

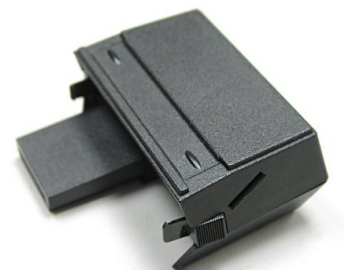
HP41CX



A PROGRAMMER'S HANDBOOK



COMPILED
BY
POUL KARRUP
1992-2015

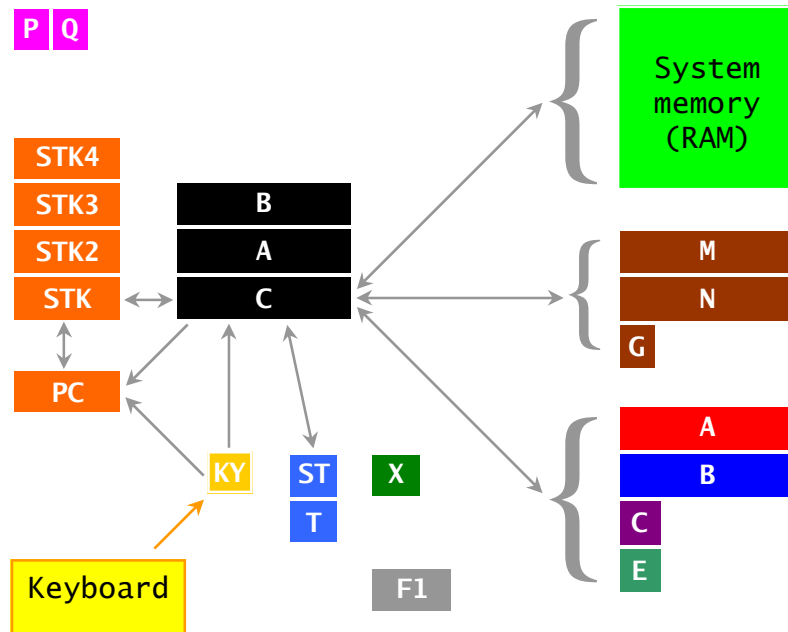


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HP 41 microprocessor

CPU register connections:



CPU:

C	56 bit	accumulator
A	56 bit	primary arithmetic register
B	56 bit	secondary arithmetic register
M	56 bit	storage register
N	56 bit	storage register
G	8 bit	storage register
PC	16 bit	program counter
STK	16 bit	4-level CPU return stack
KY	8 bit	keyboard buffer register
T	8 bit	beeper output register
ST	8 bit	CPU flag register (0-7)
X	6 bit	CPU flag register (9-13)
F1	14 bit	peripheral flag register
P	4 bit	pointer
Q	4 bit	pointer

DISPLAY:

A	48 bit	display register (bit 0-3 of each chr)
B	48 bit	display register (bit 4-7 of each chr)
C	12 bit	display register (bit 8 of each chr)
E	12 bit	display register (annunciators)

CPU FLAGS:

0	User flag (in the ST register)
1	User flag (in the ST register)
2	User flag (in the ST register)
3	User flag (in the ST register)
4	User flag (in the ST register)
5	User flag (in the ST register)
6	User flag (in the ST register)
7	User flag (in the ST register)
8	User flag
9	User flag
10	System flag (UserCode program pointer in ROM)
11	System flag (Stack lift enabled)
12	System flag (Program pointer in PRIVATE program)

RAM structure

3EF	Extended Memory #2	1007
301		769
2EF	Extended Memory #1	751
201		513
1FF	Top of Main Memory	511
	DATA register 00	
	Top of User programs	
	.END.	
	Free registers	
	I/O Buffer area	
	Alarm buffer area	
0C0	Key Assignments	192
0BF	Top of XF extended memory	191
040	Bottom of XF extended memory	64
	Nonexistent registers (void)	
00F	Status registers	15
000		0

User & system flags

- ♦ set at turn on
- ♦ cleared at turn on
- ♦ system flags - not applicable

- ♦ cleared if printer is absent
- ♦ matches flag 55 at turn on
- ♦ maintained by memory

00	♦ general use	28	♦ decimal point
01	♦ general use	29	♦ digit grouping
02	♦ general use	30	♦ CAT mode
03	♦ general use	31	♦ timer MDY / DMY
04	♦ general use	32	♦ IL manio
05	♦ general use	33	♦ IL lock
06	♦ general use	34	♦ ADRON / ADROFF
07	♦ general use	35	♦ disable autostart
08	♦ general use	36	♦ digit number 8,9
09	♦ general use	37	♦ digit number 4,5,6,7
10	♦ general use	38	♦ digit number 2,3,6,7
11	♦ auto execute	39	♦ digit number 1,3,5,7,9
12	♦ double wide print	40	♦ display FIX / SCI
13	♦ lower case print	41	♦ display ENG /FIX-ENG
14	♦ overwrite card protection	42	♦ trig mode DEG / GRAD
15	♦ IL-printer MAN / NORM	43	♦ trig mode RAD
16	♦ IL-printer TRACE	44	♦ continuous ON
17	♦ end of record	45	♦ system data entry
18	♦ TINTR enable	46	♦ partial key sequence
19	♦ general use	47	♦ SHIFT
20	♦ general use	48	♦ ALPHA
21	♦ printer enable	49	♦ low BAT
22	♦ number entry	50	♦ message
23	♦ ALPHA entry	51	♦ SST
24	♦ range error ignore	52	♦ PRGM mode
25	♦ error ignore	53	♦ I/O
26	♦ audio enable	54	♦ PSE
27	♦ USER mode	55	♦ Printer existence

Status registers

	6		5		4		3		2		1		0		
e	SHIFTED KEY ASSIGNMENTS										PTMP2		PROGRAM LINE #		00F
d	FLAG REGISTER														00E
c	SREG ABS. ADR.			printer use		COLD START 169			REG 00 ABS.ADR.			.END. ABS.ADR.			00D
b	3rd return		2nd return				1st return				PRGM POINTER				00C
a	6th return				5th return				4th return				3rd return		00B
f	UNSHIFTED KEY ASSIGNMENTS										last instruction exec.		PASN keycode		00A
Q	TEMPORARY ALPHA SCRATCH														009
P	ALPHA register (25-28)								ALPHA register (22-24)						008
O	ALPHA register (15-21)														007
N	ALPHA register (8-14)														006
M	ALPHA register (1-7)														005
L	USER stack register L														004
X	USER stack register X														003
Y	USER stack register Y														002
Z	USER stack register Z														001
T	USER stack register T														000
	13	12	11	10	9	8	7	6	5	4	3	2	1	0	

RAM register structure

One RAM register is 56 bits:

55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	---	---	---	---	---	---	---	---	---	---

or 14 nybbles:

13	12	11	10	9	8	7	6	5	4	3	2	1	0
----	----	----	----	---	---	---	---	---	---	---	---	---	---

or 7 bytes:

byte #6	byte #5	byte #4	byte #3	byte #2	byte #1	byte #0
---------	---------	---------	---------	---------	---------	---------

Text register format:

1	0	char	char	char	char	char	char
---	---	------	------	------	------	------	------

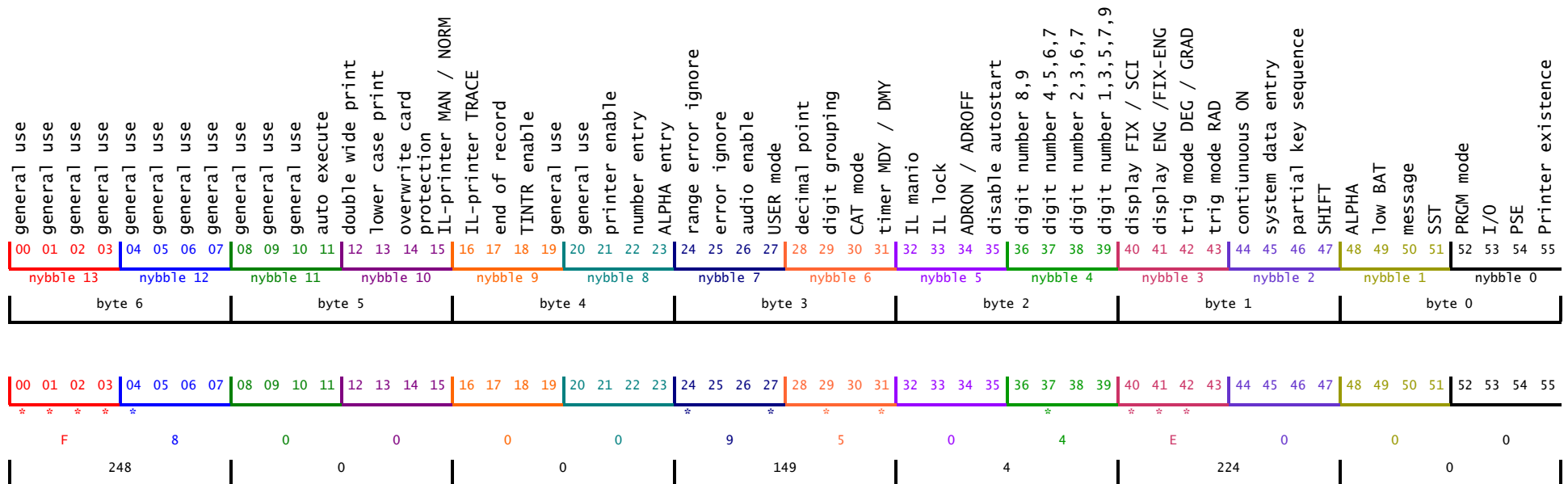
Numerical register format:

MS	Mantissa	XS	Exp.
----	----------	----	------

13	12	11	10	9	8	7	6	5	4	3	2	1	0
MS	M										XS	XP	
							ADR				S&X		
									KY				

MS 13 sign of mantissa
 M 3-12 mantissa
 XS 2 sign of exponent
 XP 0-1 exponent
 S&X 0-2 sign of exponent and exponent
 ADR 3-6 address field
 KY 3-4 key buffer field

Flag register d



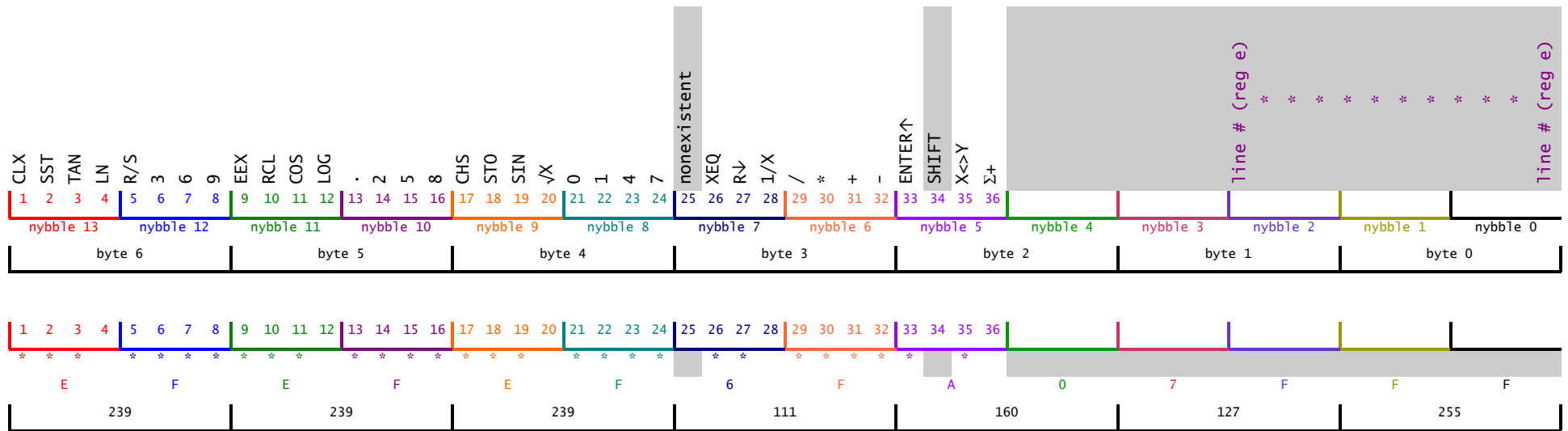
UserCode :

247, 248, 0, 0, 149, 4, 224, 0
RCL M
144, 117
STO d
145, 126

Mcode :

04E	C=0 ALL
2DC	PT=13
3D0	LD@PT- F
210	LD@PT- 8
29C	PT=7
250	LD@PT- 9
150	LD@PT- 5
010	LD@PT- 0
110	LD@PT- 4
390	LD@PT- E
3A8	WRIT (14)d

Key assign flag registers $\vdash$ & e



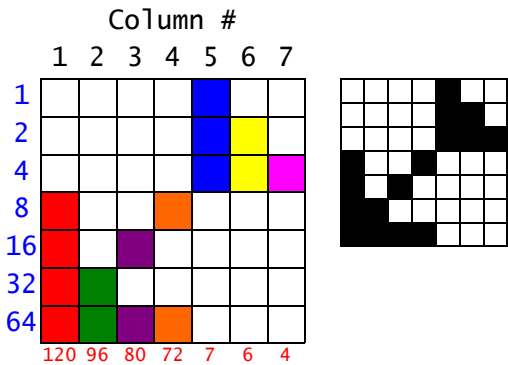
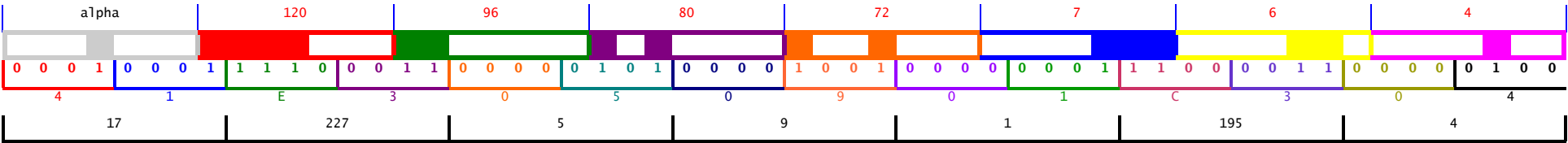
UserCode :

    $\vdash$ 	247, 239, 239, 239, 111, 160, 127, 255
RCL M	144, 117
STO e	145, 127
STO $\vdash$	145, 122

Mcode :

04E	C=0 ALL		
2DC	PT=13		
3D0	LD@PT- E		
210	LD@PT- F		
	LD@PT- E		
250	LD@PT- F		
150	LD@PT- E		
010	LD@PT- F		
110	LD@PT- 6		
390	LD@PT- F		
	LD@PT- A		
	LD@PT- 0		
	LD@PT- 7		
	LD@PT- F		
	LD@PT- F		
	LD@PT- F		
3E8	WRIT (15)e	2A8	WRIT (10) $\vdash$

BLDSPEC print



UserCode :

	247, 17, 227, 5, 9, 1, 195, 4
RCL M	144, 117
ACSPEC	167, 68
PRBUF	167, 74

Mcode :

04E	C=0 ALL
2DC	PT=13
3D0	LD@PT- F
210	LD@PT- 8
29C	PT=7
250	LD@PT- 9
150	LD@PT- 5
010	LD@PT- 0
110	LD@PT- 4
390	LD@PT- E
3A8	WRIT (14)d

M-code (Class 0)

xx xxxx xx00

	T	Z	Y	X	L	M	N	O	P	Q							
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
CLRF	384	304	204	004	044	084	144	284	104	244	0C4	184	344	2C4			clear CPU flag p
SETF	388	308	208	008	048	088	148	288	108	248	0C8	188	348	2C8			set CPU flag p
?FSET	38C	30C	20C	00C	04C	08C	14C	28C	10C	24C	0CC	18C	34C	2CC			set carry if CPU flag p is set
PT=	39C	31C	21C	01C	05C	09C	15C	29C	11C	25C	0DC	19C	35C	2DC			set pointer to digit p
?PT=	394	314	214	014	054	094	154	294	114	254	0D4	194	354	2D4			set carry if pointer is at p
LD@PT-	010	050	090	0D0	110	150	190	1D0	210	250	290	2D0	310	350	390	3D0	load C with p at pointer (PT=PT-1)
RCR		33C	23C	03C	07C	0BC	17C	2BC	13C	27C	0FC	1BC	37C	2FC			rotate C p digits right
WRIT	028	068	0A8	0E8	128	168	1A8	1E8	228	268	2A8	2E8	328	368	3A8	3E8	write C to selected user memory
READ		078	0B8	0F8	138	178	1B8	1F8	238	278	2B8	2F8	338	378	3B8	3F8	read selected user memory to C
HPIL=C	200	240	280	2C0	300	340	380	3C0									copy C[1;0] to HPIL register p
SELP	024	064	0A4	0E4	124	164	1A4	1E4	224	264	2A4	2E4	324	364	3A4	3E4	select peripheral to take control

M-code (Class 0)

XX XXXX XX00

NOP	000	no operation
LDI S&X	130	load the 10-bit word at next address to C[2;0]
PT=PT+1	3DC	decrement pointer (if PT=0 then PT=13)
PT=PT-1	3D4	increment pointer (if PT=13 then PT=0)
SLCT P	0A0	select P as active pointer
SLCT Q	0E0	select Q as active pointer
?P=Q	120	set carry if P and Q have the same value
C=M ALL	198	copy M register to C
M=C ALL	158	copy C register to M
C<>M ALL	1D8	exchange C and M registers
C=N ALL	0B0	copy N register to C
N=C ALL	070	copy C register to N
C<>N ALL	0F0	exchange C and N registers
C=G @PT,+	098	copy G register to C register digits at PT and PT+1
G=C @PT,+	058	copy C register digits at PT and PT+1 to G register
C<>G @PT,+	0D8	exchange C register digits at PT and PT+1 with G register
C=ST XP	398	copy ST to C[1;0]
ST=C XP	358	copy C[1;0] to ST
C<>ST XP	3D8	exchange ST and C[1;0]
ST=0	3C4	clears ST (CPU flags 0-7)
ST=T	298	copy T to ST
T=ST	258	copy ST to T
ST<>T	2D8	exchange ST and T
READ DATA	038	copy active user memory register to C
WRIT DATA	2F0	copy C to active user memory register
FETCH S&X	330	fetches the word at system memory given in C[6;3] to C[2;0]
WRIT S&X	040	writes word in C[2;0] to system memory given in C[6;3]
RAM SLCT	270	select user memory register specified in C[2;0]
PRPH SLCT	3F0	select peripheral unit specified in C[2;0]
CLRKEY	3C8	clears the keydown flag (immediately set if key is down)
?KEY	3CC	set carry if keydown flag is set
C=KEY KY	220	copy key code from KY to C[4;3]
GOTO KEY	230	KEY register is written into lowets byte of PC

A=B=C=0	1A0	clear A, B and C registers
SETDEC	2A0	set CPU to decimal mode
SETHex	260	set CPU to hexadecimal mode
C=C AND A	3B0	do logical AND on C and A registers and store result in C
C=C OR A	370	do logical OR on C and A registers and store result in C
RTN	3E0	return to address in STK
?C RTN	360	return to address in STK if carry is set
?NC RTN	3A0	return to address in STK if carry is clear
POP ADR	1B0	copy bottom STK to C[6;3] and STK drops
PUSH ADR	170	push STK up and store C[6;3] in bottom STK
GOTO ADR	1E0	jumps to address in C[6;3]
XQ>GO	020	pop return stack, turns the latest XQ into a GO
DSPOFF	2E0	turns display off
DSPTOG	320	toggles display on/off
?LOWBAT	160	set carry if battery is low
POWOFF	060	disp on: stop CPU, disp off: turn HP41 off, must be followed by NOP
?ALM	36C	set carry if an alarm from the timer has occured
?CRDR	32C	used with card reader
?EDAV	0AC	set carry if the diode of IR module is available
?FRAV	12C	set carry if a frame is available from HP-IL interface
?FRNS	26C	set carry if the frame transmitted (HPIL) not returns as sent
?IFCR	16C	set carry if HP-IL interface is ready
?ORAV	0EC	set carry if output register is available
?PBSY	3AC	set carry if HP82143 printer is busy
?SERV	2EC	set carry if any peripheral unit needs service
?SRQR	2AC	set carry if HPIL interface needs service
?WNDB	22C	set carry if there is data in the wand buffer
ENBANK1	100	enables primary bank
ENBANK2	180	enables secondary bank
ENBANK3	140	enables third bank
ENBANK4	1C0	enables forth bank
WPTOG	1F0	toggles write protection of HEPAX RAM specified in C[0]
ROM BLK	030	moves HEPAX ROM to memroy block specified in C[0]

M-code (Class 1)

xx xxxx xx01

Jump to adress **ABCD** :

