220	266		Load Accum with Mem
	002 221	002		(H Stack Pointer)
	002 222	053 ·		
	002 223	275		Call (Dump out)
	002 224	002		
	002 225	266		
	002 226	266		Load Accum with Mem
	002 227	002		(L Stack Pointer)
	002 230	054		
	002 231	275		Call (Dump out)
	002 232	002		
	002 233	266		
	002 234	206		Load Accum with 014
	002 235	014 _ *030*		
	002 236	227		Transfer Accum to "Z25"
	002 237	025		
	002 240	275		Call (Spacer)
	002 241	377		
	002 242	307		
	002 243	266		Load Accum with mem
	002 244	002		(H Return address?)
	002 245	055		
	002 246	275		Call (Dump)
	002 247	002		
	002 250	266		
	002 251	266		Load Accum with mem
	002 252	002		(L Return Address?)
	002 253	056		
	002 254	275		Call (Dump)
	002 255	002		
	002 256	266		
	002 257	176		Branch Uncondx
	002 260	003		(Storage Dump)
	002 261	240		
	002 262			⎫
	002 263			⎬ not used
	002 264			⎭
	002 265			
Dump	002 266	366		Load Accum B with Mem
	002 267	002		(Octal/Hex Select Code)
	002 270	057		
	002 271	301		Compare B with "H"
	002 272	310		
	002 273	047		Branch if equal
	002 274	037		(Hex)
Octal	002 275	026	OC::	Transfer Accum A to Accum B
	002 276	111		Rotate A left
	002 277	111		Rotate A left

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LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	002 300	111		Rotate A left
	002 301	204		AND A with 003
	002 302	003		(strips off lower 6 bits)
	002 303	212		OR A with 260
	002 304	260		(Convert to Ascii)
	002 305	275		Call (TV)
	002 306	377		
	002 307	322		
	002 310	027		Transfer Accum B to Accum A
	002 311	104		Shift Right
	002 312	104		Shift Right
	002 313	104		Shift Right
	002 314	204		AND A with 007
	002 315	007		(Strip off upper 2 and lower 3 bit
	002 316	212		OR A with 260
	002 317	260		(Convert to ASCII)
	002 320	275		Call (TV)
	002 321	377		
	002 322	322		
	002 323	027		Transfer Accum B to Accum A
	002 324	204		AND A with 007
	002 325	007		(Strip off upper 5 bits)
	002 326	212		OR A with 260
	002 327	260		(Convert to ASCII)
	002 330	275		Call (TV)
	002 331	377		
	002 332	322		
	002 333	071		Return
Hex	002 334	026		Transfer Accum A to Accum B
	002 335	104		Shift Right
	002 336	104		Shift Right
	002 337	104		Shift Right
	002 340	104		Shift Right
	002 341	275		Call (Hex out)
	002 342	002		
	002 343	354		
	002 344	027		Transfer Accum B to A
	002 345	275		Call (Hex out)
	002 346	002		
	002 347	354		
	002 350	275		Call (space)
	002 351	377		
	002 352	320		
	002 353	071		Return
Hex	002 354	204		AND Accum A with 017
	002 355	017		(Strip off upper 4 bits)
	002 356	201		Compare A with 012
	002 357	012		(# or alpha hex code?)

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LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	002 360	053		Branch if less
	002 361	010		(#)
Alpha	002 362	200		Subtract 011 from Accum
	002 363	011		
	002 364	212		OR A with 300
	002 365	300		(Convert to alpha ASCII)
	002 366	275		Call (TV)
	002 367	377		
	002 370	322		
	002 371	071		Return
*	002 372	212		OR A with 260
	002 373	260		(Convert to numeric ASCII)
	002 374	275		Call (TV)
	002 375	377		
	002 376	322		
	002 377	071		Return
	003 000	377		(Home Erase)
	003 001	010		030 (Spaces)
	003 002	324	T	
	003 003	326	V	
	003 004	240		
	003 005	323	S	
	003 006	324	T	
	003 007	317	O	
	003 010	322	R	
	003 011	301	A	
	003 012	307	G	
	003 013	305	E	
	003 014	240		
	003 015	304	D	
	003 016	325	U	
	003 017	315	M	
	003 020	320	P	
	003 021	051		131 (Spaces)
	003 022	301	A	
	003 023	343	C	
	003 024	343	C	
	003 025	365	U	
	003 026	355	M	
	003 027	240		
	003 030	301	A	
	003 031	005		024 (Spaces)
	003 032	301	A	
	003 033	343	C	
	003 034	343	C	
	003 035	365	U	
	003 036	355	M	
	003 037	240		

