

# LABELS ROM

by Doug Wilder 10/6/07

The labels rom extends the capabilities of the MNEM function of the -DISASM- 4D rom.

The labels rom provides labels for the mainframe, printer and HP-IL roms. Most of the labels are from the 1979 HP41C VSAM, although about a hundred have been added because they are considered usefull or some roms have been seen to use them. I tried to use hint type names or conform to the local naming/numbering. Some VSAM labels had to be changed because the entry had two labels or the same label was used at more than one address.

For the printer rom, only the universal entry points, those entries that are the same for any of the three printer roms, have labels. Actually, there are a few more apparently universal entry points, 6400 PRTMSG is one, but labels for these entries is not included. The HP names for most of these universal entry points are not used, more descriptive labels are used. The HP labels are PRT1 ... PRT15, not very enlightening. The descriptive labels used are mostly the labels of the routines to which they branch.

Version 1A of the labels rom is targeted at providing labels for mcode application roms. In the future, there may be versions specifically targeted at disassembly of a particular system rom. Nevertheless, this version does a fair job for the HP-IL rom, only missing an occasional label.

The structure of the labels rom allows very fast lookup of labels, with a worst case of about 40ms. The -DISASM- 4D MNEM function will operate with or without a labels rom present and the timing difference is essentially zero.

The labels rom may be placed in any block. The XROM number of the labels rom is 3A0. If the labels rom is loaded into block 4, it will not interfere with HP41C operation, this is because 3A0 is the RTNNC instruction. It was tempting to use 3E0 for the XROM number, yet it ocurred to me that RTN would be the most logical choice for anyone wanting to use block 4 for mcode subroutines.

The labels rom must be located at a higher address than any other rom in your system that also has a first word value of 3A0, that is: the search by MNEM is top down.

## STORAGE FORMAT

Terms:

"page"	PP, refers to the upper byte of the execute address, eight bits with a range of 00-3F for the mainframe
"page table"	the main table is sub-organized as page tables, one for each value of the page number
"execute address"	PPQQ, the address to which the execute instruction refers, 16 bits, 0000-FFFF
"execute instruction"	refers to all four class 01 types, the class 01 type is ignored by the labels rom
"disassembly address"	the address from which the execute instruction was fetched
"Local"	L, the block number where the labels rom resides

Each page table contains at least one entry. The low byte of the execute address QQ, resides at the first word of every entry. Bit nine is set on this word if this entry is the last entry in this page table.

There are 48 pages in the mainframe and 16 pages in the HP-IL module. Also, the last page of the printer rom is included for a total of 65 pages or 65 page tables.

The method of indexing into a particular page table involves the computation of a "guess" at the location and a single word offset to correct the approximation. Thus another table is required for the offsets; the offset table is 65 words.

The first format I tried used 7 words for each entry because I didn't want to go thru a time consuming decompaction process. However, after trying several different formats, I found one that is faster than the prior, non-compacted method, albiet costing another 33 words of code. This change resulted in an increase from 560 entries to 648 entries.

Each entry is six words. Five words are used for the label because the characters are 7 bit ASCII in the range 20-7E. Six characters times 7 bits is 42 bits, so it won't fit in four words. The storage scheme for compaction is as follows:

The second word contains only the first character.  
The third word contains only the second character.

The remaining three words contain a packed representation of the final four characters. Four characters of 7 bits is 28 bits, so there are an extra two bits. These two bits are set to null and placed so that the last character can be considered to occupy the rightmost 8 bits of the last word, leaving only two words to decompact and the low bit of character 5 can be transferred by testing the exponent sign.

The format for an entry is:

**|s0qqqqqqqq|0001111111|0002222222|3333333444|4444555555|5006666666|**

Where qqqqqqqq is QQ and s is set if this is the last entry in this page table.

The page table number PP (upper 8 bits of execute address) is obtained by incrementing the disassembly address and fetching the second word of the execute instruction.

If PP is in the range 6F-7F, 3F is subtracted from it for range reduction, that is; PP is range reduced to a total range of 00-40H (65 values).

The approximation used to guess at the page table location is:

**L000-0200+40\*PP**

PP is used to index into the offset table, then the offset value, JJJ is added to correct the approximation.

Usage details:

Entry point: L010

Required Inputs:

Chip zero selected

PT = 4

**C = x|000000L0xx|xxx** my local address L, x = don't care  
**A = x|xxxxxxAAAA|xxx** disassembly address, points to first word of execute instruction  
**M = x|xxxxxxxxxxx|00Q** QQ = low byte of execute address (cpu M register)  
**Z = 1|0000000000|000** null text string in the stack Z register.