1.word : **ccccddddd01**

2.word : **aaaabbbbtt**

tt is **00=?NC XQ**
 01=?C XQ
 10=?NC GO
 11=?C GO

M-code (Class 2)

xx xxxx xx10

	ALL	M	S&X	MS	XS	@PT	PT←	P-Q	
A=0	00E	01A	006	01E	016	002	00A	012	Clear A
B=0	02E	03A	026	03E	036	022	02A	032	Clear B
C=0	04E	05A	046	05E	056	042	04A	052	Clear C
A=C	10E	11A	106	11E	116	102	10A	112	Copy C to A
C=B	0CE	0DA	0C6	0DE	0D6	0C2	0CA	0D2	Copy B to C
B=A	08E	09A	086	09E	096	082	08A	092	Copy B to A
A<>C	0AE	0BA	0A6	0BE	0B6	0A2	0AA	0B2	Exchange A and C
C<>B	0EE	0FA	0E6	0FE	0F6	0E2	0EA	0F2	Exchange C and B
A<>B	06E	07A	066	07E	076	062	06A	072	Exchange A and B
C=C+A	20E	21A	206	21E	216	202	20A	212	Add A to C
A=A+C	14E	15A	146	15E	156	142	14A	152	Add C to A
A=A+B	12E	13A	126	13E	136	122	12A	132	Add B to A
C=C+C	1EE	1FA	1E6	1FE	1F6	1E2	1EA	1F2	Shift C 1 bit left
C=A-C	24E	25A	246	25E	256	242	24A	252	Subtract C from A
A=A-C	1CE	1DA	1C6	1DE	1D6	1C2	1CA	1D2	Subtract C from A
A=A-B	18E	19A	186	19E	196	182	18A	192	Subtract B from A
C=C+1	22E	23A	226	23E	236	222	22A	232	Increment C
A=A+1	16E	17A	166	17E	176	162	16A	172	Increment A
C=C-1	26E	27A	266	27E	276	262	26A	272	Decrement C
A=A-1	1AE	1BA	1A6	1BE	1B6	1A2	1AA	1B2	Decrement A
?C≠0	2EE	2FA	2E6	2FE	2F6	2E2	2EA	2F2	Carry if C≠0
?A≠0	34E	35A	346	35E	356	342	34A	352	Carry if A≠0
?B≠0	2CE	2DA	2C6	2DE	2D6	2C2	2CA	2D2	Carry if B≠0
?A≠C	36E	37A	366	37E	376	362	36A	372	Carry if A≠C
?A<C	30E	31A	306	31E	316	302	30A	312	Carry if A<C
?A<B	32E	33A	326	33E	336	322	32A	332	Carry if A<B
RSHFC	3CE	3DA	3C6	3DE	3D6	3C2	3CA	3D2	Shift C 1 digit right
RSHFA	38E	39A	386	39E	396	382	38A	392	Shift A 1 digit
RSHFB	3AE	3BA	3A6	3BE	3B6	3A2	3AA	3B2	Shift B 1 digit right
LSHFA	3EE	3FA	3E6	3FE	3F6	3E2	3EA	3F2	Shift A 1 digit left
C=0-C	28E	29A	286	29E	296	282	28A	292	1's complement
C=-C-1	2AE	2BA	2A6	2BE	2B6	2A2	2AA	2B2	2's complement

M-code (Class 3)

xx xxxx xx11

	JNC+	JC+	JNC-	JC-
01	00B	00F	3FB	3FF
02	013	017	3F3	3F7
03	01B	01F	3EB	3EF
04	023	027	3E3	3E7
05	02B	02F	3DB	3DF
06	033	037	3D3	3D7
07	03B	03F	3CB	3CF
08	043	047	3C3	3C7
09	04B	04F	3BB	3BF
0A	053	057	3B3	3B7
0B	05B	05F	3AB	3AF
0C	063	067	3A3	3A7
0D	06B	06F	39B	39F
0E	073	077	393	397
0F	07B	07F	38B	38F
10	083	087	383	387
11	08B	08F	37B	37F
12	093	097	373	377
13	09B	09F	36B	36F
14	0A3	0A7	363	367
15	0AB	0AF	35B	35F
16	0B3	0B7	353	357
17	0BB	0BF	34B	34F
18	0C3	0C7	343	347
19	0CB	0CF	33B	33F
1A	0D3	0D7	333	337
1B	0DB	0DF	32B	32F
1C	0E3	0E7	323	327
1D	0EB	0EF	31B	31F
1E	0F3	0F7	313	317
1F	0FB	0FF	30B	30F

	JNC+	JC+	JNC-	JC-
20	103	107	303	307
21	10B	10F	2FB	2FF
22	113	117	2F3	2F7
23	11B	11F	2EB	2EF
24	123	127	2E3	2E7
25	12B	12F	2DB	2DF
26	133	137	2D3	2D7
27	13B	13F	2CB	2CF
28	143	147	2C3	2C7
29	14B	14F	2BB	2BF
2A	153	157	2B3	2B7
2B	15B	15F	2AB	2AF
2C	163	167	2A3	2A7
2D	16B	16F	29B	29F
2E	173	177	293	297
2F	17B	17F	28B	28F
30	183	187	283	287
31	18B	18F	27B	27F
32	193	197	273	277
33	19B	19F	26B	26F
34	1A3	1A7	263	267
35	1AB	1AF	25B	25F
36	1B3	1B7	253	257
37	1BB	1BF	24B	24F
38	1C3	1C7	243	247
39	1CB	1CF	23B	23F
3A	1D3	1D7	233	237
3B	1DB	1DF	22B	22F
3C	1E3	1E7	223	227
3D	1EB	1EF	21B	21F
3E	1F3	1F7	213	217
3F	1FB	1FF	20B	20F
40			203	207

Jump distance **D** :

rddddddn11

r is 0=forward or 1=backwards

dddddd is the distance

n is 0=JC or 1=JNC

Custom error message

3A1	?NC XQ	
088	->22E8	ERRSUB
3C1	?NC XQ	
0B0	->2CF0	ENLCD
3BD	?NC GO	
01C	->07EF	MESSL
00D	M	
005	E	
013	S	
013	S	
001	A	
007	G	
205	E	
3DD	?NC XQ	
0AC	->2BF7	DSPLFT
201	?NC XQ	
070	->1C80	MSG105
3ED	?NC XQ	
08A	->22FB	ERR110

Error message table

3D5	?NC XQ	
088	->22F5	ERROR
XXX		

018	ALPHA DATA
022	DATA ERROR
02D	MEMORY LOST
038	NONEXISTENT
03C	NULL
043	PRIVATE
04F	OUT OF RANGE
056	PACKING
05F	TRY AGAIN
062	YES
064	NO
067	RAM
06A	ROM

Error messages

MAINFRAME:					
ALPHA DATA	14E2	PRIVATE	2184	RAM	2172
DATA ERROR	282D	OUT OF RANGE	00A2	ROM	21F0
NONEXISTENT	02E0	TRY AGAIN	2F72		

XF:					
DIR EMPTY	3C7B	KEYCODE ERR	310A	REC TOO LONG	3A2D
DUP FL	30E8	NAME ERR	3565	ROM 5 Bank 2:	
END OF FL	3E7E	NO DRIVE	3675	CHKSUM ERR	5219
FL NOT FOUND	3D2D	NO ROOM	30CF	FL SIZE ERR	5391
FL TYPE ERR	3D22	NO SUCH ALM	394A	END OF REC	5651

TIME:					
CAT EMPTY	3790	DATA ERROR Z		NO ROOM	
DATA ERROR X		ERROR = Dnn		TIMER ALARM	5EAE
DATA ERROR Y		ERROR = Rnn			

PRINTER:		
OUT OF PAPER	PRINT ERROR	PRINTER OFF

CARD READER:		
CARD	MALFUNCTION	SIZE ERR
CARD ERR	MRG ERR	TYPE t tr nn
CHECKSUM ERR	NO ROOM	WORKING
LOW BAT	RDY kk OF nn	

HP-IL:					
ADR ERR	72D7	FL TYPE ERR	788A	NO ROOM	79CE
DIR FULL	7726	MEDM ERR	742E	NO MEDM	
DRIVE ERR	7426	MEDM FULL	771F	READ ERR	7AA6
DUP FL NAME	7692	NAME ERR	72AE	SIZE ERR	7B9C
END OF FILE	773C	NO DRIVE	7CF4	TRANSMIT ERR	77E9
FL NOT FOUND	7855	NO KEYS	7DF1		
FL SECURED	7D10	NO PRINTER			

CMT-200:					
BSIZE>1771	B6AA	NO ROOM	B6D7	REACH EOB	B1D1
NO BUFFER	B12C	NO TIMER	B1C2		

Using interrupts

xFF4	Interrupt checked during Pause
xFF5	Interrupt checked if system flag 53 set
xFF6	Interrupt checked on wakeup /not ON key
xFF7	Interrupt checked when HP41 is turned off
xFF8	Interrupt checked just before CPU stops
xFF9	Interrupt checked on wakeup /ON key
xFFA	Interrupt checked on MEMORY LOST

Before interrupt routine :

1. Save nybble 3 to 10 of register C

After interrupt routine :

1. Restore nybble 3 to 10 of register C
2. Have P as selected pointer
3. Load user flags 48 to 55 into register ST (Status set zero SS0)
4. Have chip 0 selected
5. CPU must be in HEX mode
6. GOTO address 27F3

25D ?NC XQ
 01C ->0797 LDSST0
 260 SETHEX
 0A0 SLCT P
 3CD ?NC GO
 09E ->27F3 RMCK10

This entry point selects chip 0 and places the user flags 48 to 55 in C and then in ST register

This entry point returns to continue interrupt polling

M-CODE prompts

	Leftmost digit of 1st chr 2nd chr		
Example	op1	op2	Type of prompt
SIN	0	-	none
COPY	1	0	Alpha input only (null input OK)
DEL	1	1	3 digits (4 by pressing EEX)
	1	2	Same as COPY (but no null input)
FIX	1	3	1 digit (+ indirect register/indirect stack)
STO	2	0	2 digits (+indirect reg/stack + stack) (*1)
ASTO	2	1	Same as STO (*2)
FS?C	2	2	2 digits (+ indirect register/stack)
	2	3	Same as FS?C
LBL	3	0	Non-null alpha or 2 digits
XEQ	3	1	Same as LBL (+ stack/indirect stack)
	3	2	Same as LBL
GTO	3	3	Same as XEQ (*3)

- 1 When the +/- keys are pressed at the double prompt, the functions defaults to the storage arithmetic function
- 2 The storage arithmetic part does not work
- 3 If the decimal key is pressed at the double prompt the function changes to GTO.

Numeric entry : S&X of CPU A-register
Indirect numeric entry : +080h in S&X of A-reg.
ALPHA entry : Q status register

Partial key sequence

NEXT1	?NC XQ 0E45	NEXT3	?NC XQ 0E4B
NEXT2	?NC XQ 0E48	NEXT	?NC XQ 0E50

PTEMP1	in ST
PTEMP2	in G
Rightmost digit of Partial key code	in mantissa sign of A
Logical key code	in nybble 1 & 2 of N

PTEMP1							
bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
Decimal point	SHIFT	ALPHA	key from row 1 or 2	digit key	bit 0 of op1	bit 1 of op2	bit 0 of op2
					bit 8 of 1st chr of fcn name	bit 9 of 2nd chr of fcn name	bit 8 of 2nd chr of fcn name

PTEMP2							
bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
not used	INDIRECT bit	XROM bit	INSERT bit	0	bit 0 of op1	bit 1 of op2	bit 0 of op2
	set if indirect operand	set if XROM fcn	set if PRGM mode & PRGMable		bit 8 of 1st chr of fcn name	bit 9 of 2nd chr of fcn name	bit 8 of 2nd chr of fcn name

115	?NC XQ	
038	0E45	NEXT1
07B	JNC +0F	if backarrow key !
04C	?FSET 4	all other keys goes here
	:	
	:	
215	?NC XQ	
00C	0385	RSTSQ

Peripherals : The Card Reader

130	LDI S&X	
010	CON 16	
270	RAMSLCT	de-selects user memory
130	LDI S&X	
0FC	CON 252	
3F0	PRPH SLCT	selects the card reader

32C	?CDRD	sets carry if CardReader interrupt flag is set
038	READ DATA	reads data one record from CardReader to C[13;7] and C[6;0]
2F0	WRIT DATA	write on record from C[13;7] to CardReader buffer if card is present and motor is running
028	WRIT 0(T)	end write cycle
068	WRIT 1(Z)	start write cycle when motor is running
0A8	WRIT 2(Y)	end read cycle
0E8	WRIT 3(T)	set read mode
168	WRIT 5(M)	set CardReader interrupt flag if card is write protected
1E8	WRIT 7(O)	set CardReader interrupt flag if there is a card and the motor is running
2E8	WRIT 11(a)	read mode: clears interrupt flag if a record can be read write mode: sets interrupt flag if a record can be written to buffer
328	WRIT 12(b)	stop the motor
368	WRIT 13(c)	start the motor
3E8	WRIT 15(e)	set CardReader interrupt flag if the CardReader external flag is set

Peripherals : The wand

130	LDI S&X	
010	CON 16	
270	RAMSLCT	de-selects user memory
130	LDI S&X	
0FE	CON 254	
3F0	PRPH SLCT	selects the wand

22C	?WNDB	sets carry if data in wand buffer
038	READ DATA	reads data one byte to C[1;0]

Peripherals : The tone generator

258	T=ST	exchange the T value between 00h and FFh
298	ST=T	frequency is 158.000.000:(number of FF cycles + number of 00 cycles)
2D8	ST<>T	

Peripherals : The HP-IL interface

16C	?IFCR	set carry if interface ready
2AC	?SRQR	set carry if interface request service
12C	?FRAV	set carry if a frame is available from the loop
26C	?FRNS	set carry if frame not returned as it was sent
0EC	?ORAV	set carry if an output register is available

200	HPIL=C 0(T)	copies C[1;0] to HP-IL register 0
240	HPIL=C 1(Z)	copies C[1;0] to HP-IL register 1
280	HPIL=C 2(Y)	copies C[1;0] to HP-IL register 2
2C0	HPIL=C 3(X)	copies C[1;0] to HP-IL register 3
300	HPIL=C 4(L)	copies C[1;0] to HP-IL register 4
340	HPIL=C 5(M)	copies C[1;0] to HP-IL register 5
380	HPIL=C 6(N)	copies C[1;0] to HP-IL register 6
3C0	HPIL=C 7(O)	copies C[1;0] to HP-IL register 7

SELP r cccccccc01b copies cccccccc to HP-IL register r

024	SELP 0(T)
064	SELP 1(Z)
0A4	SELP 2(Y)
0E4	SELP 3(X)

124	SELP 4(L)
164	SELP 5(M)
1A4	SELP 6(N)
1E4	SELP 7(O)

024	SELP 0(T)	
03A	C=PREG 0	
003	?PFSET	copies HP-IL register 0 TO C[1;0]
064	SELP 1(Z)	
07A	C=PREG 1	
043	?PFSET	copies HP-IL register 1 TO C[1;0]
0A4	SELP 2(Y)	
0BA	C=PREG 2	
083	?PFSET	copies HP-IL register 2 TO C[1;0]
0E4	SELP 3(X)	
0FA	C=PREG 3	
0C3	?PFSET	copies HP-IL register 3 TO C[1;0]

124	SELP 4(L)	
13A	C=PREG 4	
103	?PFSET	copies HP-IL register 4 TO C[1;0]
164	SELP 5(M)	
17A	C=PREG 5	
143	?PFSET	copies HP-IL register 5 TO C[1;0]
1A4	SELP 6(N)	
1BA	C=PREG 6	
183	?PFSET	copies HP-IL register 6 TO C[1;0]
1E4	SELP 7(O)	
1FA	C=PREG 7	
1C3	?PFSET	copies HP-IL register 7 TO C[1;0]

Peripherals : The HP-IL interface

Register 0 : status	
bit 0	master clear
bit 1	clear IFC received
bit 2	write:set local ready read: RFC received
bit 3	send receive request
bit 4	listener active
bit 5	talker active
bit 6	controller active
bit 7	system controller

Register 2 : data bits	
bit 0	w:input data bits r:output data bits
bit 1	w:input data bits r:output data bits
bit 2	w:input data bits r:output data bits
bit 3	w:input data bits r:output data bits
bit 4	w:input data bits r:output data bits
bit 5	w:input data bits r:output data bits
bit 6	w:input data bits r:output data bits
bit 7	w:input data bits r:output data bits

Register 4 : lopp address	
bit 0	address bits
bit 1	address bits
bit 2	address bits
bit 3	address bits
bit 4	address bits
bit 5	scratch
bit 6	scratch
bit 7	scratch

Register 1 : control interrupt	
bit 0	w:enable FI line r:output register available
bit 1	w:not used r:frame received not as sent
bit 2	w:not used r:frame available
bit 3	w:not used r:service request received
bit 4	w:not used r:interface clear received
bit 5	w:output control bits r:input control bits
bit 6	w:output control bits r:input control bits
bit 7	w:output control bits r:input control bits

Register 3 : parallel poll	
bit 0	parallel poll response bit designation
bit 1	parallel poll response bit designation
bit 2	parallel poll response bit designation
bit 3	parallel poll polarity
bit 4	parallel poll enable
bit 5	parallel poll individual status
bit 6	automatic IDY sourcing in idle mode
bit 7	oscillator disable

Registers 5,6 & 7 : scratch	
bit 0	scratch
bit 1	scratch
bit 2	scratch
bit 3	scratch
bit 4	scratch
bit 5	scratch
bit 6	scratch
bit 7	scratch

Peripherals : The printer

3AC	?PBSY	set carry if the printer is busy
264	SELP 9	transfers control to the printer until an instruction with the rightmost bit set

while in control these instructions are understood by the printer:

003	BUSY?	set carry if the printer is busy
083	ERROR?	set carry if printer error
043	POWON?	set carry if printer is on
007	BUF=BUF+C	copy C[1;0] to printer buffer
03A	C=STATUS	copy printer status word to C[1;0] - next instruction must be 001h

printer status word:

bit	meaning
15-14	printer mode: 00 = MAN 10 = TRACE 01 = NORM
13	PRINT key is down
12	PAPER ADVANCE key is down
11	printer is OUT OF PAPER
10	printer battery is low
9	printer is idle (not printing)
8	printer buffer is empty
7	printer is using lower case (SF13)
6	printer is in graphics mode (column mode)
5	printer is using double width (SF12)
4	printer is printing right justified
3	last byte sent was End-Of-Line
2	printer error is occurring
1-0	always set

Peripherals : The timer

130	LDI S&X	
010	CON 16	
270	RAMSLCT	de-selects user memory
130	LDI S&X	
0FB	CON 21	
3F0	PRPH SLCT	selects the timer

status register bits:

bit	meaning
12	timer is in TEST A mode
11	timer is in TEST B mode
10	set if the interval timer is running
9	set if ALARM B is enabled (usually clear)
8	set if ALARM A is enabled (usually set)
7	set if CLOCK B is counting forwards
6	set if CLOCK A is counting forwards
5	set if timer chip supply voltage has been low
4	set if the interval timer has counted a whole interval
3	set if an overflow has occurred in CLOCK B
2	set if ALARM B register is the same as CLOCK B
1	set if an overflow has occurred in CLOCK A
0	set if ALARM A register is the same as CLOCK A

CLOCK REGISTER A	CURRENT TIME (1/100 SECONDS SINCE JAN 1 1900, DECIMALLY, RIGHT ALIGNED)
ALARM REGISTER A	TIME OF NEXT ALARM
SCRATCH REGISTER A	TIME WHEN CLOCK WAS LAST ADJUSTED
CLOCK REGISTER B	STOPWATCH TIME
ALARM REGISTER B	COLDSTART CONSTANT 0999999999000h
SCRATCH REGISTER B	BIT5 SET IF CLK24 FORMAT, BIT6 SET IF CLKTD FORMAT
A/B POINTER	
INTERVAL TIMER	
13 BIT STATUS REGISTER	
ACCURACY FACTOR REGISTER	

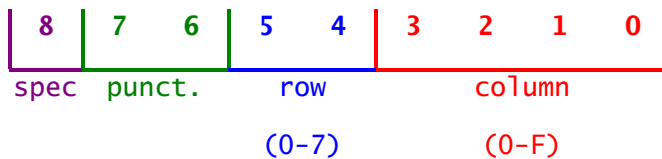
Peripherals : The timer

028	WRIT 0(T)	copy the C register to the active clock register
038	READ DATA	copy the active clock register to the C register
068	WRIT 1(Z)	as WRIT 0(T) but used after READ 1(Z), takes into account the time used since reading the time
078	READ 1(Z)	as READ DATA, used when correcting the time using T+X
0A8	WRIT 2(Y)	copy the C register to the active alarm register
0B8	READ 2(Y)	copy the active alarm register to the C register
0E8	WRIT 3(X)	if pointer set to A : copy C[5;0] to the timer status register (can only clear bits) if pointer set to B : copy C[16;4] to timer accuracy factor register (0 to 99.9 , C[16] = sign)
0F8	READ 3(X)	if pointer set to A : copy status register to C[12;0] if pointer set to B : copy the accuracy factor register to C[16;4]
128	WRIT 4(L)	copy C register to active scratch register
138	READ 4(L)	copy active scratch register to C register
168	WRIT 5(M)	copy C[4;0] to interval timer and start timer (0.01 to 999.99 seconds) each time the interval period has passed the timer interrupt flag is set (CLOCK function uses this)
178	READ 5(M)	copy the value of the interval timer to C[4;0]
1E8	WRIT 7(O)	stop the interval timer
228	WRIT 8(P)	clear test mode (A or B)
268	WRIT 9(Q)	set test mode (A or B)
2A8	WRIT 10(+)	disable the active alarm, but does not clear it ALARM A is re-enabled at turn-off, timer alarms (negative stopwatch alarms) can't be disabled
2E8	WRIT 11(a)	re-enable the disabled alarm
328	WRIT 12(b)	stop the clock in the active clock register (CLOCK A restarts as soon as CPU stops)
368	WRIT 13(c)	start the clock in the active clock register
3A8	WRIT 14(d)	set the A/B pointer to B
3E8	WRIT 15(e)	set the A/B pointer to A

Peripherals : The display

```

130 LDI S&X
010 CON 16
270 RAMSLCT de-selects user memory
130 LDI S&X
0FD CON 253
3F0 PRPH SLCT selects display
    
```



Bits:
 0-3 column of table
 4-5 row of table
 6-7 punctuation

7	6	
0	0	none
0	1	.
1	0	:
1	1	,

8 special character

BAT USER RAD SHIFT 0 1 2 3 4 PRGM ALPHA
 11 10 9 8 7 6 5 4 3 2 1 0

E

```

2F0 WRIT DATA writes C S&X to annunciators
178 READ 5(M) reads annunciators to C S&X
    
```