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LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC		COMMENTS
	003 040	302	B		
	003 041	005		024	(spaces)
	003 042	311	I		
	003 043	356	n		
	003 044	344	d		
	003 045	345	e		
	003 046	370	x		
	003 047	005		O10	(spaces)
	003 050	000			(return)
	003 051	102		104	(spaces)
	003 052	306	F		
	003 053	354	l		
	003 054	341	a		
	003 055	347	g		
	003 056	363	s		
	003 057	272	.		
	003 060	032		072	(spaces)
	003 061	303	C		
	003 062	341	a		
	003 063	362	r		
	003 064	362	r		
	003 065	371	y		
	003 066	006		026	(spaces)
	003 067	317	O		
	003 070	366	v		
	003 071	345	e		
	003 072	362	r		
	003 073	346	f		
	003 074	354	l		
	003 075	357	o		
	003 076	367	w		
	003 077	006		025	(spaces)
	003 100	332	Z		
	003 101	345	e		
	003 102	362	r		
	003 103	357	o		
	003 104	006			(spaces)
	003 105	000			(return)
	003 106	031		054	(spaces)
	003 107	316	N		
	003 110	345	e		
	003 111	347	g		
	003 112	341	a		
	003 113	364	t		
	003 114	351	i		
	003 115	366	v		
	003 116	345	e		
	003 117	002		023	(spaces)

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LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	003 120	311	I	
	003 121	356	n	
	003 122	364	t	
	003 123	345	e	
	003 124	362	r	
	003 125	362	r	
	003 126	365	u	
	003 127	360	p	
	003 130	364	t	
	003 131	003	*022*	(Spaces)
	003 132	310	H	
	003 133	341	a	
	003 134	354	l	
	003 135	346	f	
	003 136	255	–	
	003 137	303	c	
	003 140	341	a	
	003 141	362	r	
	003 142	362	r	
	003 143	371	y	
	003 144	003		(Spaces)
	003 145	000		(Return)
	003 146	071	*070* ~~x2~~	(Spaces)
	003 147	323	s	
	003 150	364	t	
	003 151	341	a	
	003 152	343	c	
	003 153	353	k	
	003 154	240		
	003 155	320	P	
	003 156	357	o	
	003 157	351	i	
	003 160	356	n	
	003 161	364	t	
	003 162	345	e	
	003 163	362	r	
	003 164	004	*020*	(Spaces)
	003 165	322	R	
	003 166	345	e	
	003 167	364	t	
	003 170	365	u	
	003 171	362	r	
	003 172	356	n	
	003 173	240		
	003 174	301	A	
	003 175	344	d	
	003 176	344	d	
	003 177	362	r	

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LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	003 200	345	e	
	003 201	363	s	
	003 202	363	s	
	003 203	277	?	_-027_
	003 204	003		(Spaces)
	003 205	000		(Return)
3 Flags	003 206	306		Load Accum B with 003
	003 207	003		
	003 210	266		Load Accum A with Mem
	003 211	002		(Flags)
	003 212	052		
	003 213	204		AND Accum with 001
	003 214	001		(1 or∅ only)
	003 215	212		OR Accum with 260
	003 216	260		(Convert to ASCII)
	003 217	275		Call (TV)
	003 220	377		
	003 221	322		
	003 222	206		Load Accum with 013
	003 223	013 _← 32_		
	003 224	227		Transfer Accum to "Z25"
	003 225	025		
	003 226	275		Call (Spacer)
	003 227	377		
	003 230	307		
	003 231	164		Shift Mem Right
	003 232	002		(Flags)
	003 233	052		
	003 234	132		Decrement Accum B
	003 235	046		Branch not zero
	003 236	351		
	003 237	071		
Storage Dump	003 240	206		Load Accum with 000
	003 241	000		
	003 242	227		Transfer Accum to "Z31"
	003 243	031		
	003 244	227		Transfer Accum to "Z32"
	003 245	032		
	003 246	336		Load Index with Start Address
	003 247	031		(Z31=H, Z32=L)
Keyboard(4)	003 250	275		Call (Keyboard)
	003 251	001		
	003 252	000		
	003 253	204		AND A with 337
	003 254	337		(Convert any lower to upper case)
	003 255	201		Compare A to 200
	003 256	200		(Space bar)
	003 257	047		Branch if equal (1)

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LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	003 260	045		
	003 261	201		Compare A to "S"
	003 262	323		(Set Storage)
	003 263	047		Branch if equal (2)
	003 264	016		
	003 265	201		Compare A to "P"
	003 266	320		(Program)
	003 267	046		Branch not equal (3)
	003 270	003		
	003 271	176		Branch Uncondx
	003 272	004		(Go to Programmer)
	003 273	300		
	003 274	201		Compare A to "R"
	003 275	322		(Restart)
	003 276	046		Branch not equal (4)
	003 277	350		
	003 300	176		Branch Uncondx
	003 301	005		(Go to Operations Monitor)
	003 302	000		
(2)Set Address	003 303	206		Load Accum with 004
	003 304	004		
	003 305	227		Transfer Accum to Z26
	003 306	026		(H Edit address)
	003 307	206		Load Accum with 053
	003 310	053		
	003 311	227		Transfer Accum to Z27
	003 312	027		(L edit address)
	003 313	275		Call (TV Editor)
	003 314	002		
	003 315	000		
	003 316	275		Call (ASC11)
	003 317	004		
	003 320	100		
	003 321	227		Transfer Accum to Z31
	003 322	031		(Set H page address)
	003 323	177		Clear Z32
	003 324	000		(Clear L address)
	003 325	032		
(1)Pages	003 326	336		Load X Index with address
	003 327	031		
	003 330	275		Call (Home Erase)
	003 331	377		
	003 332	261		
H & L Print	003 333	226		Transfer "Z31" to Accum
	003 334	031		
	003 335	275		Call (Dump)
	003 336	002		(Print H Address)
	003 337	266		