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	P	R	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
2		!	"	#	\$	%	&	'	(	)	*	+	=	-	.	/
3	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
4	!	@	a	b	c	d	e	f	g	h	i	j	k	l	m	n
5	o	p	q	r	s	t	u	v	w	x	y	z	{	}	~	
6																
7																

"Halfnuts" only

DISPLAY	PRINT	BYTE
e	e	7F
d	d	7E
c	c	7D
b	b	7C
a	a	7B
!-	!	7A
Q	_	79
P	↑	78
O	]	77
N	\	76
M	[	75

DISPLAY	PRINT	BYTE
:		3A
,		3B
<		3C
=		3D
>		3E
?		3F

Peripherals : The display

Instruction	Hex	# of chrs	Rotation	Digs in C
READ DATA	038	12	←	12 (1 each)
WRIT 0 (T)	028	12	→	12 (1 each)
READ 1 (Z)	078	12	←	12 (1 each)
WRIT 1 (Z)	068	12	→	12 (1 each)
READ 2 (Y)	0B8	12	←	12 (1 each)
WRIT 2 (Y)	0A8	12	→	12 (1 each)
READ 3 (X)	0F8	6	←	12 (2 each)
WRIT 3 (X)	0E8	6	→	12 (2 each)
READ 4 (L)	138	4	←	12 (3 each)
WRIT 4 (L)	128	4	→	12 (3 each)
WRIT 5 (M)	168	6	←	12 (2 each)
READ 6 (N)	1B8	1	←	1
WRIT 6 (N)	1A8	4	←	12 (3 each)
READ 7 (O)	1F8	1	→	1
WRIT 7 (O)	1E8	1	→	1
READ 8 (P)	238	1	→	1
WRIT 8 (P)	228	1	→	1
READ 9 (Q)	278	1	→	1
WRIT 9 (Q)	268	1	→	1
READ 10 (t-)	2B8	1	←	1
WRIT 10 (t-)	2A8	1	←	1
READ 11 (a)	2F8	1	←	1
WRIT 11 (a)	2E8	1	←	1
READ 12 (b)	338	1	→	2
WRIT 12 (b)	328	1	→	2
READ 13 (c)	378	1	←	2
WRIT 13 (c)	368	1	←	2
READ 14 (d)	3B8	1	→	3
WRIT 14 (d)	3A8	1	→	3
READ 15 (e)	3F8	1	←	3
WRIT 15 (e)	3E8	1	←	3

[illegible]

A	bit	3	2	1	0	3	2	1	0	3	2	1	0	3	2	1	0	3	2	1	0	3	2	1	0	3	2	1	0	3	2	1	0															
	char	12th				11th				10th				9th				8th				7th				6th				5th				4th				3rd				2nd				1st		
B	bit	7	6	5	4	7	6	5	4	7	6	5	4	7	6	5	4	7	6	5	4	7	6	5	4	7	6	5	4	7	6	5	4	7	6	5	4											
	char	12th				11th				10th				9th				8th				7th				6th				5th				4th				3rd				2nd				1st		
C	bit	8	8	8	8	8	8	8	8	8	8	8	8																																			
	char	12	11	10	9	8	7	6	5	4	3	2	1																																			
E	ann.	B	U	G	R	S	0	1	2	3	4	P	A																																			
	bit	12	11	10	9	8	7	6	5	4	3	2	1																																			

Port dependent jumps

341 ?NC XQ PORT DEP:
08C ->23D0 GO 1st quarter
qXX ->pQXX p000-p3FF

365 ?NC XQ PORT DEP:
08C ->23D9 GO 2nd quarter
qXX ->pQXX p400-p7FF

389 ?NC XQ PORT DEP:
08C ->23E2 GO 3rd quarter
qXX ->pQXX p800-pBFF

3AD ?NC XQ PORT DEP:
08C ->23EB GO 4th quarter
qXX ->pQXX pC00-pFFF

369 ?NC XQ PORT DEP:
03C ->0FD9 GO same quarter
qXX ->pQXX

349 ?NC XQ PORT DEP:
08C ->23D2 XQ 1st quarter
qXX ->pQXX p000-p3FF

36D ?NC XQ PORT DEP:
08C ->23DB XQ 2nd quarter
qXX ->pQXX p400-p7FF

391 ?NC XQ PORT DEP:
08C ->23E4 XQ 3rd quarter
qXX ->pQXX p800-pBFF

3B5 ?NC XQ PORT DEP:
08C ->23ED XQ 4th quarter
qXX ->pQXX pC00-pFFF

379 ?NC XQ PORT DEP:
03C ->0FDD XQ same quarter
qXX ->pQXX

NB! Musts be HEX mode. Uses 2 places in RTN-stack

HP41CX ENTRY POINTS

ENTRY	ADR	MCODE
-------	-----	-------

A

ABS	1076	
ABTS10	0D16	
ABTSEQ	0D12	149 034
ACOS	107D	
AD1_10	1809	
AD2_10	1807	01D 060
AD2_13	180C	
ADD1	1CE0	
ADD2	1CE3	
ADDONE	1800	001 060
ADRFCH	0004	
ADVNC	114D	
AFORMT	0628	
AGTO	1085	
AJ2	0DD4	
AJ3	0DD0	
ALCL00	06C9	
ALLOK	02CD	
ALPDEF	03AE	
ANN_14	075B	
ANNOUT	075C	
AOFF	1345	
AON	133C	
AOUT15	2C2B	
APHST_	2E62	
APND_	1FF3	

APND10	1FF5	
APNDDG	1FFA	
APNDNW	2D14	
APPEND	2D0E	
ARCL	108C	
ARGOUT	2C10	
ASCLCA	2C5E	
ASCLCD	2C5D	
ASHF	1092	
ASIN	1098	
ASN	109E	
ASN15	27C2	
ASN20	27CC	
ASRCH	26C5	
ASTO	10A4	
ATAN	10AA	
AVAIL	28C4	
AVAILA	28C7	
AVIEW	10B2	
AXEQ	10B5	

B

BAKAPH	09E3	
BAKDE	09A5	295 024
BCDBIN	02E3	38D 008
BEEP	10BB	
BIGBRC	004F	
BKROM2	2A91	

BLANK	05B7	
BLINK	0899	265 020
BLINK1	0899	
BRT100	1D80	
BRT140	1DEC	
BRT160	1DA8	
BRT200	1E0F	
BRT290	1DAC	
BRTS10	1D6B	
BST	10C2	
BSTCAT	0BBA	
BSTE	290B	
BSTE2	2AF2	
BSTEP	28DE	
BSTEPA	28EB	

C

CAINC	00D7	35D 000
CALDSP	29C3	
CAT	10C8	
CAT1	0BC3	
CAT2	0B53	
CAT3	1383	
CF	10CC	
CHK_NO_S	14D8	
CHK_NO_S1	14D4	
CHK_NO_S2	14D9	
CHKAD4	1686	

CHKADR	166E	
CHKFUL	05BA	
CHKRPC	0222	
CHRLCD	05B9	
CHS	123A	
CHSA	1CDA	
CHSA1	1CDC	
CLA	10D1	345 040
CLCTMG	03C9	
CLDSP	10E0	381 040
CLLCDE	2CF0	
CLP	10E7	
CLR	1733	
CLREG	10ED	
CLRLCD	2CF6	
CLRPGM	228C	
CLRREG	2155	
CLRSB2	0C00	
CLRSB3	0C02	
CLSIG	10F3	
CLST	10F9	
CLX	1101	
CNTLOP	0B9D	
COLDST	0232	
COPY	1109	
COS	127C	
CPGM10	067F	1FD 018

HP41CX ENTRY POINTS

ENTRY	ADR	MCODE
-------	-----	-------

CPGMHD	067B	
D		
D_R	110E	
DAT106	2D4C	
DAT231	2D77	
DAT260	2D94	
DAT280	2D98	
DAT300	2D9B	
DAT320	2DA2	
DAT400	2E05	
DAT500	2E10	
DATENT	2D2C	
DATOFF	0390	
DCPL00	2EC3	
DCPLRT	2F0B	
DCRT10	2F0D	
DEC	132B	
DECAD	29C7	
DECADA	29CA	
DECMPL	2EC2	
DEEXP	088C	
DEG	1114	
DEGDO	172A	
DEL	1124	
DELETE	1127	
DELLIN	2306	
DELNNN	22A8	

DEROVF	08EB	
DEROW	04AD	
DERUN	08AD	
DERW00	04B2	
DF060	0587	
DF150	0482	
DF160	0485	
DF200	04E7	
DFILLF	0563	
DFKBCK	0559	
DFRST8	0562	
DFRST9	0561	
DGENS8	0836	0D9 020
DIGENT	0837	0DD 020
DIGST_	08B2	2C9 020
DIV110	18A5	
DIV120	18AF	
DIV15	18A9	
DIVIDE	106F	
DOSKP	1631	
DOSRC1	24E3	
DOSRCH	24E4	
DROPST	00E4	
DROWSY	0160	
DRSY05	0161	
DRSY25	0173	
DRSY50	0190	

DRSY51	0194	
DSE	112D	
DSPCA	0B35	
DSPCRG	0B26	
DSPLN_	0FC7	
DSWKUP	01AD	
DTOR	1981	205 064
DV1_10	189A	
DV2_10	1898	261 060
DV2_13	189D	
E		
E_TO_X	1147	
E_TO_X_MIN	1163	
ENCP00	0952	149 024
END	1132	
END2	03B6	
END3	03BE	
ENG	1135	
ENLCD	07F6	3D9 01C
ENTER	113E	
ERR0	18C3	
ERR110	22FB	
ERR120	22FF	
ERRAD	14E2	
ERRDE	282D	
ERRIGN	00BB	
ERRNE	02E0	

ERROF	00A2	
ERROR	22F5	
ERRPR	2184	
ERRRAM	2172	
ERRSUB	22E8	
ERRTA	2F17	
EXP10	1A0A	029 068
EXP13	1A0D	
EXP400	1A21	
EXP500	1A61	
EXP710	1A4C	
EXP720	1A50	
EXSCR	192A	
F		
FACT	1154	
FC	115A	
FC_C	116B	
FCNTBL	1400	
FDIG20	0E3D	
FDIGIT	0E2F	
FILLXL	00EA	
FIND_NO_1	1775	
FIX	1171	
FIX57	0AC3	
FIXEND	2918	
FLGANN	1651	
FLINK	2928	

HP41CX ENTRY POINTS

ENTRY	ADR	MCODE
-------	-----	-------

FLINKA	2927	
FLINKM	2929	
FLINKP	2925	
FNDEND	1730	
FORMAT	0A7B	
FRAC	117C	
FS	1182	
FS_C	1188	
FSTIN	14C2	

G

GCP112	2BB5	
GCPK04	2BBC	
GCPK05	2BBE	
GCPKC	2B80	
GCPKC0	2B89	
GENLNK	239A	
GENNUM	05E8	3A1 014
GETLIN	1419	
GETN	1CEA	
GETPC	2950	
GETPCA	2952	
GETX	1CEF	
GETXSQ	1CEE	
GETXY	1CEB	
GETY	1CED	
GETYSQ	1CEC	
GOL0	23D0	

GOL1	23D9	
GOL2	23E2	
GOL3	23EB	
GOLNGH	0FD9	
GOLONG	0FDA	
GOSUB	0FDE	
GOSUB0	23D2	
GOSUB1	23DB	
GOSUB2	23E4	
GOSUB3	23ED	
GOSUBH	0FDD	
GOTINT	02F8	3E1 008
GRAD	111A	
GSB000	23FA	
GSB256	23FA	
GSB512	23FA	
GSB768	23FA	
GSUBS1	23C9	
GT3DBT	0FEB	
GTACOD	1FDB	
GTAI40	0341	
GTAINC	0304	
GTBYT	29B0	
GTBYTA	29BB	
GTBYT0	29B2	
GTCNTR	0B8D	
GTFEN1	20EB	

GTFEND	20E8	
GTLINK	224E	
GTLNKA	2247	
GTO	1191	
GTO_5	29AA	
GTOL	118C	
GTONN	2959	
GTRMAD	0800	
GTSRCH	24DF	

H

H_HMS	1199	
HMS_H	1193	
HMS_MINUS	1045	
HMS_PLUS	1032	
HMSDV	19E5	
HMSMP	19E7	

I

IN3B	2A65	
INBCHS	2E0A	
INBYT	29E6	
INBYT0	29E3	
INBYT1	29EA	
INBYTC	29E4	
INBYTJ	2E0C	
INBYTP	29E5	
INCAD	29CF	
INCAD2	29D3	

INCADA	29D6	
INCADP	29D1	
INCGT2	0286	
IND	0DB2	
IND21	0DC4	
INEX	2A4A	
INLIN	2876	
INLIN2	29F6	
INPTDG	08A0	
INSHRT	2A17	
INSLIN	29F4	
INSSUB	23B2	
INSTR	2A73	
INT	1177	
INTARG	07E1	
INTFRC	193B	0ED 064
INTINT	02FB	3ED 008
INTXC	2A7D	
IORUN	27E4	
ISG	119E	

K

KEYOP	068A	
KYOPCK	0693	

L

LASTX	1228	
LBL	11A4	
LD90	1995	

HP41CX ENTRY POINTS

ENTRY	ADR	MCODE
-------	-----	-------

LDD_P_	0B1D	
LDDP10	0B1E	
LDSST0	0797	
LEFTJ	2BF7	
LINN1A	2A93	
LINN1M	2A90	
LINNUM	2A8B	
LN	11A6	
LN1_PLUS_X	1220	
LN10	1B45	115 06C
LN560	1BD3	
LNAP	1A8A	
LNC10	1AAE	
LNC10_	1AAD	
LNC20	1ABD	
LNSUB	19F9	
LNSUB_MINUS	19F8	
LOAD3	14FA	
LOG	11AC	
LSWKUP	0180	

M

MASK	2C88	
MEAN	11B9	
MEMCHK	0205	
MEMLFT	05A1	
MESSL	07EF	3BD 01C
MIDDIG	0DE0	

MINUS	1054	
MOD	104F	
MOD10	195C	171 064
MODE	134D	
MODE1	134F	
MOVREG	215C	
MP1_10	184F	
MP2_10	184D	135 060
MP2_13	1852	
MPY150	1865	
MSG	1C6B	
MSG105	1C80	201 070
MSG110	1C86	219 070
MSGA	1C6C	1B1 070
MSGAD	1C18	
MSGDE	1C22	
MSGDLY	037C	
MSGE	1C71	
MSGML	1C2D	
MSGNE	1C38	

MSGNL 1C3C

MSGNO	1C64	
MSGOF	1C4F	
MSGPR	1C43	
MSGRAM	1C67	
MSGROM	1C6A	
MSGTA	1C5F	

MSGWR	1C56	
MSGX	1C75	
MSGYES	1C62	
MULTIPLY	105C	

N

NAM40	0F34	
NAM44_	0F7D	
NAME20	0EE6	
NAME21	0EE9	
NAME33	0EEF	
NAME37	0F09	
NAME4A	0FA4	
NAME4D	0FAC	
NAMEA	0ED9	
NBYTA0	2D04	
NBYTAB	2D06	
NEXT	0E50	141 038
NEXT1	0E45	115 038
NEXT2	0E48	121 038
NEXT3	0E4B	12D 038
NFRC	00F1	3C5 000
NFRENT	00C4	
NFRFST	00F7	3DD 000
NFRKB	00C7	31D 000
NFRKB1	00C6	
NFRNC	00A5	295 000
NFRNIO	0106	

NFRPR	00EE	3B9 000
NFRPU	00F0	3C1 000
NFRSIG	00C2	
NFRST_PLUS	0BEE	
NFRX	00CC	331 000
NFRXY	00DA	369 000
NLT000	0E91	
NLT020	0EA0	
NLT040	0EAA	
NM44_5	0F7E	
NOPRT	015B	
NOREG9	095E	179 024
NOSKP	1619	065 058
NOTFIX	0ADD	
NRM10	1870	
NRM11	1871	
NRM12	1872	
NRM13	1884	
NROOM3	28C2	
NULT_	0E65	
NULT_3	0E7C	
NULT_5	0E8F	
NULTST	0EC6	
NWGOOS	07D4	
NXBYT3	29B7	
NXBYTA	29B9	
NXBYTO	2D0B	

HP41CX ENTRY POINTS

ENTRY	ADR	MCODE
-------	-----	-------

NXL1B	2B23	
NXL3B2	2B63	
NXLCHN	2B49	
NXLDEL	2AFD	
NXLIN	2B14	
NXLIN3	2B5F	
NXLINA	2B1F	
NXLSST	2AF7	
NXLTX	2B77	
NXTBYT	2D07	

O

OCT	1330	
OFF	11C8	321 044
OFFSHF	0750	
OFSHFT	0749	
ONE_BY_X	11D6	
ONE_BY_X10	188B	
ONE_BY_X13	188E	
OPROMT	2E4C	
OUTLCD	2C80	
OUTROM	2FEE	
OVFL10	1429	

P

P_R	11DC	
P10RTN	02AC	
P6RTN	1670	
PACH10	03EC	

PACH11	03F5	
PACH12	03FC	
PACH4	03E2	
PACK	11E7	
PACKE	2002	
PACKN	2000	
PAK200	2055	
PAKEND	20AC	
PAKSPC	20F2	
PAR111	0CED	
PAR112	0CF5	
PARA06	0D22	
PARA60	0D35	
PARA61	0D37	
PARA75	0D49	
PARB40	0D99	
PARS05	0C34	
PARS56	0C93	
PARS75	0CCD	
PARSDE	0C90	
PARSE	0C05	
PARSEB	0D6D	
PATCH1	21DC	
PATCH2	21E1	
PATCH3	21EE	
PATCH5	21F3	
PATCH6	1C06	

PATCH9	1C03	
PCKDUR	16FC	
PCT	1061	
PCTCH	11EC	
PGMAON	0956	
PI	1242	
PI_BY_2	199A	
PKIOAS	2114	051 084
PLUS	104A	
PMUL	1BE9	
POWER_OF_TEN	12CA	
PR10RT	0372	
PR14RT	1365	
PR15RT	22DF	
PR3RT	0EDD	
PROMF1	05CB	
PROMF2	05D3	
PROMFC	05C7	
PROMPT	1209	
PSE	11FC	
PSESTP	03AC	
PTBYTA	2323	
PTBYTM	2921	
PTBYTP	2328	
PTLINK	231A	
PTLNKA	231B	
PTLNKB	2321	

PUTPC	2337	
PUTPCA	2339	
PUTPCD	232C	
PUTPCF	2331	
PUTPCL	2AF3	
PUTPCX	232F	
PUTREG	215E	

Q

QUTCAT	03D5	
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R

R_D	120E	
R_P	11C0	
R_SCAT	0BB7	
R_SUB	14ED	
RAD	111F	
RAK06	0C7F	
RAK60	06FA	
RAK70	070A	
RCL	122E	
RCSCR	1934	
RCSCR_	1932	
RDN	1252	
RDNSUB	14E9	
REGLFT	059A	
RFDS55	0949	
RG9LCD	08EF	3BD 020
RMCK05	27EC	

HP41CX ENTRY POINTS

ENTRY	ADR	MCODE
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RMCK10	27F3	
RMCK15	27F4	
RND	1257	
ROLBAK	2E42	
ROLLUP	1260	
ROMCHK	27E6	
ROMH05	066C	1B1 018
ROMH35	0678	
ROMHED	066A	
ROUND	0A35	
ROW0	2766	
ROW10	02A6	
ROW11	25AD	
ROW12	2743	
ROW120	0519	
ROW933	0467	
ROW940	0487	
RST05	009B	26D 000
RSTANN	0759	
RSTKB	0098	261 000
RSTMS0	038E	239 00C
RSTMS1	0390	
RSTMSC	0392	
RSTSEQ	0384	
RSTSQ	0385	215 00C
RSTST	08A7	
RTJLBL	14C9	

RTN	125C	
RTN30	272F	
RTOD	198C	231 064
RUN	07C2	
RUN_STOP	1218	
RUNING	0108	
RUNNK	011D	
RW0110	04E9	
RW0141	04F1	
S		
SAR021	2640	
SAR022	2641	
SAROM	260D	
SAVR10	27D5	
SAVRC	27DF	
SAVRTN	27D3	
SCI	1265	
SCROL0	2CDE	
SCROLL	2CDC	
SD	1D10	
SEARC1	2434	
SEARCH	2433	
SEPTY	14D2	
SERR	24E8	
SETQ_P	0B15	
SETSST	17F9	
SF	1269	

SGT019	25C9	
SHF10	186D	
SHF40	186C	
SHIFT	1348	
SIGMA	1C88	
SIGMA_MINUS	1271	
SIGMA_PLUS	126D	
SIGN	1337	
SIGREG	1277	
SIN	1288	
SINFR	1947	
SINFRA	194A	
SIZE	1292	
SIZSUB	1797	
SKP	162E	0B9 058
SKPDEL	2349	
SKPLIN	2AF9	
SNR10	243F	
SNR12	2441	
SNROM	2400	
SQR10	18BE	2F9 060
SQR13	18C1	
SQRT	1298	
SRBMAP	2FA5	
SST	129E	
SSTBST	22DD	
SSTCAT	0BB4	

STATCK	1CC8	
STAYON	12A3	
STBT10	2EA3	
STBT30	2FE0	
STBT31	2FE5	
STDEV	11B2	
STFLGS	16A7	
STK	0DF3	
STK00	0DFA	
STK04	0E00	
STMSGF	037E	
STO	10DA	
STO_DIVIDE	12C1	
STO_MINUS	12B9	
STO_MULTIPLY	12A8	
STO_PLUS	12B0	
STOLCC	2E5B	
STOP	1215	
STOPS	03A7	
STOPSB	03A9	
STORFC	07E8	
STOST0	013B	
STSCR	1922	
STSCR_	1920	
SUBONE	1802	009 060
SUMCHK	1667	
SUMCK2	1669	

HP41CX ENTRY POINTS

ENTRY	ADR	MCODE
-------	-----	-------

T

TAN	1282	
TBITMA	2F7F	
TBITMP	2F81	
TEN_TO_X	1BF8	
TEXT	2CAF	
TGSHF1	1FE7	
TODEC	1FB3	
TOGSHF	1FE5	
TONE	12D0	
TONE7	1716	
TONE7X	16DB	
TOBEB	16DD	
TONSTF	0054	
TOOCT	1F79	
TOPOL	1D49	
TOREC	1E75	
TRC10	19A1	285 064
TRC30	1E38	
TRCS10	1E57	
TRG100	1E78	
TRG240	1ED1	
TRG430	1F5B	
TRGSET	21D4	
TSTMAP	14A1	
TXRW10	04F6	
TXTLB1	2FC6	

TXTLBL	2FC7	
TXTR0M	04F5	
TXTR0W	04F2	
TXSTR	04F6	

U

UPLINK	2235	
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V

VIEW	12D6	
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W

WKUP10	0184	
WKUP21	01A7	
WKUP25	01BA	
WKUP70	01F5	
WKUP80	01FF	

X

X_BY_Y13	1893	
X_EQ_0	130E	
X_EQ_Y	1314	
X_GT_0	131A	
X_GT_Y	1320	
X_LE_0	12EF	
X_LE_Y	12F6	
X_LT_0	12E8	
X_LT_Y	1308	
X_NE_0	12DC	
X_NE_Y	12E2	
X_TO_2	106B	

X_XCHNG	124C	
X_XCHNG_Y	12FC	
XARCL	1696	
XASHF	1748	
XASN	276A	
XASTO	175C	
XAVIEW	0364	
XBAR	1CFE	
XBAR_	1D07	
XBEEP	16D1	
XBST	2250	
XCAT	0B80	
XCF	164D	
XCLSIG	14B0	
XCLX1	1102	
XCOPY	2165	
XCUTB1	0091	
XCUTE	015B	
XCUTEB	0090	
XDEG	171C	
XDELET	22AF	
XDSE	159F	
XECROM	2F4A	
XEND	2728	
XEQ	1328	
XEQC01	24EA	
XFS	1645	

XFT100	18EC	
XGA00	248D	
XGI	24C7	
XGI07	24DA	
XGI57	24C1	
XGNN10	2512	
XGNN12	2514	
XGNN40	255D	
XGOIND	1323	
XGRAD	1726	
XGTO	2505	
XISG	15A0	
XLN1_PLUS_X	1B73	
XMSGPR	056D	
XNNROW	0026	
XPACK0	2000	001 080
XPRMPT	03A0	
XR_S	079D	
XRAD	1722	
XRDN	14BD	
XRND	0A2F	
XROLLUP	14E5	
XROM	2FAF	
XROMNF	2F6C	
XROW1	0074	
XRS45	07BE	
XRTN	2703	

HP41CX ENTRY POINTS

ENTRY

ADR

MCODE

XSCI	16C0	
XSF	164A	
XSGREG	1659	
XSIGN	0FF4	
XSIZE	1795	
XSST	2260	
XSTYON	1411	
XTOHRS	19B2	
XTONE	16DE	
XVIEW	036F	
XX_EQ_0	1606	
XX_EQ_Y	1614	
XX_GT_0	15F1	
XX_GT_Y	15F8	
XX_LE_0	160D	
XX_LE_0A	1609	
XX_LE_Y	1601	
XX_LT_0	15FA	
XX_LT_Y	15EF	
XX_NE_0	1611	
XX_NE_Y	1629	
XXEQ	252F	
XY_TO_X	1B11	

Y

Y_MINUS_X	1421	
Y_TO_X	102A	

1

1/X10	188B	22D	060
10/X	1BF8	3E1	06C

FAT-addresses

ADR1
ADR2

XROM#
FCN#

000	XROM ID	020	15	040	31	060	47	080	63
001	# FCN's	021	16	041	32	061	48	081	64
002	00	022	16	042	32	062	48	082	NOP
003	01	023	17	043	33	063	49	083	NOP
004	01	024	17	044	33	064	49		
005	02	025	18	045	34	065	50		
006	02	026	18	046	34	066	50		
007	03	027	19	047	35	067	51		
008	03	028	19	048	35	068	51		
009	04	029	20	049	36	069	52		
00A	04	02A	20	04A	36	06A	52		
00B	05	02B	21	04B	37	06B	53		
00C	05	02C	21	04C	37	06C	53		
00D	06	02D	22	04D	38	06D	54		
00E	06	02E	22	04E	38	06E	54		
00F	07	02F	23	04F	39	06F	55		
010	07	030	23	050	39	070	55		
011	08	031	24	051	40	071	56		
012	08	032	24	052	40	072	56		
013	09	033	25	053	41	073	57		
014	09	034	25	054	41	074	57		
015	0A	035	26	055	42	075	58		
016	10	036	26	056	42	076	58		
017	0B	037	27	057	43	077	59		
018	11	038	27	058	43	078	59		
019	0C	039	28	059	44	079	60		
01A	12	03A	28	05A	44	07A	60		
01B	0D	03B	29	05B	45	07B	61		
01C	13	03C	29	05C	45	07C	61		
01D	0E	03D	30	05D	46	07D	62		
01E	14	03E	30	05E	46	07E	62		
01F	0F	03F	31	05F	47	07F	63		

ROM function names

Address	Code	Description
x00E	004	M-code
x00F	002	Function address x402
:		
x39E	094	T
x39F	013	S
x400	005	E
x401	014	T
x402	08C	?FSET 5 ← entry point
:		
x39E	094	T +080 last character of name
x39F	013	S
x400	005	E o=op2 used for
x401	014	T o=op1 prompting
x402	000	NOP = NOT PRGMable
x403	000	NOP = NOT NULLable

Address	Code	Description
x00E	204	UserCode
x00F	002	Function address x402
:		
x400	009	9 regs to copy
x401	220	
x402	1C2	LBL
x403	001	← entry point
x404	0F5	T
x405	000	
x406	054	T
x407	045	E
x408	053	S
x409	054	T
x40A	19C	FIX
x40B	000	0
x40C	1A6	XROM
x40D	C5	27,05
:		

DEBUG registers

ABS reg #	13	12	11	10	09	08	07	06	05	04	03	02	01	00
487	0	0		RTN 3				RTN 2				RTN 1		
488		KY		RTN 4			XY	P	Q		G		ST	
489														
490														
491														
492														
493														
494														
495														
496														
497														
498														
499														
500														
501														
502														
503														
504														
505														
506														
507														
508														
509														
510														
511														
#	13	12	11	10	09	08	07	06	05	04	03	02	01	00

XY bit
CPU flag #

07	06	05	04	03	02	01	00
13	12	11	10	9	8	v	w

0 =	hex mode	SLCT P
1 =	dec mode	SLCT Q

Synthetic QRC

HP-41C QUICK REFERENCE CARD FOR SYNTHETIC PROGRAMMING

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	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
	CAT	@c (GTO.)	DEL	COPY	CLP	R/S	SIZE	BST	SST	ON	PACK	←(PRGM)	USR/P/A	2 ---	SHIFT	ASN	
0	NULL 00 - 0 ♦	LBL 00 01 π 1 ×	LBL 01 02 ∞ 2 ∞	LBL 02 03 ∞ 3 ←	LBL 03 04 π 4 α	LBL 04 05 π 5 β	LBL 05 06 √ 6 √	LBL 06 07 ∞ 7 ↓	LBL 07 08 ∞ 8 Δ	LBL 08 09 ∞ 9 α	LBL 09 10 ∞ 10 →	LBL 10 11 ∞ 11 >	LBL 11 12 ∞ 12 ∞	LBL 12 13 ∞ 13 ∞	LBL 13 14 ∞ 14 ∞	LBL 14 15 ∞ 15 ∞	0
1	0 16 ∞ 16 ∞	1 17 ∞ 17 ∞	2 18 ∞ 18 ∞	3 19 ∞ 19 ∞	4 20 ∞ 20 ∞	5 21 ∞ 21 ∞	6 22 ∞ 22 ∞	7 23 ∞ 23 ∞	8 24 ∞ 24 ∞	9 25 ∞ 25 ∞	EEX 26 ∞ 26 ∞	NEG 27 ∞ 27 ∞	GTO ↑ 28 ∞ 28 ∞	XEQ ↑ 29 ∞ 29 ∞	W ↑ 30 ∞ 30 ∞	31 ∞ 31 ∞ 31 ∞	1
2	RCL 00 32 32	RCL 01 33 √ 33 √	RCL 02 34 √ 34 √	RCL 03 35 √ 35 √	RCL 04 36 √ 36 √	RCL 05 37 √ 37 √	RCL 06 38 √ 38 √	RCL 07 39 √ 39 √	RCL 08 40 √ 40 √	RCL 09 41 √ 41 √	RCL 10 42 √ 42 √	RCL 11 43 √ 43 √	RCL 12 44 √ 44 √	RCL 13 45 √ 45 √	RCL 14 46 √ 46 √	RCL 15 47 √ 47 √	2
3	STO 00 48 ∞ 48 ∞	STO 01 49 ∞ 49 ∞	STO 02 50 ∞ 50 ∞	STO 03 51 ∞ 51 ∞	STO 04 52 ∞ 52 ∞	STO 05 53 ∞ 53 ∞	STO 06 54 ∞ 54 ∞	STO 07 55 ∞ 55 ∞	STO 08 56 ∞ 56 ∞	STO 09 57 ∞ 57 ∞	STO 10 58 ∞ 58 ∞	STO 11 59 ∞ 59 ∞	STO 12 60 ∞ 60 ∞	STO 13 61 ∞ 61 ∞	STO 14 62 ∞ 62 ∞	STO 15 63 ∞ 63 ∞	3
4	+ 64 ∞ 64 ∞	- 65 ∞ 65 ∞	* 66 ∞ 66 ∞	/ 67 ∞ 67 ∞	X<Y? 68 ∞ 68 ∞	X>Y? 69 ∞ 69 ∞	X≤Y? 70 ∞ 70 ∞	Σ+ 71 ∞ 71 ∞	Σ- 72 ∞ 72 ∞	HMS+ 73 ∞ 73 ∞	HMS- 74 ∞ 74 ∞	MOD 75 ∞ 75 ∞	% 76 ∞ 76 ∞	%CH 77 ∞ 77 ∞	P→R 78 ∞ 78 ∞	R→P 79 ∞ 79 ∞	4
5	LN 80 ∞ 80 ∞	X↑2 81 ∞ 81 ∞	SQRT 82 ∞ 82 ∞	Y↑X 83 ∞ 83 ∞	CHS 84 ∞ 84 ∞	E↑X 85 ∞ 85 ∞	LOG 86 ∞ 86 ∞	10↑X 87 ∞ 87 ∞	E↑X-1 88 ∞ 88 ∞	SIN 89 ∞ 89 ∞	COS 90 ∞ 90 ∞	TAN 91 ∞ 91 ∞	ASIN 92 ∞ 92 ∞	ACOS 93 ∞ 93 ∞	ATAN 94 ∞ 94 ∞	→DEC 95 ∞ 95 ∞	5
6	1/X 96 ∞ 96 ∞	ABS 97 ∞ 97 ∞	FACT 98 ∞ 98 ∞	X≠0? 99 ∞ 99 ∞	X>0? 100 ∞ 100 ∞	LN1+X 101 ∞ 101 ∞	X<0? 102 ∞ 102 ∞	X=0? 103 ∞ 103 ∞	INT 104 ∞ 104 ∞	FRC 105 ∞ 105 ∞	D→R 106 ∞ 106 ∞	R→D 107 ∞ 107 ∞	→HMS 108 ∞ 108 ∞	→HR 109 ∞ 109 ∞	RND 110 ∞ 110 ∞	→OCT 111 ∞ 111 ∞	6
7	CLΣ T ∞ 112 ∞	X<>Y Z ∞ 113 ∞	PI Y ∞ 114 ∞	CLST X ∞ 115 ∞	R↑ L ∞ 116 ∞	RDN M ∞ 117 ∞	LASTX N ∞ 118 ∞	CLX O ∞ 119 ∞	X=Y? P ∞ 120 ∞	X≠Y? Q ∞ 121 ∞	SIGN T ∞ 122 ∞	X≤0? a ∞ 123 ∞	MEAN b ∞ 124 ∞	SDEV c ∞ 125 ∞	AVIEW d ∞ 126 ∞	CLD e ∞ 127 ∞	7
	0 0000	1 0001	2 0010	3 0011	4 0100	5 0101	6 0110	7 0111	8 1000	9 1001	A 1010	B 1011	C 1100	D 1101	E 1110	F 1111	
	00 01 02 03	04 05 06 07	08 09 10 11	12 13 14 15	16 17 18 19	20 21 22 23	24 25 26 27	28 29 30 31	32 33 34 35	36 37 38 39	40 41 42 43	44 45 46 47	48 49 50 51	52 53 54 55	← bit numbers in a 7-byte register		

FLAGS (Register d)

00-10	general purpose	33	IL absolute manual
11	auto execute	34	not used
12	doublewide	35	not used
13	lower case	36-39	number of digits
14	overwrite	40-41	display
15-16	IL printer	0 0	SCI
0 0	MAN	1 0	ENG
0 1	NORM	1 1	FIX/ENG
1 0	TRACE	42-43	trig mode
1 1	TR/STACK	0 0	DEG
17	record incomplete	0 1	RAD
18	general use	1 0	GRAD
19	cleared at	1 1	RAD
20	turn-on	44	cont. ON
21	ptr enable	45	system data entry
22	num. entry	46	partial key sequence
23	alpha entry	47	SHIFT
24	range ignore	48	ALPHA
25	error ignore	49	low BAT
26	audio enable	50	message
27	USER mode	51	SST
28	dec./comma	52	PGRM
29	digit grouping	53	I/O
30	CAT	54	PSE
31	timer	55	printer existence
32	DMY/MDY		
	manual IL I/O		

Synthetic QRC

HP-41C QUICK REFERENCE CARD FOR SYNTHETIC PROGRAMMING

© 1982, SYNTHETIX

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	
8	DEG IND 00 128 ➔	RAD IND 01 129 ✕	GRAD IND 02 130 ✕	ENTER↑ IND 03 131 ←	STOP IND 04 132 α	RTN IND 05 133 ⌘	BEEP IND 06 134 Γ	CLA IND 07 135 ↓	ASHF IND 08 136 Δ	PSE IND 09 137 σ	CLRG IND 10 138 ➔	AOFF IND 11 139 ✕	AON IND 12 140 μ	OFF IND 13 141 <	PROMPT IND 14 142 ↵	ADV IND 15 143 ⌘	8
9	RCL IND 16 144 ⅈ	STO IND 17 145 Ω	ST+ IND 18 146 ♂	ST- IND 19 147 ♀	ST* IND 20 148 α	ST/ IND 21 149 ÷	ISG IND 22 150 α	DSE IND 23 151 ⅈ	VIEW IND 24 152 ⅈ	Σ REG IND 25 153 ⅈ	ASTO IND 26 154 ⅈ	ARCL IND 27 155 ⅈ	FIX IND 28 156 ⅈ	SCI IND 29 157 ≠	ENG IND 30 158 ₤	STONE IND 31 159 ⌘	9
A	XR 0-3 IND 32 160	XR 4-7 IND 33 161 !	XR8-11 IND 34 162 "	X12-15 IND 35 163 #	X16-19 IND 36 164 \$	X20-23 IND 37 165 %	X24-27 IND 38 166 &	X28-31 IND 39 167 *	SF IND 40 168 <	CF IND 41 169 >	FS?C IND 42 170 *	FC?C IND 43 171 +	FS? IND 44 172 -	FC? IND 45 173 -	GTO IND 46 174 -	SPARE IND 47 175 ⌘	A
B	SPARE IND 48 176 ⅈ	GTO 00 IND 49 177 1	GTO 01 IND 50 178 2	GTO 02 IND 51 179 3	GTO 03 IND 52 180 4	GTO 04 IND 53 181 5	GTO 05 IND 54 182 6	GTO 06 IND 55 183 7	GTO 07 IND 56 184 8	GTO 08 IND 57 185 9	GTO 09 IND 58 186 :	GTO 10 IND 59 187 ;	GTO 11 IND 60 188 <	GTO 12 IND 61 189 =	GTO 13 IND 62 190 >	GTO 14 IND 63 191 ?	B
C	GLOBAL IND 64 192 @	GLOBAL IND 65 193 A	GLOBAL IND 66 194 B	GLOBAL IND 67 195 C	GLOBAL IND 68 196 D	GLOBAL IND 69 197 E	GLOBAL IND 70 198 F	GLOBAL IND 71 199 G	GLOBAL IND 72 200 H	GLOBAL IND 73 201 I	GLOBAL IND 74 202 J	GLOBAL IND 75 203 K	GLOBAL IND 76 204 L	GLOBAL IND 77 205 M	X<>--- IND 78 206 N	LBL --- IND 79 207 O	C
D	GTO --- IND 80 208 P	GTO --- IND 81 209 Q	GTO --- IND 82 210 R	GTO --- IND 83 211 S	GTO --- IND 84 212 T	GTO --- IND 85 213 U	GTO --- IND 86 214 V	GTO --- IND 87 215 W	GTO --- IND 88 216 X	GTO --- IND 89 217 Y	GTO --- IND 90 218 Z	GTO --- IND 91 219 [	GTO --- IND 92 220 \	GTO --- IND 93 221]	GTO --- IND 94 222 ^	GTO --- IND 95 223 _	D
E	XEQ --- IND 96 224 [	XEQ --- IND 97 225 a	XEQ --- IND 98 226 b	XEQ --- IND 99 227 c	XEQ --- IND 100 228 d	XEQ --- IND 101 229 e	XEQ --- IND 102 230 f	XEQ --- IND 103 231 g	XEQ --- IND 104 232 h	XEQ --- IND 105 233 i	XEQ --- IND 106 234 j	XEQ --- IND 107 235 k	XEQ --- IND 108 236 l	XEQ --- IND 109 237 m	XEQ --- IND 110 238 n	XEQ --- IND 111 239 o	E
F	TEXT 0 IND T 240 P	TEXT 1 IND Z 241 a	TEXT 2 IND Y 242 r	TEXT 3 IND X 243 s	TEXT 4 IND L 244 t	TEXT 5 IND M 245 u	TEXT 6 IND N 246 v	TEXT 7 IND O 247 w	TEXT 8 IND P 248 x	TEXT 9 IND Q 249 y	TEXT 10 IND T 250 z	TEXT 11 IND a 251 [	TEXT 12 IND b 252 l	TEXT 13 IND c 253 →	TEXT 14 IND d 254 Σ	TEXT 15 IND e 255 t	F
	0 0000	1 0001	2 0010	3 0011	4 0100	5 0101	6 0110	7 0111	8 1000	9 1001	A 1010	B 1011	C 1100	D 1101	E 1110	F 1111	

For price information and a list of dealers in your area, send a self-addressed stamped envelope to: SYNTHETIX, 1540 Mathews Ave., Manhattan Beach, CA 90266, USA

Structure of multi-byte instructions

Two-byte instructions

STO 16=145,16 DSE IND 55 =151,183
LBL e =207,127 FS?C IND Y =170,242
RCL b =144,124 TONE 89 =159,89
X<>M=206,117 ST+ IND N =146,246
LBL Q =207,121 VIEW H(109)=152,109

Two-byte special cases

GTO IND=174, reg. XEQ IND=174,128+r
GTO IND 09=174,9 XEQ IND X=174,243
XROM i,j =160+i/4,64(i mod 4)+j
WSTS =XROM 30,10 =167,138
short form GTO =177+label,0
GTO 12 =189,0