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LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	003 340	226		Transfer "Z32" to Accum
	003 341	032		
	003 342	275		Call (Dump)
	003 343	002		(Print L address)
	003 344	266		
	003 345	275		Call (Space)
	003 346	377		
	003 347	320		
	003 350	275		Call (Space)
	003 351	377		
	003 352	320		
	003 353	206		Load Accum with 006
	003 354	006 *016*		(#of characters in each line)
	003 355	227		Transfer Accum to "Z33"
	003 356	033		
	003 357	275		Call (Line Writer)
	003 360	004		
	003 361	011		
	003 362	226		Load Accum with "Z32"
	003 363	032		(L)
	003 364	201		Compare Accum with 140
	003 365	140 *340*		(Check for end of 1st page)
	003 366	047		Branch if equal (5)
	003 367	013		(TV Keyboard)
	003 370	201 *001*		Compare Accum with 300
	003 371	300 *001*		(Check for end of 2nd page)
	003 372	047 *001*		Branch if equal (5)
	003 373	007 *001*		(TV Keyboard)
	003 374	201		Compare Accum with 002
	003 375	002 *012*		
	003 376	046		Branch not equal (6)
	003 377	006		(H & L address print)
	004 000	177		Clear "Z32"
	004 001	000		
	004 002	032		
(5)	004 003	176		Branch Uncondx
	004 004	003		(Keyboard)
	004 005	250		
(6)	004 006	176		Branch Uncondx
	004 007	003		(H & L Print)
	004 010	333		
(8)Line Writer	004 011	275		Call (Space)
	004 012	377		
	004 013	320		
	004 014	246		Load Accum with Mem, Indexed
	004 015	000		(Z31=H, Z32=L)
	004 016	275		Call (Dump)
	004 017	002		

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LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	004 020	266		
	004 021	174		Increment "Z32"
	004 022	000		
	004 023	032		
	004 024	046		Branch not zero (7)
	004 025	003		
	004 026	174		Increment "Z31"
	004 027	000		
	004 030	031		
(7)	004 031	336		Load X Index with Mem
	004 032	031		
	004 033	172		Decrement "Z33"
	004 034	000		(Another address in line printed)
	004 035	033		
	004 036	046		Branch not zero (8)
	004 037	351		
	004 040	071		Return
	004 041			
	004 042			
	004 043			
	004 044			
	044 045			
	044 046			
	004 047			
	004 050			
	004 051			
	004 052			
	004 053	377		(Home Erase)
	004 054	305	E	
	004 055	356	n	
	004 056	364	t	
	004 057	345	e	
	004 060	362	r	
	004 061	240		
	004 062	360	p	
	004 063	341	a	
	004 064	347	g	
	004 065	345	e	
	004 066	240		
	004 067	341	a	
	004 070	344	d	
	004 071	344	d	
	004 072	362	r	
	004 073	345	e	
	004 074	363	s	
	004 075	363	s	
	004 076	002		(spaces)
	004 077	000		(return)

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LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
ASCII	004 100	275	*oct 300*	Call (Keyboard)
	004 101	001	*channel op*	
	004 102	000		
ASCII-short	004 103	366		Load Accum B with Mem
	004 104	002		(Octal/Hex select code)
	004 105	057		
	004 106	301		Compare B with "H"
	004 107	310		
	004 110	047		Branch if equal
	004 111	056		(Hex)
ASCll-Octal	004 112	026		Transfer Accum A to Accum B
	004 113	275		call (TVASCII)
	004 114	004		
	004 115	223		
	004 116	027		Transfer Accum B to Accum A
	004 117	110		Shift left
	004 120	110		Shift left
	004 121	110		Shift left
	004 122	110		Shift left
	004 123	110		Shift left
	004 124	110		Shift left
	004 125	227		Transfer Accum to Z34
	004 126	034		
	004 127	275		Call (Keyboard)
	004 130	001		
	004 131	000		
	004 132	026		Transfer Accum A to B
	004 133	275		Call (TV ASCll)
	004 134	004		
	004 135	223		
	004 136	027		Transfer Accum B to A
	004 137	110		Shift left
	004 140	110		Shift left
	004 141	110		Shift left
	004 142	204		AND Accum with 070
	004 143	070		
	004 144	232		OR Accum with "Z34"
	004 145	034		
	004 146	227		Transfer Accum to "Z34"
	004 147	034		
	004 150	275		Call (Keyboard)
	004 151	001		
	004 152	000		
	004 153	026		Transfer Accum A to Accum B
	004 154	275		Call (TV Ascii)
	004 155	004		
	004 156	223		
	004 157	027		Transfer Accum B to Accum A