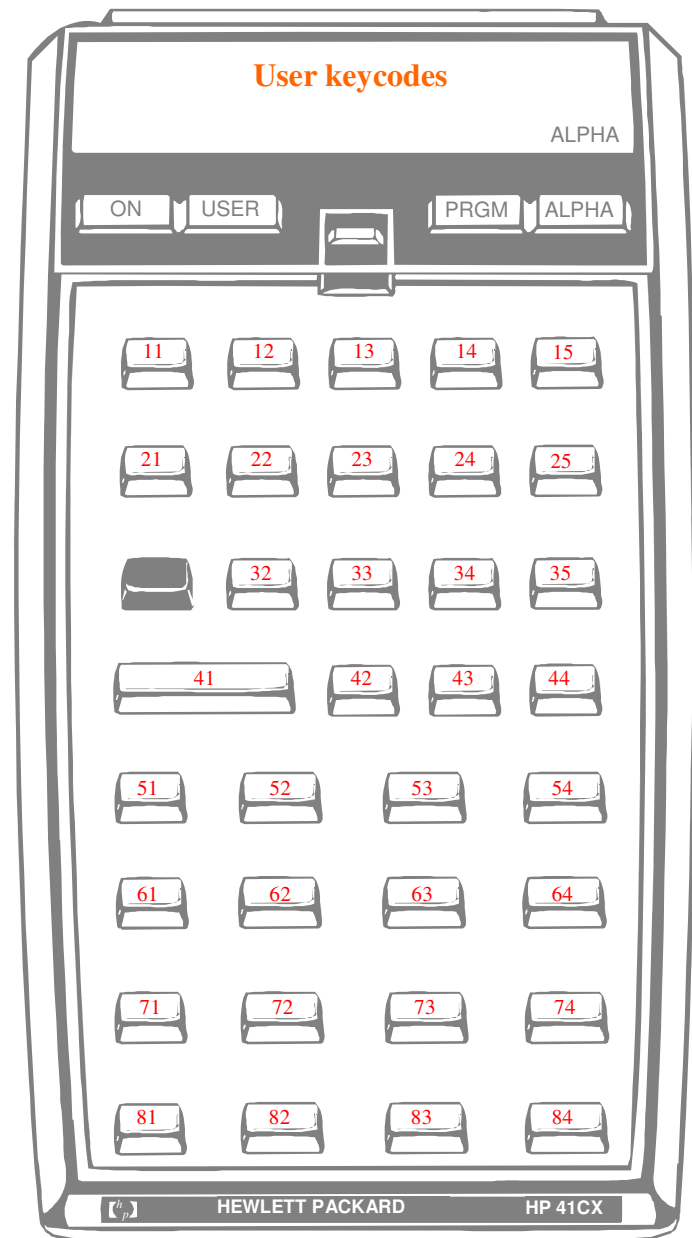
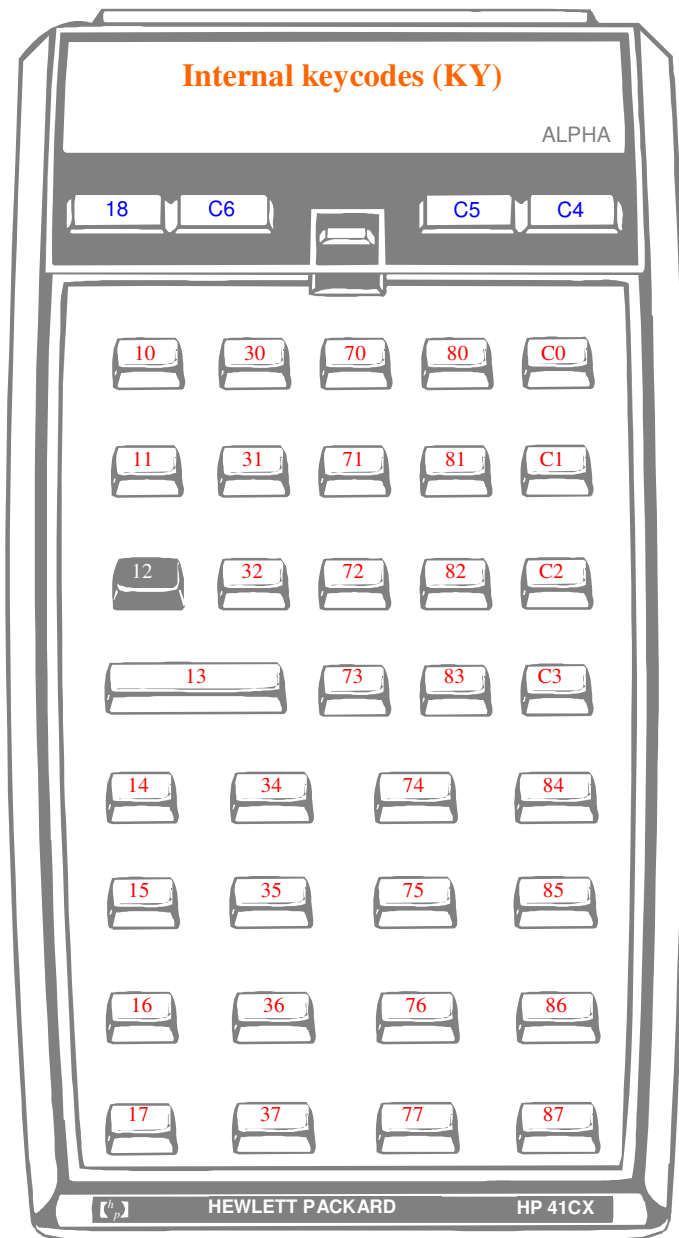
Three-byte instructions

long form GTO =208,0,label
GTO 32 =208,0,32
XEQ =224,0,label
XEQ D =224,0,105
END =192,0,9+ sum of status indicators
32(.END.), 4(rePACK), 2(decompile)

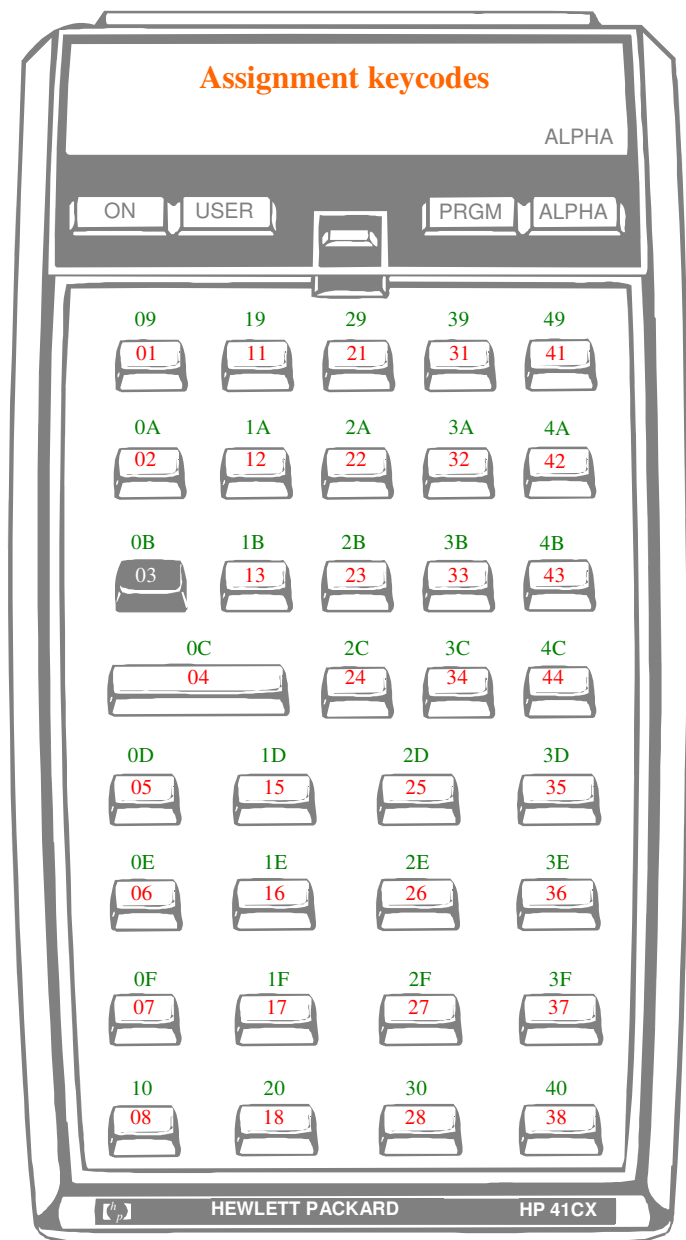
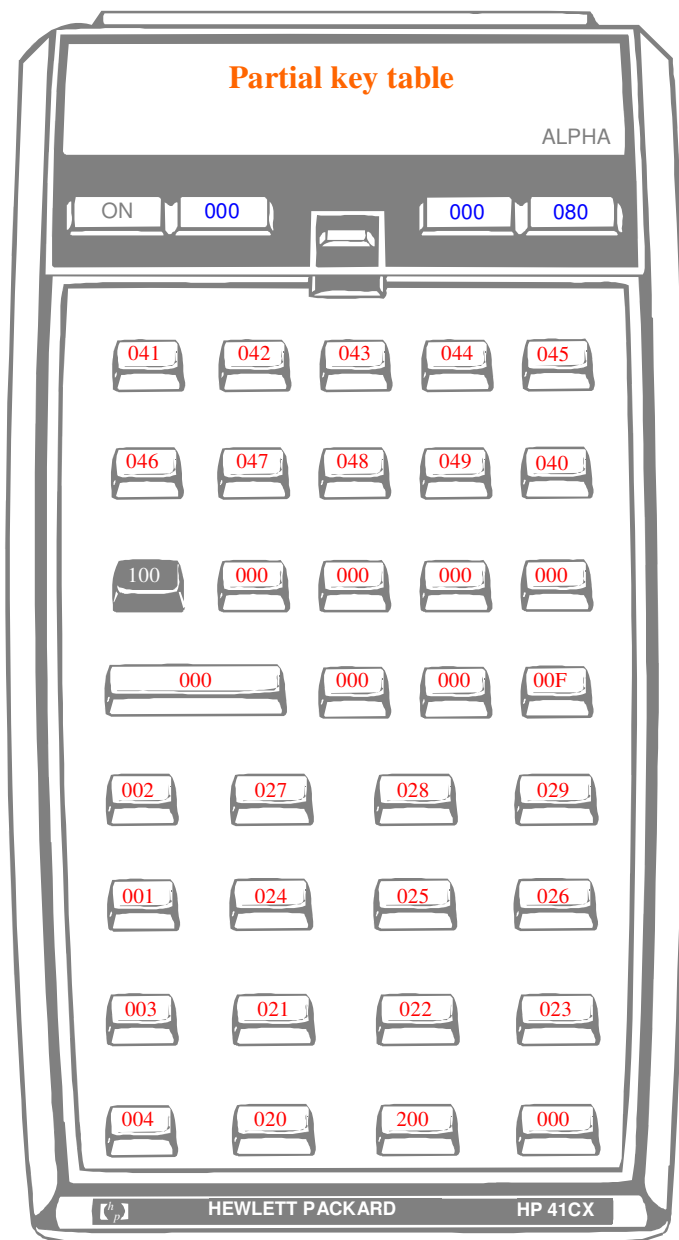
Variable length instructions

TEXT =240+n, n character bytes
Append symbol counts as first char.
T& =241,38 Tt)? =243,127,41,63
GTO T =29,240+n, n character bytes
GTO TXYZ =29,243,88,89,90
XEQ T =30,240+n, n character bytes
XEQ TA =30,241,65 (synthetic)
LBL T =192,0,241+n, (key), n chars.
LBL T: =192,0,242,0,58 (synthetic)

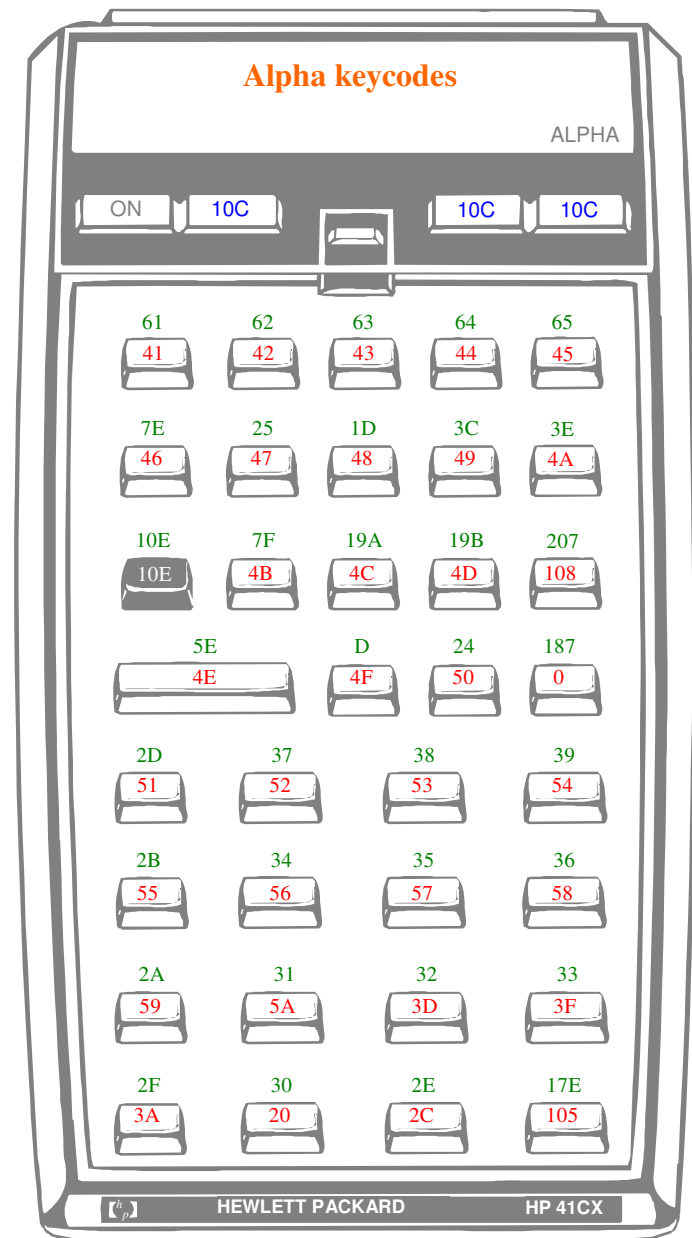
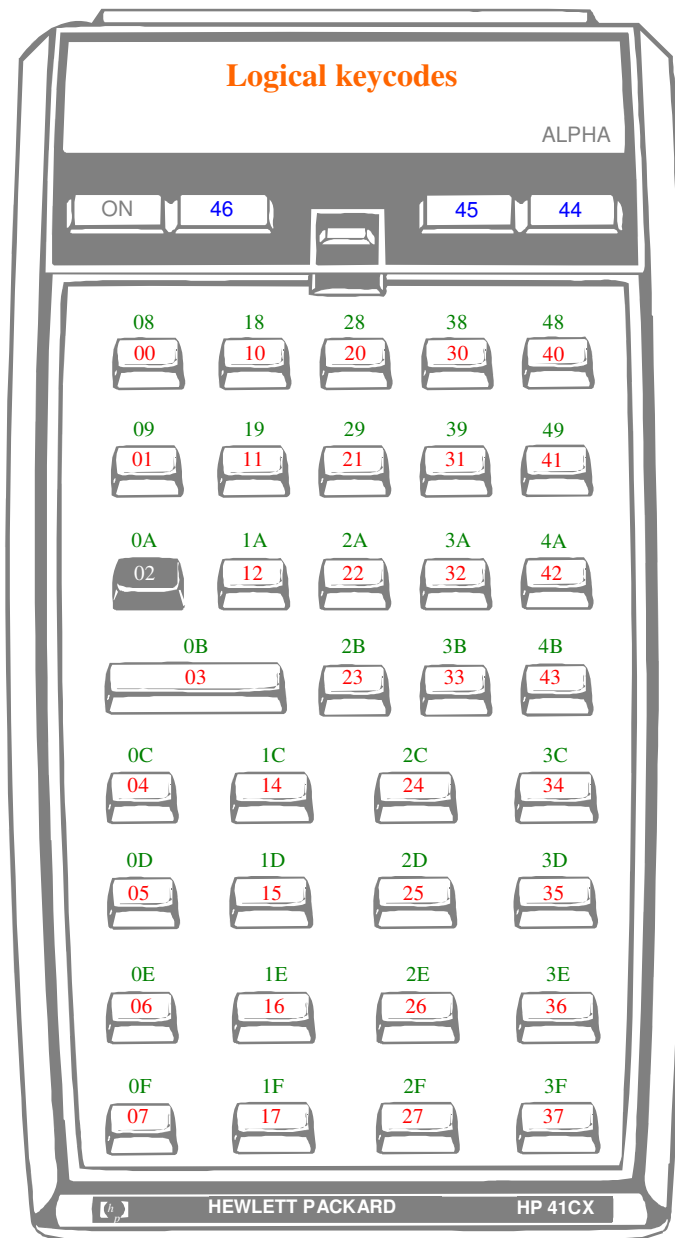
Keycode maps



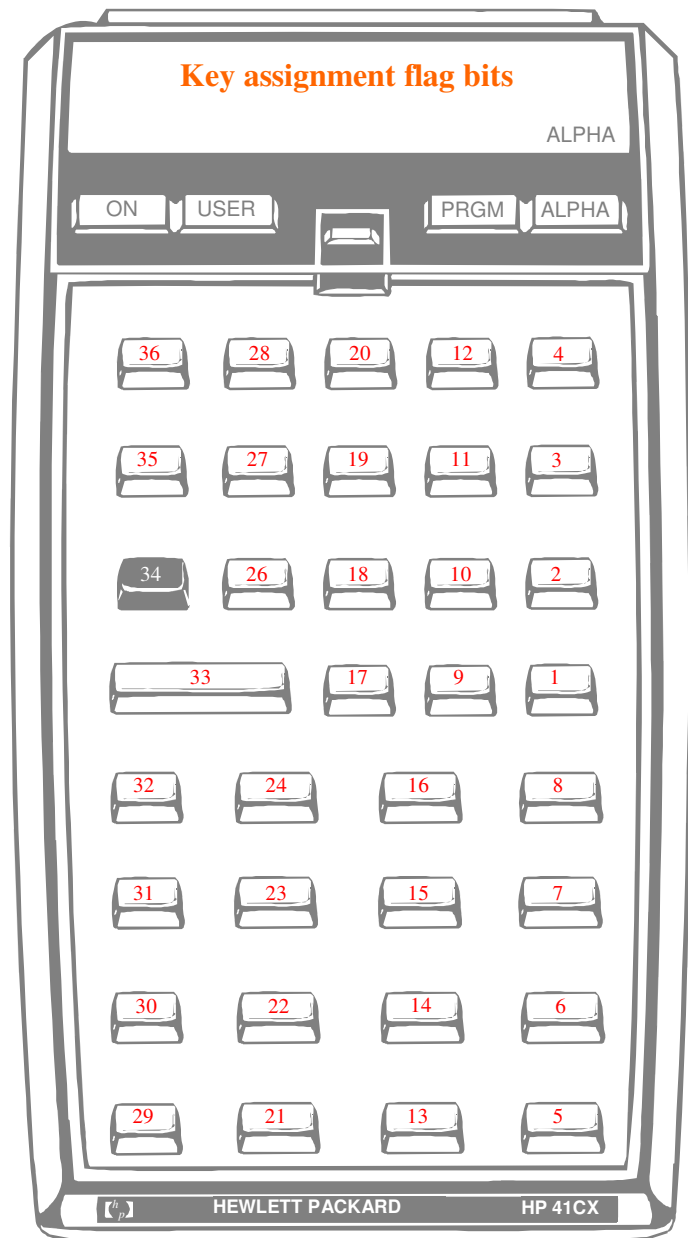
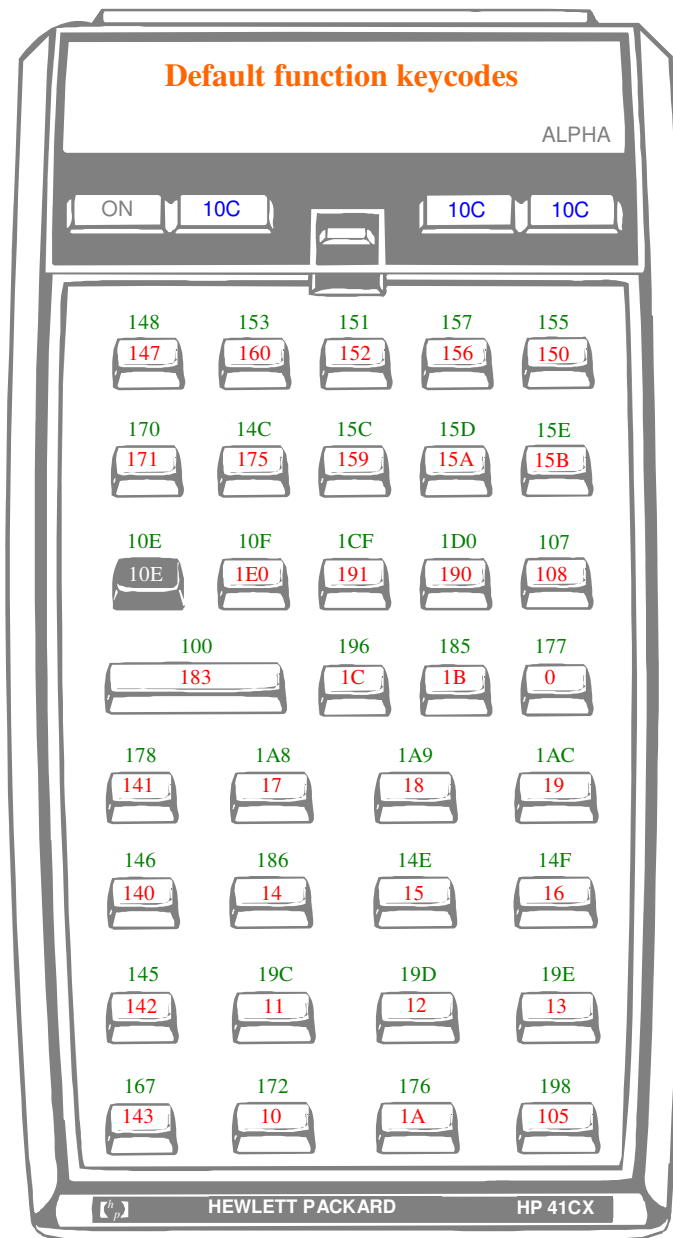
Keycode maps



Keycode maps



Keycode maps



ROM module structure

Address	Code	Description
x000		XROM ID #
x001		# of FAT entries (n)
x002	t0a	Address of 1st function in page
x003	0aa	t is 0=Mcode or 2=UserCode
:		
x(2n)		Address of last function in page
x(2n+1)		
x(2n+2)	000	End of FAT
x(2n+3)	000	
x(2n+4)		Start of functions or program code
:		
:		
:		
:		
:		
:		
:		
xFC7	100	Enable bank 1
xFC8	3E0	
xFC9	180	Enable bank 2
xFCA	3E0	
:		
xFF4		Interrupt checked during Pause
xFF5		Interrupt checked if system flag 53 set
xFF6		Interrupt checked on wakeup /not ON key
xFF7		Interrupt checked when HP41 is turned off
xFF8		Interrupt checked just before CPU stops
xFF9		Interrupt checked on wakeup /ON key
xFFA		Interrupt checked on MEMORY LOST
xFFB		ROM revision ID
xFFC		ROM revision ID
xFFD		ROM revision ID (bit 8 & 9 is bankswitch-bits)
xFFE		ROM revision ID
xFFF		Page checksum