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LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	004 160	204		AND Accum with 007
	004 161	007		
	004 162	232		OR Accum with "Z34"
	004 163	034		
	004 164	026		Transfer Accum A to Accum B
	004 165	176		Branch Uncondx
	004 166	004		(TV Delay)
	004 167	212		
ASCll-HEX	004 170	275		Call (Hex Short)
	004 171	004		
	004 172	246		
	004 173	110		Shift left
	004 174	110		Shift left
	004 175	110		Shift left
	004 176	110		Shift left
	004 177	227		Transfer Accum to "Z34"
	004 200	034		
	004 201	275		Call (Hexer)
	004 202	004		
	004 203	243		
	004 204	232		OR Accum with "Z34"
	004 205	034		
	004 206	026		Transfer Accum A to Accum B
	004 207	275		Call (Space)
	004 210	377		
	004 211	320		
TV Delay	004 212	206		Load Accum with 031
	004 213	031		(¼ second)
	004 214	227		Transfer Accum to "Z26"
	004 215	026		
	004 216	275		Call (MS timer)
	004 217	001		
	004 220	032		
	004 221	027		Transfer Accum B to Accum A
	004 222	071		Return
TV ASCII	004 223	201		Compare Accum with 300
	004 224	300		
	004 225	053		Branch if less
	004 226	006		(number)
alpha TV	004 227	204		AND A with 337
	004 230	337		(Convert to Upper Case)
	004 231	275		Call (TV)
	004 232	377		
	004 233	322		
	004 234	071		Return
number TV	004 235	212		OR Accum with 040
	004 236	040		
	004 237	275		Call (TV)

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	004 240	377		
	004 241	322		
	004 242	071		Return
Hexer	004 243	275		Call (Keyboard)
	004 244	001		
	004 245	000		
Hex-short	004 246	201		Compare Accum with 272
	004 247	272		(Check for >"9")
	004 250	052		Branch if not less
	004 251	010		(alpha)
Number	004 252	026		Transfer Accum A to Accum B
	004 253	275		Call (TV ASCll)
	004 254	004		
	004 255	223		
	004 256	027		Transfer Accum B to Accum A
	004 257	204		AND Accum with 017
	004 260	017		(Drop 4 MSB's)
	004 261	071		Return
Alpha	004 262	204		AND Accum with 337
	004 263	337		(Convert to Upper Case)
	004 264	026		Transfer Accum A to Accum B
	004 265	275		Call (TV ASCll)
	004 266	004		
	004 267	223		
	004 270	027		Transfer Accum B to Accum A
	004 271	213		ADD 011 to Accum
	004 272	011		
	004 273	204		AND Accum with 017
	004 274	017		
	004 275	071		Return
	004 276			
	004 277			
Programmer	004 300	017		Enable Interrupts
	004 301	206		Load Accum with 006
	004 302	006		
	004 303	227		Transfer Accum to "Z26"
	004 304	026		(H)
	004 305	206		Load Accum with 000
	004 306	000		
	004 307	227		Transfer Accum to "Z27"
	004 310	027		(L)
	004 311	275		Call (TV Editor)
	004 312	002		
	004 313	000		
	004 314	206		Load Accum with 006
	004 315	006	← Start page	
	004 316	227		Transfer Accum to Z36
	004 317	036		

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LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	004 320	206		Load Accum with 300
	004 321	300	← START Location	
	004 322	227		Transfer Accum to Z37
	004 323	037		
H&L Display	004 324	336		Load Index with start address
	004 325	036		(Z36=H, Z37=L)
	004 326	226		Transfer Z36 to Accum
	004 327	036		
	004 330	275		Call (Dump)
	004 331	002		
	004 332	266		
	004 333	226		Transfer Z37 to Accum
	004 334	037		
	004 335	275		Call (Dump)
	004 336	002		
	004 337	266		
Key	004 340	275		Call (Keyboard)
	004 341	001		
	004 342	000		
	004 343	204		AND A with 337
	004 344	337		(Convert lower case to upper case
	004 345	026		Transfer Accum A to Accum B
	004 346	275		Call (Home Erase)
	004 347	377		
	004 350	261		
	004 351	027		Transfer Accum B to Accum A
	004 352	201		Compare A with "H"
	004 353	310		(Set High Address?)
	004 354	046		Branch not equal
	004 355	016		
	004 356	275		Call (TV)
	004 357	377		
	004 360	322		
	004 361	275		Call (ASCll)
	004 362	004		
	004 363	100		
	004 364	227		Transfer Accum to "Z36"
	004 365	036		
Clear & Print	004 366	275		Call (Home Erase)
	004 367	377		
	004 370	261		
	004 371	176		Branch Uncondx
	004 372	004		(print whole updated adds)
	004 373	324		
	004 374	176		Branch Uncondx
	004 375	006		(continue on page 6 of mem)
	004 376	040		
	004 377			

PROGRAM: 6800 Operating System

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	005 000	017		Enable Interrupts
	005 001	216		Load Stack Pointer
	005 002	001		
	005 003	377		
	005 004	206		Load Accum with 005
	005 005	005		
	005 006	227		Transfer Accum to Z26
	005 007	026		
	005 010	206		Load Accum with 124
	005 011	124		
	005 012	227		Transfer Accum to Z27
	005 013	027		
	005 014	275		Call (TV Editor)
	005 015	002		
	005 016	000		
(1)	005 017	275		Call (Keyboard)
	005 020	001		
	005 021	000		
	005 022	201		Compare Accum with 272
	005 023	272		
	005 024	052		Branch if not less(1)
	005 025	371		
	005 026	201		Compare Accum with 260
	005 027	260		
	005 030	053		Branch if less (1)
	005 031	365		
	005 032	026		Transfer Accum A to Accum B
	005 033	201		Compare Accum A with 265
	005 034	265		
	005 035	053		Branch if less
	005 036	010		(Octal desired)
Hex	005 037	206		Load Accum with "H"
	005 040	310		
	005 041	267		Load Mem with Accum
	005 042	002		
	005 043	057		
	005 044	176		Branch Uncondx
	005 045	005		
	005 046	052		
Octal	005 047	177		Clear Mem
	005 050	002		
	005 051	057		
Option Select	005 052	275		Call (Erase)
	005 053	377		
	005 054	261		
	005 055	027		Transfer Accum B to Accum A
	005 056	110		Shift left
	005 057	204		AND Accum with 136