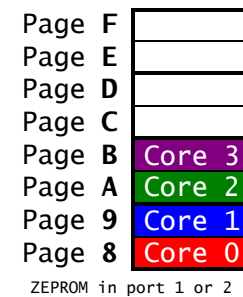
ROM bankswitching

Word at xFFD :

bit 9 bit 8

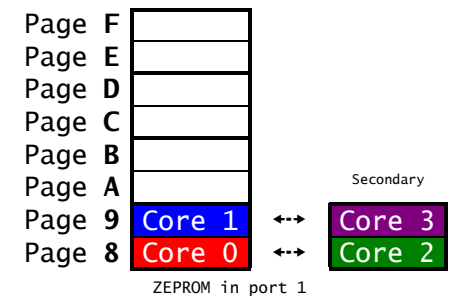
0	0	page not bankswitched
0	1	bankswitched, primary bank
1	0	bankswitched, indeterminate bank (HP)
1	1	bankswitched, secondary bank

Straight 16K module



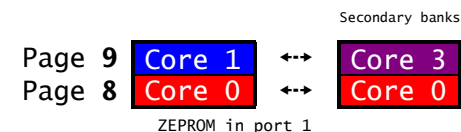
ZEPROM in port 1 or 2

Bankswitched 16K module



ZEPROM in port 1

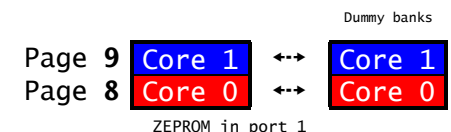
Bankswitched 12K module



ZEPROM in port 1

Secondary banks

Straight 8K module

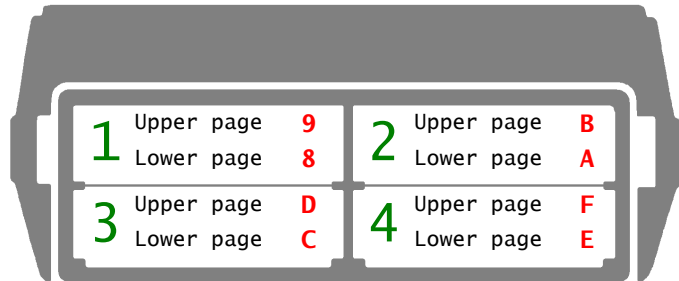


ZEPROM in port 1

Dummy banks

ROM structure

Primary Bank	Page	Secondary Bank	Page
PORT 4 Upper page F		PORT 4 Upper page F	
Lower page E		Lower page E	
PORT 3 Upper page D		PORT 3 Upper page D	
Lower page C		Lower page C	
PORT 2 Upper page B		PORT 2 Upper page B	
Lower page A		Lower page A	
PORT 1 Upper page 9		PORT 1 Upper page 9	
Lower page 8		Lower page 8	
IL Mass Storage	7		
Printer ROM	6	IR printer	6
Timer ROM	5	CX Extended	5
Take-over ROM	4		
CX Extended	3		
System ROM 2	2		
System ROM 1	1		
System ROM 0	0		



GTO 00 - 14 forward

Bx xx

RAM		ROM
LBL 01 ↓		LBL 01 ↓
B2 00	2 bytes	1B2 080
B2 10	3 bytes	1B2 081
B2 20	4 bytes	1B2 082
.. ..	..	
B2 60	8 bytes	1B2 086
B2 01	9 bytes	1B2 087
B2 11	10 bytes	1B2 088
.. ..	..	
B2 5F	112 bytes	1B2 0EE
B2 6F	113 bytes	1B2 0EF

1011 1111 0bbb rrrr

1011 is B
 1111 is label# + 1
 0 is forward
 bbb is number of bytes
 rrrr is number of registers

GTO 00 - 14 backwards

Bx xx

RAM		ROM
LBL 01 ↓		LBL 01 ↓
B2 B0	2 bytes	1B2 003
B2 C0	3 bytes	1B2 004
.. ..	..	
B2 F0	6 bytes	1B2 007
B2 81	7 bytes	1B2 008
B2 91	8 bytes	1B2 009
B2 A1	9 bytes	1B2 00A
B2 B1	10 bytes	1B2 00B
.. ..	..	
B2 DF	108 bytes	1B2 06E
B2 EF	109 bytes	1B2 06F

1011 1111 1bbb rrrr

1011 is B
 1111 is label# + 1
 1 is backwards
 bbb is number of bytes
 rrrr is number of registers

GTO 15 - 99 forward

Dx xx xx

RAM				ROM		
			LBL 15 ↓			LBL 15 ↓
D4	00	0F	2 bytes	1D0	002	08F
D6	00	0F	3 bytes	1D0	003	08F
D8	00	0F	4 bytes	1D0	004	08F
DA	00	0F	5 bytes	1D0	005	08F
DC	00	0F	6 bytes	1D0	006	08F
D0	01	0F	7 bytes	1D0	007	08F
D2	01	0F	8 bytes	1D0	008	08F
..	..	..	..	..	..	..

1101 bbb rrrr rrrr 0111 1111

1101 is D
 bbb is number of bytes
 r rrrr rrrr is number of registers
 0 is forward
 111 1111 is label#

GTO 15 - 99 backwards

Dx xx xx

RAM				ROM		
			LBL 15 ↓			LBL 15 ↓
D6	00	8F	3 bytes	1D0	003	00F
D8	00	8F	4 bytes	1D0	004	00F
DA	00	8F	5 bytes	1D0	005	00F
DC	00	8F	6 bytes	1D0	006	00F
D0	01	8F	7 bytes	1D0	007	00F
D2	01	8F	8 bytes	1D0	008	00F
D4	01	8F	9 bytes	1D0	009	00F
..	..	..	..	..	..	..

1101 bbb rrrr rrrr 1111 1111

1101 is D
 bbb is number of bytes
 r rrrr rrrr is number of registers
 1 is backwards
 111 1111 is label#

XEQ forward

Ex xx xx

RAM				ROM		
		LBL 01 ↓			LBL 01 ↓	
E4	00	02	3 bytes	1E0	002	082
E6	00	02	4 bytes	1E0	003	082
E8	00	02	5 bytes	1E0	004	082
EA	00	02	6 bytes	1E0	005	082
EC	00	02	7 bytes	1E0	006	082
E0	01	02	8 bytes	1E0	007	082
..	..	..	..	..	..	..

1110 bbb rrrr rrrr 0111 1111

1110 is E
 bbb is number of bytes
 r rrrr rrrr is number of registers
 0 is forwards
 111 1111 is label#

XEQ backwards

Ex xx xx

RAM				ROM		
		LBL 01 ↓			LBL 01 ↓	
E4	00	82	3 bytes	1E0	002	002
E6	00	82	4 bytes	1E0	003	002
E8	00	82	5 bytes	1E0	004	002
EA	00	82	6 bytes	1E0	005	002
EC	00	82	7 bytes	1E0	006	002
E0	01	82	8 bytes	1E0	007	002
..	..	..	..	..	..	..

1110 bbb rrrr rrrr 1111 1111

1110 is E
 bbb is number of bytes
 r rrrr rrrr is number of registers
 1 is backwards
 111 1111 is label#

XROM

Ax xx

1010 0ddd ddff ffff

1010 is A
 ddd dd is device#
 ff ffff is function#

END

Cx xx xx

1100 bbb rrrr rrrr 0ne0 lpc1

1100 is C
 bbb is number of bytes to next END
 r rrrr rrrr is number of registers to next END
 n is 0=NOT PRIVATE or 1=PRIVATE
 e is 0=END or 1=.END.
 p is 0=packed or 1=unpacked
 c is 0=compiled or 1=not c

XEQ & GTO IND

AE xx

1010 1110 trrr rrrr

1010 1110 is AE
 t is 0=GTO IND or 1=XEQ IND
 rrr rrrr is the "indirect" register

alpha

F~~x~~ XX XX XX

1111 nnnn aabb ccdd eeff

1111 is F
nnnn is number of letters in the text
aabb ccdd eeff is the text

XEQ alpha

1E F~~x~~ XX XX

0001 1110 1111 nnnn aabb ccdd eeff

0001 1110 1111 er 1E F
nnnn is number of letters in the text
aabb ccdd eeff is the text

GTO alpha

1D F~~x~~ XX XX

0001 1101 1111 nnnn aabb ccdd eeff

0001 1101 1111 is 1D F
nnnn is number of letters in the text
aabb ccdd eeff is the text

LBL alpha

CX XX F~~x~~ ~~xx~~ XX XX .. XX

1010 bbb~~r~~ rrrr rrrr 1111 nnnn kkkk aabb ccdd eeff

1010 is C
bbb is number of bytes to next LBL
r rrrr rrrr is number of registers to next LBL
1111 is F
nnnn is number of letters + 1
kkkk is assign keycode
aabb ccdd eeff
is the text

HP41 CX mainframe functions

ID = 004

000 CAT	064 +	086 LOG	108 HMS	130 GRAD	152 VIEW
001 GTO..	065 -	087 10↑X	109 HR	131 ENTER↑	153 ΣREG
002 DEL	066 *	088 E↑X-1	110 RND	132 STOP	154 ASTO
003 COPY	067 /	089 SIN	111 OCT	133 RTN	155 ARCL
004 CLP	068 X<Y?	090 COS	112 CLΣ	134 BEEP	156 FIX
005 R/S	069 X>Y?	091 TAN	113 X<>Y	135 CLA	157 SCI
006 SIZE	070 X<=Y?	092 ASIN	114 PI	136 ASHF	158 ENG
007 BST	071 Σ+	093 ACOS	115 CLST	137 PSE	159 TONE
008 SST	072 Σ-	094 ATAN	116 R↑	138 CLRG	
009 ON	073 HMS+	095 DEC	117 RDN	139 AOFF	168 SF
010 PACK	074 HMS-	096 1/X	118 LASTX	140 AON	169 CF
	075 MOD	097 ABS	119 CLX	141 OFF	170 FS?C
014 SHIFT	076 %	098 FACT	120 X=Y?	142 PROMPT	171 FC?C
015 ASN	077 %CH	099 X≠0?	121 X≠Y?	143 ADV	172 FS?
	078 P-R	100 X>0?	122 SIGN	144 RCL	173 FC?
	079 R-P	101 LNX+1	123 X<=0?	145 STO	
	080 LN	102 X<0?	124 MEAN	146 ST+	206 X<>
	081 X↑2	103 X=0?	125 SDEV	147 ST-	207 LBL
	082 SQRT	104 INT	126 AVIEW	148 ST*	208 GTO
	083 Y↑X	105 FRC	127 CLD	149 ST/	
	084 CHS	106 D-R	128 DEG	150 ISG	224 XEQ
	085 E↑X	107 R-D	129 RAD	151 DSE	

MODULE ID's

The colors represent the way I have the module: green = actual module; purple, black & blue = programmable module; orange = digital

XROM#	◆MODULE					◆NoVRAM	◆CLONIX41	◆.ROM		◆ZEPROM
1	MATH 1					41Z ROM				LAND NAV
2	STAT 1						EXTENDED IL			
3	SURVEYING 1					SANDMATH				
4	FINANCIAL 1	CMT-200							ES-41	CO-OP ROM
5	STANDARD	PANAME	ZENROM 1						BLDROM	RAMBOX32
6	CIRCUITS 1							TOMSROM	ALPHA ROM	
7	STRC ANAL X	STD HEPAX				HEPAX 1D				
8	STRESS					SANDBOX			SKWIDBC	
9	CCD MODULE	PANAME	HOME MGMT				ZEP PROGRAM		TEST	
10	PPC ROM	GAMES	KOELN3	FORECAST1	FORECASTER2			ERAMCO MLDL	AUTO/DUP	
11	CCD MODULE	REAL ESTATE								
12	MACHINE									
13	THERMAL					SANDBOX			TOOLBOX ROM	
14	NAVIGATION								PROTOPARIO	
15	PETROLEUM							MC-EPROM	DISASM4C	
16	PETROLEUM							SIMPLEX		
17	PLOTTER						NFCROM		BLDROM2	
18	PLOTTER	AECROM					AECROM			
19	STRC ANAL X	SECURITIES X	AVIATION X	CLIN LAB X				Advantage Application ROM	HP-IL DIAG	
20	PPC ROM									
21	DEL.SERV.1	SCHENK MODUL	KOELN4	SEA KING MK5	ML-IDC	BG/UG IDC	MLROM	DATA LOGGER	HYDRACOMP	ASSEMBLER 3
22	ADVANTAGE	HP-IL DEVEL			ML-IDC					
23	EXTENDED I/O									
24	ADVANTAGE	HP-IL DEVEL								
25	X FUNCTIONS									
26	TIME MODULE									
27	WAND						DAVID ASSEM		PROFISSET L	
28	HP-IL									
29	PRINTER	I/R PRINTER	IL-PRINTER							
30	CARD READER									
31	DEL.SERV.1	SCHENK MODUL	KOELN4			RAMBOXII	SUP-R-ROM	DATA LOGGER	PROFISSET U	CO-OP ROM
◆NO ID				Laitram XQ2	PRINTERSERVICE		FORTH 41	Service-C	Service-CX	TEST ROM

01 MATH 1

00 MATH 1C
01 MATRIX
02 SIMEQ
03 VCOL
04 VMAT
05 PVT
06 DET
07 INV
08 EDIT
09 SOLVE
10 SOL
11 POLY
12 ROOTS
13 INTG
14 DIFEQ
15 FOUR
16 C+
17 C-
18 C*
19 C/
20 MAGZ
21 CINV
22 Z↗N
23 Z↗1/N
24 e↗N
25 LNZ
26 a↗Z
27 LOGZ
28 Z↗W
29 Z↗1/W
30 SINZ
31 COSZ
32 TANZ
33 SINH
34 COSH
35 TANH
36 ASINH
37 ACISH
38 ATANH

39 SSS
40 ASA
41 SAA
42 SAS
43 SSA
44 TRANS
45 *FN

02 STAT 1

00 STAT 1B
01 ΣBSTAT
02 ΣBSTG
03 *BE
04 ΣMMTUG
05 ΣMMTGD
06 *MT
07 *MD
08 ΣAOVONE
09 ΣANOTWO
10 ΣANOCOV
11 ΣLIN
12 ΣEXP
13 ΣLOGVONE
14 ΣPOW
15 ΣPOLYP
16 ΣPOLYC
17 ΣMLRXY
18 ΣMLRXYZ
19 ΣPTST
20 ΣTSTAT
21 ΣXSQEV
22 ΣEEFXSQ
23 ΣCTKK
24 ΣCTKKK
25 ΣSPEAR
26 ΣNORMD
27 ΣCHISQD
28 *a
29 *b

02 DAVID ASSEM

00 DAVID-ASSEM
01 ASSM
02 BEG/END
03 BUF>REG
04 DISTOA
05 REG>BUF

03 SURVEYING 1

00 SURVEY 1B
01 TRAV
02 COMP
03 TRANSIT
04 ADJUST
05 INTER
06 CURVE
07 HORIZ
08 VERT
09 RESECT
10 PREAREA
11 ENDEVOL
12 PIT
13 COORD
14 ACRES
15 AZ
16 BRG
17 CIR
18 INVERSE
19 NE
20 TS
21 *A0
22 *1
23 *BR
24 *DL
25 *DS
26 *EL
27 *H
28 *S
29 *A1
30 *B1
31 *IN
32 *YN

04 CMT-200

00 -DIGIO 1B
01 ANDXY
02 A>BUF
03 BUF>AX
04 BUF>TX
05 BUF>X
06 BUFX
07 FLAG>X
08 FLAG<>X
09 HS
10 IA
11 IAX
12 IBUFX
13 ICX
14 IDX
15 INTMASK
16 INTOFF
17 INTON
18 INVOFF
19 INVON
20 MATCHI
21 NOTX
22 OA
23 OBUFX
24 OCX
25 ODX
26 ORXY
27 PT>X
28 RATE
29 STROBE
30 TIMEI
31 TIMEO
32 TX>BUF
33 VIEWIN
34 WAITIX
35 X>A
36 X>BUF
37 X>FLAG
38 X>PT

04 CO-OP MODULE

00	SUN	39	PBEG
01	ALM 1	40	PRCL
02	AV	41	ASWC
03	GRID	42	BSWC
04	SETS	43	ATOC
05	BS	44	ASWB
06	KC	45	PRTPT
07	KD	46	F2
08	TS	47	ACRE
09	BB	48	STASTO
10	BD	49	∠ RST
11	DD	50	STAKE
12	PERPO	51	PRTC
13	CR	52	RPS
14	TR	53	RS
15	SS	54	RPR
16	COORTR	55	RR
17	PINV	56	Z
18	SSSTO	57	PPP
19	PNO	58	NEXTN
20	TMS		
21	T41		
22	PP		
23	IN		
24	CX		
25	TRASTO		
26	PTRA		
27	NEXTNO		
28	RECALL		
29	RMM		
30	REM		
31	INV		
32	ATB		
33	BTA		
34	BAZ		
35	DMS		
36	T		
37	TRA		
38	POB		

04 FINANCIAL 1

00	FINANCE 1D
01	MONEY
02	IRR
03	MIRR
04	NPV
05	AMORT
06	SL
07	DB
08	SOYD
09	BOND
10	DAYS
11	*N
12	*I
13	*PV
14	*PMT
15	*FV
16	*IRR
17	*MIRR
18	*NPV
19	*AMORT
20	*SL
21	*DB
22	*SOYD
23	*PRC
24	*YLD
25	*DAYS
26	*BGN
27	*SIZE
28	*DATA
29	*DATA1
30	*OUT
31	*TGL
32	*TGL1
33	*Y/N

05 PANAME

00	-ADV PRT 3C	39	-82905 FCNS
01	AID	40	BELL
02	ID	41	CHARSET
03	FINDAID	42	FFEEED
04	OUTAX	43	FORMLEN
05	OUTCR	44	GRAPHX
06	OUTLF	45	MODE
07	OUTLFX	46	SKIPOFF
08	OUTSPX	47	SKIPON
09	OUTXB	48	TEXTLEN
10	OUTYBX	49	VSPAC
11	OUTa	50	-PLOT FCNS
12	OUTaX	51	AXIS
13	RCLSEL	52	BACKSP
14	-82163 FCNS	53	BACKSPX
15	CLEAR	54	BOX
16	CLEARO	55	COLOR
17	CSRDN	56	*CSIZE
18	CSRHX	57	*DRAW
19	CSRL	58	*HOME
20	CSROFF	59	*LABEL
21	CSRON	60	*LDIR
22	CSRR	61	*LTYPE
23	CSRVX	62	*MOVE
24	CSRUP	63	*PLREGX
25	CTYPE		
26	HOME		
27	SCRLDN		
28	SCRUP		
29	SCRUX		
30	XYTAB		
31	-82162 FCNS		
32	CLBUF		
33	8BIT		
34	ESCAPE		
35	PARSE		
36	STATUS		
37	TABCOL		
38	UNPARSE		

05 ZENROM 1

00	ZENROM 3B
01	CLMM
02	CLXM
03	CODE
04	DECODE
05	LASTP
06	MCED
07	NOP
08	NRCLM
09	NRCLX
10	NSTOM
11	RAMED
12	TOGF

05
STANDARD

00	STRD 1A	39	FF
01	CLSTK	40	HEX
02	1	41	FIN
03	2	42	ROOT
04	3	43	LIN
05	4	44	EXP
06	5	45	LOG
07	6	46	POW
08	7	47	INIT
09	8	48	CSUB
10	9	49	CADD
11	0	50	CDIV
12	STACK	51	CMULT
13	E↗	52	UV
14	RDWN	53	CRD
15	SWAP	54	Q
16	RUP	55	10
17	PL	56	SH
18	MI	57	DL
19	MU	58	S
20	DI	59	HT
21	CLR	60	DB
22	CHSN	61	PH
23	ST	62	DH
24	RC	63	P
25	LSTK		
26	CLNDR		
27	WORDS		
28	LTTR		
29	DESPEL		
30	TEACH		
31	AGN		
32	TRY		
33	YES		
34	+		
35	-		
36	*		
37	/		
38	RNDM		

06
CIRCUIT 1

00	CIR ANL 1A	39	STUB0=
01	GNAP	40	STUBS=
02	*J	41	PV
03	PHASE	42	P _Δ V
04	H<F>dB	43	PVdB
05	H<F>	44	Δ V2/V1
06	GM=	45	V2/1dB
07	R=	46	V2/V1
08	L=	47	PI
09	C=	48	P _Δ I
10	LNAP	49	PIdB
11	RS	50	Δ I2/I1
12	RP	51	I2/1dB
13	CS	52	I2/I1
14	CP	53	PZIN
15	LS	54	P _Δ ZIN
16	LP	55	ZIN
17	TF	56	Δ ZIN
18	GY	57	PP2/P1
19	LCS	58	P2/P1
20	LCP	59	ALL
21	LINE	60	*AN
22	STUB0	61	*MAT*
23	STUBS	62	*C*
24	ICIS	63	*C+
25	VCIS		
26	RS=		
27	LS=		
28	CS=		
29	LCS=		
30	LINE=		
31	ICIS=		
32	VCIS=		
33	TF=		
34	GY=		
35	RP=		
36	LP=		
37	CP=		
38	LCP=		

07
HEPAX

00	-HEPAX 1D	39	PRIVATE
01	HAPPCHR	40	CLRAM
02	HAPPREC	41	CODE
03	HARCLRC	42	COPYROM
04	HASROOM	43	DECODE
05	HCLFL	44	DECODYX
06	HRFLAS	45	DISASM
07	HCRFLD	46	HEPAX
08	HDELCRH	47	HEPAXA
09	HDELREC	48	HEXEDIT
10	HEPDIR	49	HPROMPT
11	HEPDIRX	50	RAMTOG
12	HEPROOM	51	READROM
13	HFLSIZE	52	WRTROM
14	HGETA	53	XF
15	HGETK	54	XFA
16	HGETR		
17	HGETREC		
18	HGETRX		
19	HGETX		
20	HINSCHR		
21	HINSREC		
22	HPOSFL		
23	HPURFL		
24	HRCLPT		
25	HRCLPTA		
26	HREADFL		
27	HRENAME		
28	HSAVEA		
29	HSAVEK		
30	HSAVEP		
31	HSAYER		
32	HSAYERX		
33	HSAVEX		
34	HSEC		
35	HSEKPT		
36	HSEKPTA		
37	HUNSEC		
38	HWRTFL		

07
STRC ANAL X

```

00 STRCTA 1B
01 SECTION
02 SIMPLE
03 CANT
04 FIXED
05 PROPPED
06 SPAN
07 NSPAN
08 FIXL
09 FIXR
10 MOMENTS
11 SETTLE
12 CFRAME
13 VECTOR
14 SIZE?
15 SZ?
16 ATANY/X
17 BEAM
18 *B
19 *AI
20 *LI
21 *PI
22 *MI
23 *WI
24 *P
25 *M
26 *L
27 *W

```

08
STRESS

```

00 STRESS 1B
01 SIMPLE
02 CANT
03 FIXED
04 PROPPED
05 SPAN
06 NSPAN
07 FIXL
08 FIXL
09 MOMENTS
10 COLUMN
11 SECTION
12 MOHR
13 DELTA
14 REC
15 SODER
16 VECTOR
17 SIZE?
18 ATANY/X
19 BEAM
20 *B
21 *AI
22 *LI
23 *L
24 *PI
25 *P
26 *MI
27 *M
28 *WI
29 *W
30 *ROS
31 *MO
32 *COL

```

09
PANAME

```

00 RDRAW
01 RESET
02 REVLFX
03 REVLFX
04 RMOVE
05 SETORG
06 -UTILITIES
07 /MOD
08 AD-LC
09 ALENG
10 ANUM
11 ANUMDEL
12 APPX
13 AROT
14 ATOXL
15 ATOXR
16 ATOXX
17 BLDPT
18 BRKPT
19 CHFLAG
20 CLINC
21 COLPT
22 GETRGX
23 LC-AD
24 LINPT
25 NOP
26 OUT
27 POSA
28 PSIZE
29 READEM
30 RG
31 RG+-
32 RG*
33 RG/
34 RG+Y
35 RG*Y
36 RG/Y
37 RGAX
38 RGCOPY
39 RGINIT
40 RGNb
41 RGORD
42 RGXTR
43 RGSUM
44 RGVIEW
45 SAVERGX
46 SIZE?
47 SORT
48 STO>L
49 SUB$
50 TF55
51 VKEYS
52 WRTEM
53 X=NN?
54 X NN?
55 X<NN?
56 X<=NN?
57 X>NN?
58 X>=NN?
59 X<>F
60 XTOAL
61 XTOAR
62 Y/N
63 YTOAX

```

09
CCD

```

00 -W&W CCD A
01 B?
02 CAS
03 CLB
04 RNDM
05 SAS
06 SEED
07 SORT
08 -ARR FNS
09 >C+
10 >R+
11 ?IJ
12 ?IJA
13 C<>C
14 C>+
15 C>-
16 CMAXAB
17 CNRM
18 CSUM
19 DIM
20 FNRM
21 IJ=
22 IJ=A
23 M+
24 M-
25 M*
26 M*M
27 M/
28 MAX
29 MAXAB
30 MDIM
31 MIN
32 MOVE
33 PIV
34 R-PR
35 R-QR
36 R<>R
37 R>+
38 R>-
39 R>R?
40 RMAXAB
41 RNRM
42 RSUM
43 SUM
44 SUMAB
45 SWAP
46 YC+C
47 -HEX FNS
48 1CMP
49 2CMP
50 AND
51 bC?
52 bS?
53 Cb
54 NOT
55 OR
56 R<
57 R>
58 S<
59 S>
60 Sb
61 UNS
62 WSIZE
63 XOR

```

09
HOME MGMT

```

00 HOME MN 1A
01 BUDGET
02 TRAVEL
03 STOCKS
04 FINANCE
05 BAL
06 IRA
07 INS
08 CHECK
09 HOME
10 BUY?
11 STORE
12 RELOAD
13 CL
14 *
15 *0
16 *e
17 N
18 *I
19 PV
20 PMT
21 FV
22 *J
23 *H

```

09
ZEP PROG

```

00 -ZEP PROG
01 ADDBSW
02 ADDMCF
03 ADDUCF
04 BLANK?
05 BNKSW?
06 BURNUC
07 BURNWD
08 CHKSUM
09 COMPUC
10 COPYPG
11 CPXYZ
12 DECHEX
13 ENABLEP
14 ENABLES
15 FRSPC?
16 HEXDEC
17 ILBURN
18 ILSAVE
19 INIT
20 INITP
21 INITPG
22 PB01
23 PGX=Y?
24 PRGMLN
25 READWD
26 REBURN
27 RRBURN
28 SB01
29 UCBURN

```

10
GAMES

```

00 GAMES 1A
01 BAGELS
02 BIOR
03 BIOF
04 CRAPS
05 HANG
06 PINBALL
07 SWAR
08 SUBHUNT
09 BOOM
10 INI
11 P
12 SIZE?
13 RNDM
14 RNDMW

```

10
FORECAST 1

```

00 *FORECASTER
01 START
02 EDIT
03 UP
04 LS
05 FC
06 CS
07 MR
08 T1
09 T2
10 TL
11 C1
12 C2
13 C3
14 SB
15 DS
16 SS
17 SZ
18 CC
19 *ASTRO
20 JD
21 CD
22 DBD
23 DAD
24 DOW
25 DOCY
26 DOLY
27 DLIST
28 PREC
29 EQ-H
30 RISE
31 SET
32 ANG
33 LMT
34 ST
35 UT
36 GST
37 LST
38 FW

```

```

39 BW
40 QLST
41 OUT
42 ACXR

```

10
FORECASTER 2

```

00 FORECASTER2
01 START
02 CS
03 EDIT
04 UP
05 LS
06 FC
07 CA
08 PS
09 TF
10 DFC
11 PT
12 RC
13 WC
14 TL
15 SS
16 DS
17 SB
18 BX
19 SZ
20 C1
21 C2
22 MS
23 FCA
24 FCO
25 S
26 EN
27 PPV
28 PSS
29 FT
30 PP
31 NFT
32 GINT

```


10
PPC

00	C PPC 1981	39	SU
01	MK	40	NH
02	1K	41	HN
03	+K	42	BL
04	F?	43	FL
05	LF	44	BI
06	CK	45	IP
07	VA	46	PS
08	UD	47	T1
09	PK	48	MS
10	A?	49	IF
11	DC	50	CB
12	ML	51	RT
13	RF	52	PD
14	Σ?	53	DP
15	S?	54	QR
16	C?	55	2D
17	DT	56	SX
18	AD	57	RX
19	XE	58	OM
20	HD	59	PA
21	ΣC	60	GE
22	LB	61	Ab
23	L-	62	E?
24	-B	63	FI
25	XD		
26	VM		
27	EX		
28	MT		
29	DS		
30	VS		
31	EP		
32	TN		
33	CX		
34	CU		
35	CD		
36	VK		
37	AL		
38	NC		

11
CCD

00	-I/O FNS	39	SAVEB
01	ABSP	40	SAVEK
02	ACAXY	41	SORTFL
03	ACLX		
04	ARCLE		
05	ARCLH		
06	ARCLI		
07	CLA-		
08	F/E		
09	INPT		
10	PMTA		
11	PMTH		
12	PMTK		
13	PRAXY		
14	PRL		
15	VIEWH		
16	XTOAH		
17	-ADV FNS		
18	A+		
19	A+B		
20	A-		
21	A-A		
22	DCD		
23	PC<>RTN		
24	PC>X		
25	PEEKB		
26	PEEKR		
27	PHD		
28	PLNG		
29	POKEB		
30	POKER		
31	PPLNG		
32	X>PC		
33	X>RTN		
34	XR>RTN		
35	-XF/M FNS		
36	GETB		
37	GETK		
38	MRGK		

11
REAL ESTATE

00	REAL EST 1B	39	R
01	\$	40	CH
02	N	41	*EQ
03	*I	42	*RT
04	PV	43	OUT
05	PMT	44	SIZE?
06	FV	45	START
07	12*	46	CLK
08	12/		
09	BEG/END		
10	LIST		
11	CLFIN		
12	AMORT		
13	NPV		
14	IRR		
15	MIRR		
16	DEPR		
17	IPA		
18	GPMT		
19	WRAP		
20	SUMMARY		
21	EQ		
22	RENT		
23	*N		
24	I*		
25	*PV		
26	*PMT		
27	*FV		
28	*AMORT		
29	*AMT		
30	*SL		
31	*SOYD		
32	*DB		
33	*NPV		
34	*IRR		
35	*MIRR		
36	CALC		
37	SALE		
38	Y		

12
MACHINE

```

00 MACHINE 1A
01 CAM
02 HAR
03 CYC
04 PAR
05 DWECC
06 GEN4BAR
07 4BAR
08 CRANK
09 GEAR
10 SPUR
11 INV
12 SPRING
13 MOTION
14 COORD
15 POINTS
16 3POINTS
17 FCON
18 BCON
19 INI
20 *O
21 *IN
22 +360
23 *OUT
24 KEY

```

13
THERMAL

```

00 THRML 1A
01 KWONG
02 IDEAL
03 POLYTRP
04 ISNFLOW
05 FLOW
06 FLOW2
07 H2O
08 Re
09 ENERGY
10 HEATEX
11 A0
12 E0
13 ACNT
14 ECNT
15 APAR
16 EPAR
17 APRC
18 EPRC
19 ACRS
20 ECRS
21 BLKBODY
22 EbL
23 UNIT?
24 SZ?
25 INPUT
26 OUTPUT
27 KEY
28 -SI
29 SI-

```

14
NAVIGATION

```

00 NAVIG 1B
01 NA
02 *NA
03 STAR
04 *STAR
05 SUN
06 *SUN
07 *SUNL
08 *SUNU
09 MOON
10 *MOON
11 *MOONU
12 *MOONL
13 VENUS
14 *VENUS
15 P
16 MARS
17 *MARS
18 JUPITER
19 *JUPIT
20 SATURN
21 *SATUR
22 SRT
23 *SRT
24 JD
25 D+T
26 LBRYZX
27 ZYXdHA
28 DSPHAd
29 *IN
30 *IN1
31 DMT
32 DMS
33 HR
34 *T
35 FA
36 GST
37 BODY
38 *BODY

```

```

39 SIGHT
40 RM
41 DR
42 *DR
43 GCPOS
44 *GCPOS
45 GC
46 *GC
47 GCPLAN
48 *GCPLAN
49 GCPLLOT
50 *GCPLLOT
51 DSPP2
52 LOTOL
53 *LOTOL
54 DSPL
55 DSPL0
56 RLPOS
57 *RLPOS
58 RL
59 *RL
60 *M/a
61 *ec

```

15
PETROLEUM

```

00 PETROL 1A
01 Z
02 CG
03 CCG
04 BG
05 CBG
06 UG
07 CUG
08 TcPc
09 CTcPc
10 CCWA
11 PROP
12 W0
13 COMP
14 SOUR
15 IN
16 CGASG
17 CTPC
18 W1
19 CHV
20 CCB
21 W2
22 W3
23 C0
24 CC0b
25 CC0
26 COS
27 W4
28 W5
29 B0
30 CB0b
31 CB0
32 CBT
33 U0
34 CU0d
35 CU0b
36 CU0
37 CW
38 CCW

```

```

39 BW
40 CBW
41 UW
42 CUW
43 CPSAT
44 CFR
45 CCFR

```

16
PETROLEUM

00	RS	39	OUT
01	CRSb	40	INK
02	Pb	41	INU
03	CPb	42	CZ
04	BT	43	CCR
05	CBTb	44	CON
06	RSW	45	INCON
07	CRSW		
08	CT		
09	CCT		
10	CCTb		
11	TITLE		
12	W6		
13	Y/N?		
14	ITcPc		
15	STDTP		
16	SEPTP		
17	T		
18	P		
19	GASG		
20	OILG		
21	IRS		
22	RSI		
23	%NACL		
24	%POR		
25	W7		
26	W8		
27	W9		
28	X0		
29	X1		
30	X2		
31	X3		
32	X4		
33	X5		
34	X6		
35	X7		
36	X8		
37	OUTK		
38	OUTU		

17
PLOTTER

00	-PLOTTER 1A-
01	CLIPUU
02	CSIZE
03	CSIZE0
04	DGTIZE
05	DRAW
06	FRAME
07	GCLEAR
08	IDRAW
09	IMOVE
10	IPLOT
11	LABEL
12	LDIR
13	LIMIT
14	LOCATD
15	LOCATE
16	LORG
17	LTYPE
18	LTYPE0
19	LXAXIS
20	LYAXIS
21	MOVE
22	PEN
23	PENDN
24	PENUP
25	PINIT
26	PLOT
27	PLREGX
28	RATIO
29	RPLLOT
30	SCALE
31	SETGU
32	SETUU
33	TICLEN
34	UNCLIP
35	WHERE
36	XAXIS
37	XAXISO
38	YAXIS

18
PLOTTER

00	-PLOTTER 2A-
01	PCLBUF
02	PDIR
03	PRCL
04	NEWPLOT
05	REPLOT
06	PLINIT
07	PLTUXY
08	PLANOT
09	Y?
10	X?
11	BC
12	BCA
13	BCAA
14	BCCKSM
15	BCO
16	BCP
17	BCREGX
18	BCSIZE
19	BCX
20	BCXS

19
CLINICAL LAB X

00	CLINLAB 1A	39	*PR
01	BEERS	40	*R
02	BRA	41	*SE
03	CREAT	42	*SR
04	BLOOD	43	*TC
05	O2SAT	44	*X
06	RCI	45	*XE
07	TBV	46	*YN
08	THY		
09	RADCORR		
10	RIA		
11	BSTAT		
12	CHI		
13	TSTAT		
14	TDIST		
15	*		
16	*0		
17	*1		
18	*2		
19	*3		
20	*4		
21	*5		
22	*6		
23	*7		
24	*8		
25	*9		
26	*A		
27	*C		
28	*CO		
29	*CR		
30	*CS		
31	*F		
32	*H		
33	*HG		
34	*IN		
35	*I125		
36	*I131		
37	*P		
38	*Pt		

XROM

◆HEADER ◆MCODE ◆USERCODE

19 SECURITIES X

00 SECUR 1B
01 BONDS
02 STOCK
03 CALL
04 OPTION
05 HEDGING
06 BFLY
07 BULL
08 CSEC
09 CBOND
10 SPEC
11 PRC
12 YLD
13 ATY
14 ATP
15 JDAY
16 BEP
17 *BFLY
18 DBEP
19 UBEP
20 CONV

19 STRC ANAL X

00 STRCTB 1A
01 COLE
02 COLSI
03 TBEAM
04 ABEAM
05 CONCOL
06 ITCON
07 IRCON

19 AVIATION

00 AVIATIN 1A
01 FM
02 WB
03 CG
04 CLWB
05 PLAN
06 DP
07 WA
08 PERF
09 FLY
10 CLIMB
11 CRUISE
12 360+
13 WALT
14 DISP
15 IFW
16 HCW
17 1VOR
18 R2
19 2VOR
20 TAS
21 *T

20 PPC

00 SR
01 Sb
02 LR
03 SD
04 SK
05 RD
06 RK
07 BV
08 CV
09 IG
10 SV
11 FD
12 FR
13 DF
14 NP
15 GN
16 RN
17 BD
18 TB
19 PM
20 CM
21 CJ
22 JC
23 CA
24 LG
25 HA
26 HS
27 CP
28 MP
29 HP
30 BA
31 M2
32 M3
33 M1
34 BE
35 M4
36 M5
37 IR
38 DR

39 BM
40 BR
41 BX
42 BΣ
43 BC
44 UR
45 PR
46 S1
47 S3
48 S2
49 NS
50 NR
51 PO
52 Rb
53 AM
54 MA
55 SM
56 SE
57 XL
58 VF

21 SEA KING MK5

00 STAC ROM
01 TONE
02 CPA
03 L
04 K
05 DEPTH
06 ANGLE
07 UPD
08 TURN
09 HYFIX
10 UPDATE
11 HARM
12 TRACKEX
13 ESM
14 LESM
15 COG
16 VMX
17 CC
18 CBY
19 CST
20 CP
21 CW
22 CF
23 BRF
24 CLKEYS
25 LOGBOOK
26 BATHY
27 N
28 P
29 M
30 IF

21 ASSEMBLER 3

00	ASSEMBLER3	39	SXL
01	AND	40	SXR
02	OR	41	X>\$
03	APPFN	42	X+Y
04	ASSEM	43	Y-X
05	DISASM	44	1CMP
06	A>X	45	2CMP
07	X>A	46	1-D
08	BCD>BIN	47	2-D
09	BIN>BCD	48	3-D
10	CF55	49	4-D
11	SF55		
12	CLROM		
13	CODE		
14	DECODE		
15	COMPILE		
16	COPYROM		
17	CVIEW		
18	VIEWA		
19	DISS		
20	GETPC		
21	PUTPC		
22	HEXKB		
23	INSBYTE		
24	RCLBYTE		
25	STOBYTE		
26	LOADP		
27	MLDL?		
28	NEXTFN		
29	NRCL		
30	NSTO		
31	PCWRT		
32	REG>ROM		
33	ROM>REG		
34	ROM>X		
35	X>ROM		
36	ROM?		
37	RXL		
38	RXR		

21 DEL.SERV.1

00	U
01	K
02	L
03	RN
04	DI
05	CC
06	2
07	Q
08	P
09	M1
10	RP
11	3
12	0
13	9
14	7
15	QF
16	3C
17	TC
18	SP
19	11
20	W
21	CLFL
22	CRFLD
23	GETX
24	SAVEX
25	SEEKPTA
26	V
27	CL
28	S

22 ADVANTAGE

00	-ADV CONV A	39	MRC-
01	BININ	40	MRIJ
02	BINVIEW	41	MRIJA
03	OCTIN	42	MRR+
04	OCTVIEW	43	MRR-
05	HEXIN	44	MS
06	HEXVIEW	45	MSC+
07	NOT	46	MSIJ
08	AND	47	MSIJA
09	OR	48	MSR+
10	XOR	49	MSWAP
11	ROTX	50	MSYS
12	BIT?	51	PIV
13	-ADV MTRX	52	R<>R
14	C<>C	53	R>R?
15	CMAAB	54	RMAAB
16	CNRM	55	RNRM
17	CSUM	56	RSUM
18	DIM?	57	SUM
19	FNRM	58	SUMAB
20	I+	59	TRNPS
21	I-	60	YC+C
22	J+	61	MEDIT
23	J-	62	CMEDIT
24	M*M	63	MP
25	MAT*		
26	MAT+		
27	MAT-		
28	MAT/		
29	MATDIM		
30	MAX		
31	MAXAB		
32	MDET		
33	MIN		
34	MINV		
35	MMOVE		
36	MNAME?		
37	MR		
38	MRC+		

22

HP-IL DEVEL

00	-HP-IL DEV	39	PRFRMS
01	A-BUF	40	REN
02	A=BUF?	41	RFRM
03	A=BUF?	42	RG-BUFX
04	AAD	43	RG=BUF?
05	AAU	44	RREG
06	AIPT	45	SAI
07	BSIZE?	46	SCOPE
08	BSIZE	47	SDA
09	BUF-AX	48	SDC
10	BUF-RGX	49	SDI
11	BUF-XA	50	SF33
12	BUF-XB	51	SRQR?
13	CF33	52	SST
14	CMD	53	TAD
15	DDL	54	TCT
16	DDT	55	UNL
17	FRAV?	56	UNT
18	FRNS?	57	WFRM
19	GET	58	WREG
20	GTL	59	X-BUF
21	IDY	60	X=BUF?
22	IFCR?	61	X<>FLAG
23	IFC		
24	INBIN		
25	INBUFX		
26	LAD		
27	LPD		
28	MIPT		
29	MONITOR		
30	NRD		
31	NRE		
32	ORAV?		
33	OUTBIN		
34	OUTBINY		
35	OUTBUFX		
36	PT=		
37	PT?		
38	PRBYTES		

23

CLINICAL LAB X

00	-X MASS 1A	39	OUTXB
01	COPYFL	40	OUTP
02	DIRX	41	POLL
03	FLENG	42	POLLD
04	FLTYPE	43	POLLE
05	MCOPY	44	POLLUNC
06	MCOPYPV	45	RCLSEL
07	MVERIFY	46	SRQ?
08	-X EXT FCN	47	STAT
09	ALENGIO	48	XFER
10	ANUMDEL	49	XFERC
11	ATOXL	50	XFERCL
12	ATOXR	51	XFERE
13	ATOXX	52	XFERN
14	XTOAL	53	-ADV CTL FN
15	XTOAR	54	ADROFF
16	X<>FIO	55	ADRON
17	YTOAX	56	DDL
18	-X CTL FNS	57	DDT
19	AID	58	LAD
20	CLRDEV	59	SEND
21	CLRLOOP	60	TAD
22	DEVL	61	UNL
23	DEVT	62	UNT
24	FINDAID		
25	ID		
26	INAC		
27	INACL		
28	INAE		
29	INAN		
30	INXB		
31	INP		
32	LOCK		
33	NLOOP		
34	NOTREM		
35	OUTAC		
36	OUTACL		
37	OUTAE		
38	OUTAN		