PROGRAM: 6800 Operating System

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	005 060	136		
	005 061	267		Load Mem with Accum
	005 062	005		(5067)
	005 063	067		
	005 064	026		Transfer Accum A to Accum B
	005 065	266		Load Accum with Mem
	005 066	005		
	005 067	*		
	005 070	267		Load Mem eith Accum
	005 071	005		(H Set)
	005 072	376		
	005 073	134		Increment Accum B
	005 074	176		Branch Uncondz
	005 075	005		
	005 076	364		
	005 077			
	005 100	*	H	Ø (User's Option)
	005 101	*	L	
	005 102	377		1 Read Cassette (2K Default)
	005 103	042		
	005 104	001		2 Write Cassette
	005 105	231		
	005 106	002		3 Octal Dump
	005 107	060		
	005 110	004		4 Octal Program
	005 111	300		
	005 112	002		5 Hex Dump
	005 113	060		
	005 114	004		6 Hex Program
	005 115	300		
	005 116	*	H	7
	005 117	*	L	
	005 120	*	H	8 (User's option)
	005 121	*	L	
	005 122	*	H	9
	005 123	*	L	
	005 124	377		(Home Erase)
	005 125	011		(Spaces)
	005 126	266	6	
	005 127	270	8	
	005 130	260	0	
	005 131	260	0	
	005 132	240		
	005 133	317	O	
	005 134	320	P	
	005 135	240		
	005 136	323	S	
	005 137	331	Y	

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LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	005 140	323	S	
	005 141	324	T	
	005 142	305	E	
	005 143	315	M	
	005 144	011		031 (Spaces)
	005 145	323	S	
	005 146	345	e	
	005 147	354	l	
	005 150	345	e	
	005 151	343	c	
	005 152	364	t	
	005 153	240		
	005 154	317	o	
	005 155	360	p	
	005 156	364	t	
	005 157	351	i	
	005 160	357	o	
	005 161	356	n	
	005 162	272	:	
	005 163	062		162 (Spaces)
	005 164	261	1	
	005 165	240		
	005 166	322	R	
	005 167	305	E	
	005 170	301	A	
	005 171	304	D	
	005 172	240		
	005 173	303	C	
	005 174	341	a	
	005 175	363	s	
	005 176	363	s	
	005 177	345	e	
	005 200	364	t	
	005 201	364	t	
	005 202	345	e	
	005 203	021		061 (Spaces)
	005 204	262	2	
	005 205	240		
	005 206	327	W	
	005 207	322	R	
	005 210	311	I	
	005 211	324	T	
	005 212	305	E	
	005 213	240		
	005 214	303	C	
	005 215	341	a	
	005 216	363	s	
	005 217	363	s	

PROGRAM: 6800 Operating System

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	005 220	345	e	
	005 221	364	t	
	005 222	364	t	
	005 223	345	e	
	005 224	020		*060* (Spaces)
	005 225	263	3	
	005 226	240		
	005 227	317	O	
	005 230	303	C	
	005 231	324	T	
	005 232	301	A	
	005 233	314	L	
	005 234	240		
	005 235	304	D	
	005 236	365	u	
	005 237	355	m	
	005 240	360	p	
	005 241	024		*-06A* (Spaces)
	005 242	264	4	
	005 243	240		
	005 244	317	O	
	005 245	303	C	
	005 246	324	T	
	005 247	301	A	
	005 250	314	L	
	005 251	240		
	005 252	320	P	
	005 253	362	r	
	005 254	357	o	
	005 255	347	g.	
	005 256	362	r	
	005 257	341	a	
	005 260	355	m	
	005 261	021		*061* (Spaces)
	005 262	265	5	
	005 263	240		
	005 264	310	H	
	005 265	305	E	
	005 266	330	X	
	005 267	240		
	005 270	304	D	
	005 271	365	u	
	005 272	355	m	
	005 273	360	p	
	005 274	026		*066* (Spaces)
	005 275	266	6	
	005 276	240		
	005 277	310	4	

PROGRAM: 6800 Operating System

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	005 300	305	E	
	005 301	330	X	
	005 302	240		
	005 303	320	P	
	005 304	362	r	
	005 305	357	o	
	005 306	347	g	
	005 307	362	r	
	005 310	341	a	
	005 311	355	m	
	005 312	023	- 063	(Spaces)
	005 313	241	!	(Next edit supplied by user.)
	005 314	000		
	005 315			
	005 316			
	005 317			
	005 320			
	005 321			
	005 322			
	005 323			
	005 324			
	005 325			
	005 326			
	005 327			
	005 330			
	005 331			
	005 332			
	005 333			
	005 334			
	005 335			
	005 336			
	005 337			
	005 340			
	005 341			
	005 342			
	005 343			
	005 344			
	005 345			
	005 346			
	005 347			
	005 350			
	005 351			
	005 352			
	005 353			
	005 354			
	005 355			
	005 356			
	005 357			

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	005 360			
	005 361			
	005 362			
	005 363			
	005 364	367		Load Memory with Accum B
	005 365	005		
	005 366	371		
	005 367	266		Load Accum with Memory
	005 370	005		
	005 371	*		
	005 372	267		Load Mem with Accum
	005 373	005		(L set)
	005 374	377		
	005 375	176		Branch Uncondx
	005 376	*	H	
	005 377	*	L	
	006 000	377		(Home Erase)
	006 001	046		(Spaces)
	006 002	313	K	
	006 003	305	E	
	006 004	331	Y	
	006 005	302	B	
	006 006	317	O	
	006 007	301	A	
	006 010	322	R	
	006 011	304	D	
	006 012	240		
	006 013	320	P	
	006 014	322	R	
	006 015	317	O	
	006 016	307	G	
	006 017	322	R	
	006 020	301	A	
	006 021	315	M	
	006 022	315	M	
	006 023	305	E	
	006 024	322	R	
	006 025	147		(Spaces)
	006 026	301	A	
	006 027	344	d	
	006 030	344	d	
	006 031	362	r	
	006 032	345	e	
	006 033	363	s	
	006 034	363	s	
	006 035	272	:	
	006 036	002		(Spaces)
	006 037	000		(return)

PROGRAM: 6800 Operating System

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	006 040	201		Compare Accum with "L"
	006 041	314		(Set Low Address?)
	006 042	046 ←		Branch not equal
	006 043	013		
	006 044	275		Call (TV)
	006 045	377		
	006 046	322		
	006 047	275		Call (ASC11)
	006 050	004		
	006 051	100		
	006 052	227		Transfer Accum to "Z37"
	006 053	037		
	006 054	176		Branch Uncondx
	006 055	004		
	006 056	366		
	006 057	201		Compare Accum with "S"
	006 060	323		(Storage Dump?)
	006 061	046		Branch not equal
	006 062	003		
	006 063	176		Branch Uncondx
	006 064	002		
	006 065	060		
	006 066	201		Compare Accum with "R"
	006 067	322		(Restart?)
	006 070	046		Branch not equal
	006 071	003		
	006 072	176		Branch Uncondx
	006 073	005		
	006 074	000		
	006 075	227		Transfer Accum to "Z34"
	006 076	034		(Save A)
	006 077	206		Load Accum with 010
	006 100	010		
	006 101	227		Transfer Accum to "Z33"
	006 102	033		(Back up counter)
(1)	006 103	172		Decrement "Z37"
	006 104	000		(L address)
	006 105	037		
	006 106	226		Transfer "Z37" to Accum
	006 107	037		
	006 110	201		Compare Accum with 377
	006 111	377		(Page rollback boundary)
	006 112	046		Branch not equal
	006 113	003		
	006 114	172		Decrement "Z36"
	006 115	000		(H address)
	006 116	036		
	006 117	172		Decrement "Z33"

PROGRAM: 6800 Operating System

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	006 120	000		
	006 121	033		
	006 122	046		Branch not zero (1)
	006 123	357		
	006 124	275		Call (Home erase)
	006 125	377		
	006 126	261		
Print last 8	006 127	206		Load Accum with 010
	006 130	010		(Print past 8 addresses)
	006 131	227		Transfer Accum to "Z33"
	006 132	033		
(2) PrintAddress	006 133	226		Transfer "Z36" to Accum
	006 134	036		(H address)
	006 135	275		Call (Dump)
	006 136	002		
	006 137	266		
	006 140	226		Transfer "Z37" to Accum
	006 141	037		(L address)
	006 142	275		Call (Dump)
	006 143	002		
	006 144	266		
	006 145	275		Call (Space)
	006 146	377		
	006 147	320		
	006 150	275		Call (Space)
	006 151	377		
	006 152	320		
	006 153	336		Load Index with address
	006 154	036		
	006 155	246		Load Accum with Mem, Indexed
	006 156	000		
	006 157	275		Call (Dump)
	006 160	002		
	006 161	266		
	006 162	206		Load Accum with 025
	006 163	025 *065 64 char*		
	006 164	227		Transfer Accum to "Z25"
	006 165	025		
	006 166	275		Call (spacer)
	006 167	377		
	006 170	307		
	006 171	174		Increment "Z37"
	006 172	000		(L address)
	006 173	037		
	006 174	046		Branch not zero
	006 175	003		
	006 176	174		Increment "Z36"
	006 177	000		(H address)