23

EXTENDED I/O

00	-X MASS 1A	39	OUTXB
01	COPYFL	40	OUTP
02	DIRX	41	POLL
03	FLENG	42	POLLD
04	FLTYPE	43	POLLE
05	MCOPY	44	POLLUNC
06	MCOPYPV	45	RCLSEL
07	MVERIFY	46	SRQ?
08	-X EXT FNS	47	STAT
09	ALENGIO	48	XFER
10	ANUMDEL	49	XFERC
11	ATOXL	50	XFERCL
12	ATOXR	51	XFERE
13	ATOXX	52	XFERN
14	XTOAL	53	-ADV CTL FN
15	XTOAR	54	ADROFF
16	X<>FIO	55	ADRON
17	YTOAX	56	DDL
18	-X CTL FNS	57	DDT
19	AID	58	LAD
20	CLRDEV	59	SEND
21	CLRLOOP	60	TAD
22	DEVL	61	UNL
23	DEVT	62	UNT
24	FINDAID		
25	ID		
26	INAC		
27	INACL		
28	INAE		
29	INAN		
30	INXB		
31	INP		
32	LOCK		
33	NLOOP		
34	NOTREM		
35	OUTAC		
36	OUTACL		
37	OUTAE		
38	OUTAN		

24
ADVANTAGE

00	MATRX	39	VE
01	MATR	40	V-
02	-ADV MATH	41	V+
03	SOLVE	42	VXY
04	INTEG	43	UV
05	SILLOOP	44	V _Δ
06	SIRTN	45	VD
07	Z↗N	46	V*
08	MAGZ	47	TR
09	e↗Z	48	CT
10	LNZ	49	AIP
11	Z↗1/N	50	-ADV TVM
12	SINZ	51	TVM
13	COSZ	52	N
14	TANZ	53	PV
15	a↗Z	54	PMT
16	LOGZ	55	FV
17	Z↗1/W	56	*I
18	Z↗W		
19	C+		
20	C-		
21	CINV		
22	C*		
23	C/		
24	PLY		
25	RTS		
26	DIFEQ		
27	CFIT		
28	AΣ		
29	DΣ		
30	BFIT		
31	FIT		
32	Y?X		
33	SZ?		
34	VC		
35	CROSS		
36	VS		
37	VR		
38	DOT		

24
HP-IL DEVEL

00	---
01	AND
02	ASIZE?
03	A-XL
04	A-XR
05	A-XX
06	BININ
07	BINVIEW
08	BIT?
09	HEXIN
10	HEXVIEW
11	NOT
12	OR
13	OCTIN
14	OCTVIEW
15	ROMCHKX
16	ROTXY
17	XOR
18	X-AL
19	X-AR
20	Y-AX

25
XF

00	-EXT FCN 2D	39	SAVER
01	ALENG	40	SAVERX
02	ANUM	41	SAVEX
03	APPCHR	42	SEEKPT
04	APPREC	43	SEEKPTA
05	ARCLREC	44	SIZE?
06	AROT	45	STOFLAG
07	ATOX	46	X<>F
08	CLFL	47	XTOA
09	CLKEYS	48	-CX EXT FCN
10	CRFLAS	49	ASROOM
11	CRFLD	50	CLRGX
12	DELCHR	51	ED
13	DELREC	52	EMDIRX
14	EMDIR	53	EMROOM
15	FLSIZE	54	GETKEYX
16	GETAS	55	RESZFL
17	GETKEY	56	ΣREG?
18	GETP	57	X=NN?
19	GETR	58	X≠NN?
20	GETREC	59	X<NN?
21	GETRX	60	X<=NN?
22	GETSUB	61	X>NN?
23	GETX	62	X>=NN?
24	INSCHR		
25	INSREC		
26	PASN		
27	PCLPS		
28	POSA		
29	POSFL		
30	PSIZE		
31	PURFL		
32	RCLFLAG		
33	RCLPT		
34	RCLPTA		
35	REGMOVE		
36	REGSWAP		
37	SAVEAS		
38	SAVEP		

26
TIME

00	-TIME 2C
01	ADATE
02	ALMCAT
03	ALMNOW
04	ATIME
05	ATIME24
06	CLK12
07	CLK24
08	CLKT
09	CLKTD
10	CLOCK
11	CORRECT
12	DATE
13	DATE+
14	DDAYS
15	DMY
16	DOW
17	MDY
18	RCLAF
19	RCLSW
20	RUNSW
21	SETAF
22	SETDATE
23	SETIME
24	SETSW
25	STOPSW
26	SW
27	T+X
28	TIME
29	XYZALM
30	-CX TIME
31	CLALMA
32	CLALMX
33	CLRALMS
34	RCLALM
35	SWPT

27
WAND

```

00 - WAND 1F -
01 WNDATA
02 WNDATX
03 WNDLNK
04 WNDSUB
05 WNDSCN
06 WNDTST

```

27
EXT IL

```

00 EXTILROM
01 CLRBUF
02 DIRLEFT
03 DIRSIZE
04 NAMEMED
05 READBUF
06 READCAL
07 READXM
08 RECLEFT
09 SCOPYFL
10 SCREATE
11 SDIR
12 SNEWM
13 SWRTA
14 SWRTK
15 SWRTP
16 SWRTPV
17 SWRTS
18 WRTBUF
19 WRTCAL
20 WRTXM
21 PRINTFCNS
22 ATOBUF
23 MCLIST
24 MCPRP
25 PRTAID
26 SACA
27 X>AR

```

28
HP-IL

```

00 -MASS ST 1H
01 CREATE
02 DIR
03 NEWM
04 PURGE
05 READA
06 READK
07 READP
08 READR
09 READRX
10 READS
11 READSUB
12 RENAME
13 SEC
14 SEEKR
15 UNSEC
16 VERIFY
17 WRTA
18 WRTK
19 WRTP
20 WRTPV
21 WRTR
22 WRTRX
23 WRTS
24 ZERO
25 -
26 -CTL FNS
27 AUTOIO
28 FINDID
29 INA
30 IND
31 INSTAT
32 LISTEN
33 LOCAL
34 MANIO
35 OUTA
36 PWRDN
37 PWRUP
38 REMOTE

```

29
PRINTER

```

39 SELECT
40 STOPIO
41 TRIGGER

```

29
IR PRINTER

```

00 -PRINTER 2E
01 ACA
02 ACCHR
03 ACCOL
04 ACSPEC
05 ACX
06 BLDSPEC
07 LIST
08 PRA
09 PRAXIS
10 PRBUF
11 PRFLAGS
12 PRLEYS
13 PRP
14 PRPLOT
15 PRPLOT
16 PRREG
17 PRREGX
18 PRΣ
19 PRSTK
20 PRX
21 REGPLOT
22 SKPCHR
23 SKPCOL
24 STKPLOT

```

```

00 -PRINTER 3B
01 ACA
02 ACCHR
03 ACCOL
04 ACSPEC
05 ACX
06 BLDSPEC
07 LIST
08 PRA
09 PRAXIS
10 PRBUF
11 PRFLAGS
12 PRLEYS
13 PRP
14 PRPLOT
15 PRPLOT
16 PRREG
17 PRREGX
18 PRΣ
19 PRSTK
20 PRX
21 REGPLOT
22 SKPCHR
23 SKPCOL
24 STKPLOT
25 FMT
26 --
27 DELAY
28 MAN
29 MAPOFF
30 MAPON
31 NORM
32 PRTOFF
33 PRTON
34 RESETP
35 STARTU
36 STOPU
37 TESTP
38 TRACE

```


30 CARD READER

00	CARD READER
01	MRG
02	RDTA
03	RDTAX
04	RSUB
05	VER
06	WALL
07	WDTA
08	WDTAX
09	WPRV
10	WSTS
11	7CLREG
12	7DSP0
13	7DSP1
14	7DSP2
15	7DSP3
16	7DSP4
17	7DSP5
18	7DSP6
19	7DSP7
20	7DSP8
21	7DSP9
22	7DSPI
23	7DSZ
24	7DSZI
25	7ENG
26	7FIX
27	7GSBI
28	7GT0I
29	7ISZ
30	7ISZI
31	7P<>S
32	7PRREG
33	7PRSTK
34	7PRTX
35	7RCLΣ
36	7SCI

31 DEL.SERV.1

00	SR
01	Z
02	US
03	T
04	2C
05	M
06	SG
07	6
08	R
09	N
10	5
11	I1
12	1
13	L1
14	X
15	Y

31 RAMBOX32

00	-RAMBOX 32
01	BUFLNG?
02	CLLSTFL
03	CLPG
04	CLRFL
05	COPYPG
06	CRDIR
07	CRFLBUF
08	CRFLDTA
09	CRFLKEY
10	ENDPG
11	FNC?
12	FRBYT?
13	GTBUF
14	GTKEY
15	GTREG
16	GTREGX
17	GTREGXY
18	INITPG
19	KEYAS?
20	LDBUF
21	LDKEY
22	LDPGM
23	LDREG
24	LDREGX
25	LDREGXY
26	PG?
27	PGSUM
28	PTCT
29	READPG
30	SETPRV
31	UNPTCT
32	WRTPG
33	XQ>XR

31 CO-OP MODULE

00	CO-OP ROM
01	SC
02	S
03	BA
04	TRAVRS
05	SIDS
06	O
07	R
08	∠ LT
09	W
10	∠ RT
11	DEF-LT
12	DEF-RT
13	ZS
14	ZSL
15	VSLOP
16	ZSLOP
17	STORE
18	SMM
19	INC
20	SEM
21	Y
22	MS
23	LOAD
24	SAVE
25	PREM
26	CONTOUR
27	SEARCH
28	CARD
29	K
30	KT
31	KB
32	N-E
33	S-E
34	S-W
35	N-W
36	CH
37	ABO
38	S1
39	S2
40	S3
41	S4
42	NN
43	ID
44	IE
45	IT
46	LR
47	IR
48	CURV
49	*D
50	AUTO
51	REP
52	PPTS
53	CRIS

BUFFER ID's

ID	Module	Function
1		
2		
3		
4		
5	CCD	WSIZE / SEED
6		
7	PK PROG	RTN
8		
9		
10	TIME	ALARM
11	PKROM1	KEY
12	CMT / HPIL-DEV	I/O
13		
14		

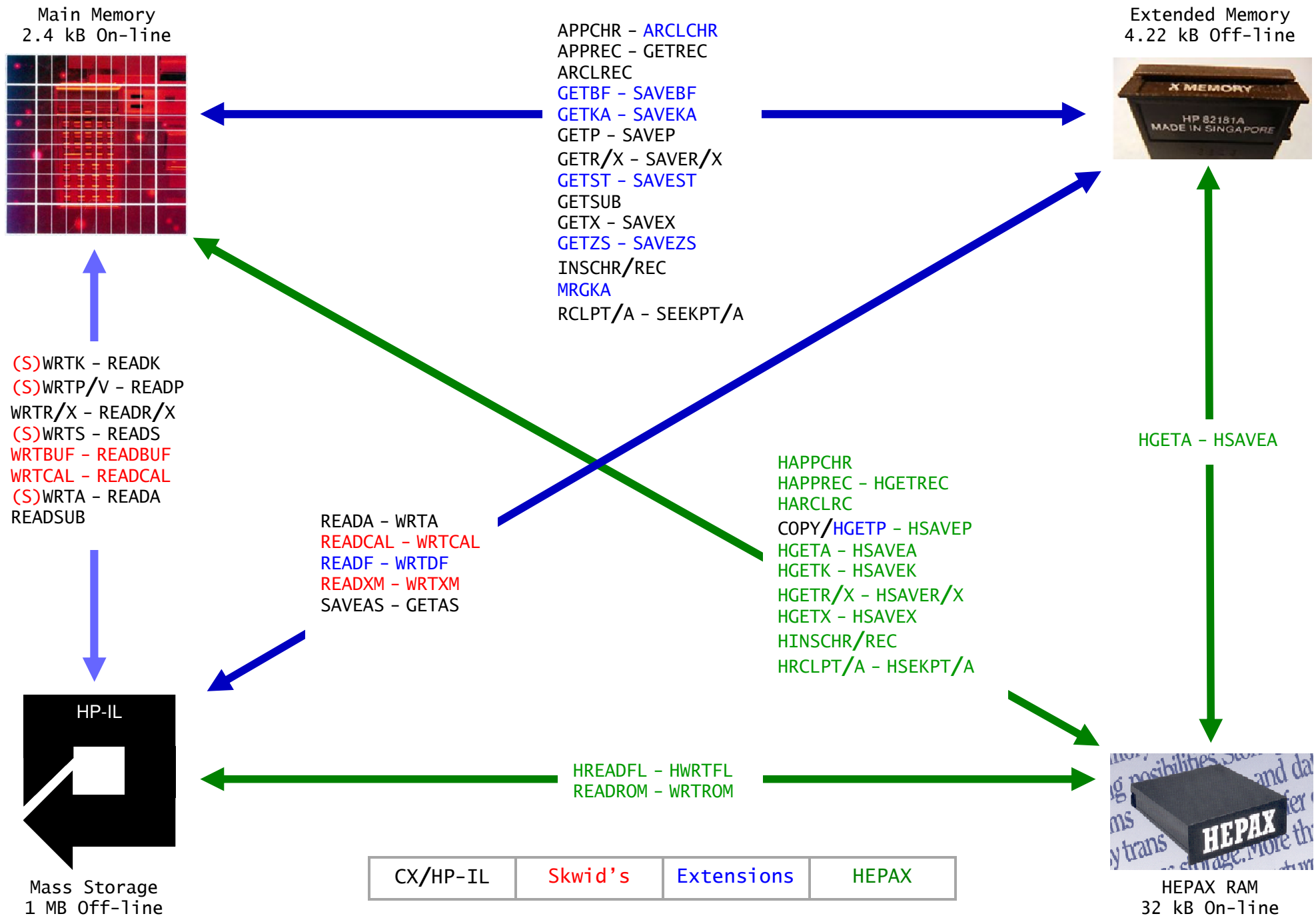
See PK Collection Manual for an updated list

Bytes pr. function

Bytes	Function
1	AOFF, AON, etc
2	XROM
	ASTO nn, ARCL nn, etc
3	END
	GTO 15 - GTO 99
	XEQ 00 - XEQ 99
	GTO A - GTO J
4	LBL alpha (+alpha)

System Memory Map

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Main RAM

7P<>S
 CLMM
 CLP
 CLRAM
 CLRG/X
 CLS
 CLST
 CLX
 ENTER^
 PCLPS
 COPY
 LASTX
 NRCLX - NSTOY
 PC>X - X>PC
 PC<>RTN
 PACK
 PEEKR - POKER
 R↯ - RDN
 RAMED/EDIT
 REGMOVE/SWAP
 RCLBM - STOBM
 ST>RG - RG>ST
 ST<>RG __
 ST>S - S>ST
 ST<>S
 (A)STO - (A)RCL
 STOFLAG - RCLFLAG
 SWAPR
 (P)SIZE
 X<>
 X<>BM
 X<>F
 X<>Y
 X<I>Y

ALPHA

A<>RG __
 A<>ST
 A>ST/ST>A
 A>RG - RG>A
 ABSP
 AINT/AIP/ARCLI
 ALENG/X/XY
 ANUM/DEL
 AREV
 ASHF/X - AROT/X
 ASWAP/USWAP
 AXEQ?
 (L)ATOX - XTOAL
 CLA/-/C/?
 LADEL/X
 LEFT\$ - MID\$ - RIGHT\$
 LOW\$ - UPR\$
 M<>N/O/P
 N<>O/P
 O<>P
 POSA
 PRES/PFX - POSTSP/
 FX
 RATOX - XTOA(R)
 REMZER
 XATOX - ASTOXX
 YTOAX/ASUB

I/O Area

ARCLBF - ASTOBF
 B?/BUF?
 BF>RGX - RGX>BF
 BF>ST - ST>BF
 BFHD
 BHEAD
 BFLNG
 BRFCL - BFSTO
 CLB/DELBUFF
 CLRBF
 CRBUF
 KACLR
 KALNG
 KAPCK
 REIDBF
 RESZBF

General XM

CLEM/CLXM
 FLCOPY
 RENMFL
 RETPFL
 FLDH
 FLSIZE
 PURFL
 RESZFL
 WORKFL

 GETBF - SAVEBF
 GETKA - SAVEKA
 GETST - SAVEST
 GETZS - SAVEZS
 MRGKA

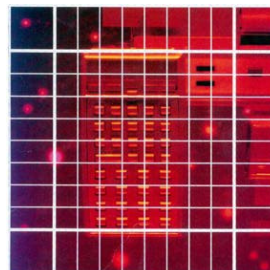
PRGM/DATA/ASCII

GETP - SAVEP
 GETSUB
 RSTCHK
 XQXM

 CRFLD
 CLFL
 GETR/X - SAVER/X
 GETX - SAVEX
 RCLPT/A - SEEKPT/A
 WRTDF - READF

 APPCHR - ARCLCHR
 APPREC - GETREC
 ARCLREC
 ASROOM
 CRFLAS
 DELCHR/REC
 ED
 GETAS - SAVEAS
 INSCR/REC
 POSFL
 RCLPT/A - SEEKPT/A

Main Memory
2.4 kB On-line



Extended Memory
4.22 kB Off-line



-HEPAX 1F"

CLRAM
CODE
COPYROM
DECODE/YX
DISASM
HAPPCHR/REC
HARCLRC
HASROOM
HCLFL
HCRFLAS
HCRFLD
HDELCHR/REC
HEPDIR/X
HEPROOM
HEXEDIT
HFLADR
HFLSIZE
HFLTYP
HGETREC
HINSCHR/REC
HPOSFL
HPROMPT
HPURFL
HRCLPT/A
HRENAME
HSAVEA - HGETA
HSAVEK - HGETK
HSAVEP - HGETP
HSAVER/X - HGETR/X
HSAVEX - HGETX
HSEC
HSEKPT/A
HUNSEC
HWRKFL
HWRTFL - HREADFL
PRIVATE
RAMTOG
READROM - WRTROM
RLSRAM

XF(A)

ALENG
ANUM
AROT
ATOX
CLEM
CLKEYS
CLRGX
GETKEY
GEYTKYX
PASN
PCLPS
POSA
PSIZE
RCLFLAG
REGMOVE
REGSWAP
RTN?
SIZE?
SREG?
STOFLAG
X#NN?
X<=NN?
X<>F
X<NN?
X=NN?
X>=NN?
X>NN?
XTOA
XQ>GO
XQXM

HEPAX(A)

AND
BCAT
BCD-BIN
BIN-BCD
CTRAST
DELETE
INSERT
NOT
OR
PGROOM
PGSUM
ROTYX
SHIFTYX
X-\$
X+Y
XOR
Y-X

RAMBOX

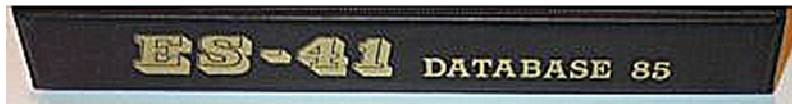
BUFLNG?
CLLSTFL
CLPG
CLRFL
COPYPG
CRDIR
CRFLDTA
CRFLBUF
CRFLKEY
ENDPG
FNC?
FRBYT?
INITPG
KEYAS?
LDPGM
LDREG/X - GTREG/X
LDREGXY - GTREGXY
LDKEY - GTKEY
LDBUF - GTBUF
PG<>
PG?
PGSUM
PTCT
PG01/10
SETPRV
UNPTCT
WRTPG - READPG
XQ>XR

HEPAX RAM
32 kB On-line



RAMBOX
16 kB On-line /
16 kB Off-line





ProfiSET

CLDF
CLEM
CLPR
CLRSU
CLSEC
CRDF
DELFL
DF+/-/*//
DPTDF
EXALL
EXEM
EXREG/X
EXST
FIND/I
FLDIR
INIDATA
INIPRGM
IPTDF
LOADP
MPTDF
RCLALL
RCLDF/X
RCLEM
RCLIDF
RCLREG/X

RCLST
READRAM
RENFL
RESDF
RLEFT?
RPTDF
RSTDF/X
SETSEC
SPTDF
STOALL
STODF/Y
STOEM
STOREG/X
STOST
SZ?DF
WRTRAM
X<>DF/Y
X=DF?
X<>DF?
X<DF?
X<=DF?
X>DF?
X>=DF?
X=PT?

ACHR/REC
AFLD
ALEN?
ASRM?
A=F? - A<>F?
A<F? - A>F?
A<=F? - A>=F?
CLAF
CRAF
DCHPT
DCHR/REC
DFLD
DRCPT
EDT
FINDPS
FLEN?
GCHR/REC
GFLD
ICHPT/R
IFLD
IRCPT
IREC
MCHPT
MRCPT
NAMAf/DF

NFLD?
NREC?
NUMREC
OUTCHR/REC
OUTFLD
RCHPT/R
RESAF
RFLD
RLEN?
RRCPT/REC
RSTAF
SCHPT
SFPT
SRCPT
ST<>DF
SWPREC
SZ?AF
X<>CHR
?EOF

EP=BL?
EP=FF?
EPROM?
PROM
PBL
CLEAR
CLRN
COPYBL
IDBL
INIT
NAMEBL
NEWBL
NEXTBL
PACKBL/KC
REVB
SLCT
SUMBL
ADR>ID
BL?/A?/1A?
BLCAT/X
BLF?
CATF?
CATS?
ID?
LENG?
CHKBL
ID>ADR
REV?
SRV
TYP?
LADEP
PRVBL
PRVP
XROMBL/P
DATE2/5/7/N
DATI2/4/7/9
X>DATY
GETBL - SAVEBL
GETF - SAVEF
CLRS
EPACK
J?
L*/-/=
LADEK
LADES
N?
PKEY
PRM