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	006 200	036		
	006 201	172		Decrement "Z33"
	006 202	000		
	006 203	033		
	006 204	046		Branch not zero (2)
	006 205	325		(another address)
	006 206	226		Transfer "Z36" to Accum
	006 207	036		(H)
	006 210	275		Call (Dump)
	006 211	002		
	006 212	266		
	006 213	226		Transfer "Z37" to Accum
	006 214	037		(L)
	006 215	275		Call (Dump)
	006 216	002		
	006 217	266		
	006 220	275		Call (Space)
	006 221	377		
	006 222	320		
	006 223	275		Call (Space)
	006 224	377		
	006 225	320		
	006 226	226		Transfer "Z34" to Accum
	006 227	034		(Restore A)
	006 230	275		Call (ASCll-short)
	006 231	004		
	006 232	103		
	006 233	336		Load Index with address
	006 234	036		
	006 235	247		Load Mem with Accum indexed
	006 236	000		
	006 237	206		Load Accum with 065
	006 240	065		Transfer Accum to "Z25"
	006 241	227		
	006 242	025		
	006 243	275		Call (Spacer)
	006 244	377		
	006 245	307		
	006 246	174		Increment "Z37"
	006 247	000		(L)
	006 250	037		
	006 251	046		Branch not zero
	006 252	003		
	006 253	174		Increment "Z36"
	006 254	000		(H)
	006 255	036		
	006 256	226		Transfer "Z36" to Accum
	006 257	036		

(handwritten note beside 006 240: 165 64char)

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	006 260	275		Call (Dump)
	006 261	002		
	006 262	266		
	006 263	226		Transfer "Z37" to Accum
	006 264	037		
	006 265	275		Call (Dump)
	006 266	002		
	006 267	266		
	006 270	206		Load Accum with "?"
	006 271	277		
	006 272	275		Call (TV)
	006 273	377		
	006 274	322		
	006 275	176		Branch Uncondx
	006 276	004		(Key)
	006 277	340		
	300	266		
	301	376		
	302	000		
	303	052		
	304	373		
	305	275		
	306	001		
	307	017		
	310	266		
	311	376		
	312	000		
	313	227		
	314	024		
	315	266		
	316	376		
	317	000		
	320	053		
	321	373		
	322	226		
	323	024		
	324	071		

PROGRAM: 6800 EROM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
System Init- ialize	377 000	017		Disable Interrupts
	377 001	216		Load Stack Pointer
	377 002	001		
	377 003	377		
	377 004	226		Load A with "Z376"
	377 005	376		(Constant area)
	377 006	201		Compare A with "123"
	377 007	123		
	377 010	046		Branch not equal (1)
	377 011	007		
	377 012	221		Compare Accum with "Z377"
	377 013	377		(Do both positions have "123"?)
	377 014	046		Branch not equal
	377 015	003		
	377 016	176		Branch unconditional
	377 017	005		(Operations Monitor)
	377 020	000		
(1) Disp. Msg.	377 021	275		Call (Home Erase)
	377 022	377		
	377 023	261		
	377 024	316		Load Index
	377 025	377		(Message start address)
	377 026	333		
(2)	377 027	246		Load A, Indexed
	377 030	000		
	377 031	275		Call (TV)
	377 032	377		
	377 033	322		
	377 034	010		Increment Index
	377 035	214		Compare Index with 377 370
	377 036	377		
	377 037	370		
	377 040	046		Branch not equal (2)
	377 041	365		
	377 042	206		Load A with "105"
	377 043	105		(Read Speed Constant for 1100 baud)
	377 044	227		Load "Z13" with A
	377 045	013		
	377 046	206		Load A with 000
	377 047	000		(Cassette Start Low & High Addr.)
	377 050	227		Load "Z14"
	377 051	014		
	377 052	227		Load "Z15"
	377 053	015		
	377 054	206		Load A with 007
	377 055	007		(Cassette Stop High Addr.)
	377 056	227		Load "Z16"
	377 057	016		

PROGRAM: 6800 EROM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	377 060	206		Load A with 377
	377 061	377		(Cassette Stop Low Addr.)
	377 062	227		Load "Z17"
	377 063	017		
Cassette	377 064	336		Load Index with Memory
Read	377 065	014		(Z14 & Z15) - Gets Start Addr.
Byte Read	377 066	206		Load Accum with 010
	377 067	010		(# Bits)
	377 070	227		Transfer Accum to "Z26"
	377 071	026		
Clear Start	377 072	266		In 1
Bit	377 073	376		
	377 074	001		
	377 075	204		AND Accum A with 001
	377 076	001		
	377 077	046		Branch not zero
	377 100	371		(Looking for start)
	377 101	306		Load Accum B with 003
	377 102	003		(Delay to middle of first bit)
	377 103	275		Call (Delay Loop)
	377 104	377		
	377 105	245		
Bits	377 106	206		Load Accum with 000
	377 107	000		
	377 110	227		Transfer Accum to "Z27"
	377 111	027		(Clear for temp byte storage)
Bit Read	377 112	306		Load Accum B with 002
	377 113	002		(Bit to Bit delay)
	377 114	266		In 1
	377 115	376		
	377 116	001		
	377 117	204		AND Accum with 001
	377 120	001		
	377 121	232		OR "Z27" with Accum
	377 122	027		
	377 123	227		Transfer Accum to "Z27"
	377 124	027		
	377 125	275		Call (Delay Loop)
	377 126	377		
	377 127	245		
	377 130	172		Decrement "Z26"
	377 131	000		
	377 132	026		
	377 133	047		Branch if zero
	377 134	010		(Byte ended - load mem)
	377 135	226		Transfer "Z27" to Accum
	377 136	027		
	377 137	110		Shift Accum Left

PROGRAM: 6800 EROM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	377 140	227		Transfer Accum back to "Z27"
	377 141	027		
	377 142	176		Branch Unconditional
	377 143	377		(Bit Read)
	377 144	112		
Load Byte	377 145	226		Transfer "Z27" to Accum
	377 146	027		
	377 147	247		Load Mem with Accum, Indexed
	377 150	000		
	377 151	246		Load Accum with Mem, Indexed
	377 152	000		
	377 153	221		Compare Accum with "Z27"
	377 154	027		
	377 155	047		Branch if equal
	377 156	005		(TV Display)
	377 157	206		Load Accum with "."
	377 160	256		
	377 161	176		Branch Unconditional
	377 162	377		(Write Char)
	377 163	205		
TV Display	377 164	226		Load Accum with "Z14"
	377 165	014		(Page #)
Hex Char Com	377 166	204		AND Accum with 017
	377 167	017		
	377 170	201		Compare Accum with 012
	377 171	012		(Hex alpha or #?)
	377 172	053		Branch if less
	377 173	007		(#)
Alpha	377 174	200		Subtract 011 from Accum
	377 175	011		
	377 176	212		OR Accum with 300
	377 177	300		(Convert to ASCII alpha Char)
	377 200	176		Branch Unconditional
	377 201	377		(Write Char)
	377 202	205		
#	377 203	212		OR Accum with 260
	377 204	260		(Convert to ASCII number)
Write Char	377 205	275		Call (TV)
	377 206	377		
	377 207	322		
End Check	377 210	226		Load Accum with "Z17"
	377 211	017		
	377 212	221		Compare Accum with "Z15"
	377 213	015		
	377 214	046		Branch not equal
	377 215	011		(not end yet)
	377 216	226		
	377 217	016		

PROGRAM: 6800 EROM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONIC	COMMENTS
	377 220	221		Compare Accum with "Z14"
	377 221	014		
	377 222	046		Branch not equal
	377 223	003		(not end yet)
	377 224	176		Branch unconditional
	377 225	005		(Operations Monitor)
	377 226	000		
Not end yet	377 227	010		Increment X
	377 230	337		Load "Z14" with Index
	377 231	014		
	377 232	176		Branch unconditional
	377 233	377		(Byte Read)
	377 234	066		
	377 235			
	377 236			
	377 237			
	377 240			
	377 241			
	377 242			
	377 243			
	377 244			
Delay Loop	377 245	226		Load Accum with "Z13"
	377 246	013		
	377 247	112		Decrement Accum A
	377 250	046		Branch not zero
	377 251	375		
	377 252	132		Decrement Accum B
	377 253	046		Branch not zero
	377 254	370		
	377 255	071		Return
	377 256			
	377 257			
	377 260			
Home Erase	377 261	206		Load Accum with 377
	377 262	377		("Home" command)
	377 263	275		Call (TV)
	377 264	377		
	377 265	322		
	377 266	206		Load Accum with 002
	377 267	002		(2 times through)
	377 270	227		Load "Reg Z24" with Accum
	377 271	024		
	377 272	206		Load Accum with 000
	377 273	000		(256 Blanks)
	377 274	227		Load "Reg Z25" with Accum
	377 275	025		
	377 276	275		Call (Spacer)
	377 277	377		

PROGRAM: 6800 EROM

LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
	377 300	307		
	377 301	172		Decrement "Z24" counter
	377 302	000		
	377 303	024		
	377 304	046		Branch not zero
	377 305	370		
	377 306	071		Return
Spacer	377 307	275		Call (a space)
	377 310	377		
	377 311	320		
	377 312	172		Decrement "Z25" counter
	377 313	000		
	377 314	025		
	377 315	046		Branch not zero
	377 316	370		
	377 317	071		Return
a space	377 320	206		Load Accum with "Space"
	377 321	240		
TV	377 322	267		Out ∅
	377 323	376		
	377 324	000		
	377 325	206		Clear A
	377 326	000		
	377 327	267		Out ∅
	377 330	376		
	377 331	000		
	377 332	071		Return
Edit Message	377 333	322		R
	377 334	345		e
	377 335	341		a
	377 336	344		d
	377 337	240		
	377 340	266		6
	377 341	270		8
	377 342	260		0
	377 343	260		0
	377 344	240		
	377 345	311		I
	377 346	316		N
	377 347	311		I
	377 350	324		T
	377 351	311		I
	377 352	301		A
	377 353	314		L
	377 354	311		I
	377 355	332		Z
	377 356	305		E
	377 357	240		

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LABEL	OCTAL ADDRESS	OCTAL CODE	MNEMONICS	COMMENTS
	377 360	303		C
	377 361	341		a
	377 362	363		s
	377 363	363		s
	377 364	345		e
	377 365	364		t
	377 366	364		t
	377 367	345		e
	377 370	000		(IRQ) - High Address
	377 371	002		(IRQ) - Low Address
	377 372	000		(SWI) - High Address
	377 373	010		(SWI) - Low Address
	377 374	000		(NMI) - High Address
	377 375	005		(NMI) - Low Address
	377 376	377		(Reset) - High Address
	377 377	000		(Reset) - Low Address