Outputs:

Q = right justified six character label, leading spaces as necessary, Q(13-12)=00

Z = four spaces if f8 is clear, five spaces if f8 is set.

Q and Z are not modified if a label was not found.. Scratched registers are A&C, f7-f0 and PT. No stack levels are used, exit is via RTN. f13-f8 are not modified. Iff a label was found: **C=Z**.

Alternate entry point: L019

Inputs and outputs are the same except:

PT = 2

C = x |xxxxxxxxxxx|xxx

A = x |000000L082|0PP      PP high byte of execute address. L082 is the address of the offset table.

The page tables are located at L0C4-LFF3.

Here's the code that MNEM uses to locate the labels rom (it's from within a subroutine, so there is a RTN on the stack):

```
130 LDI
3A0 CON 0928
106 STOA X
04E C=0
15C PT= 6
262 DECC PT
330 FETCH
366 ?A#C X
023 JNC+04
262 DECC PT
3E3 JNC-04
3E0 RTN
05C PT= 4
222 INCC PT
1E0 GOTOC
```

If there isn't a labels rom present, this routine eats up 16x6 states (the FETCH takes two states) or about 16 ms. The last page of the document lists the 648 labels contained in version 1A of the labels rom, typeface is sort of small, but looks ok when printed.

If you notice a label that needs to be included in this rom, please drop me an email at [jubalsams@juno.com](mailto:jubalsams@juno.com) and I will include it/them in the next revision.

Doug

1/C	188B	CRF43	770F	FIXEND	2918	LEFTJ	2BF7	PAR113	+0CEE	RSTSQ	0385	TBITMP	2F81
1/Y13	188E	CRF45	7717	FIXND	+291D	LEFTJ0	+2BF9	PAR140	+0D0F	RSTST	08A7	TEXT30	2CC9
		CRPREG	6FCF	FLINK	2928	LINNM1	2A90	PARS07	+0C3D	RTJ10	14CA	TGSHF1	1F7E
ABTS10	0D16	CRPRTX	6FCB	FLINKA	2927	LINNUM	2A8B	PARS08	+0C3F	RTJLBL	14C9	TODEC	1FB3
ABTSEQ	0D12	CRPSTK	6FCD	FLINKM	2929	LN1+X2	1B70	PARSE	0C05	RTN30	272F	TOGSHF	1FE5
ACKX	73F1	CRTFL	76B0	FLINKP	2925	LN10	1B45	PARWRT	7416	RTN31	+2736	TONE7	1716
ACKX	73F0	CRTFL0	76AE	FLNFND	7855	LN13	1B48	PATCH2	21E1	RTN32	+2738	TONE7X	16DB
ACRGCX	6FF0	CRTFLX	76A5	FLNMER	72AE	LOAD3	14FA	PATCH3	21EE	RTOD	198C	TONE8	1711
AD1-10	1809	CSEOF	773C	FLSCH	780B	LXEX	1229	PAVIEW	6FD9	RUN	07C2	TONE9	170D
AD2-10	1807	CSERCK	7634	FLSCH0	780A			PBYTCX	6FF2	RWCHK	7895	TONEB	16DD
AD2-13	180C	CSERE0	7D00	FLSCHD	7808	MANIO	72F3	PCHKKB	7F38	R^R^	+14EB	TONSTF	0054
ADDONE	1800	CSEREX	7CFE	FLSCHI	7802	MAPKEY	+7AD2	PCRA00	+022A	R^SUB	14ED	TOOCT	1F79
AENT	+14F1	CSFULL	771F	FLSCHJ	7805	MASK	2C88	PCTCO	00D7			TOPOL	1D49
AFORMT	0628	CSRDU	7CE1	FLSCHX	780E	MEMLFT	05A1	PGMAON	0956	SAROM	260D	TOREC	1E75
ALPHOP	6FE9	CSSTAS	71C0	FLSECR	7D10	MESS10	07F0	PI/2	199A	SAVR10	27D5	TRG100	1E78
ANN+14	075B			FLSH07	781F	MESSL	07EF	PI/4	19A1	SAVR20	27DB	TRG240	1ED1
ANNOUT	075C	DAT240	2D88	FLSHDT	7883	MESSLP	77B7	PILEN	7063	SAVRC	27DF	TRG430	1F5B
AOFF	1345	DAT321	+2DA6	FLSHRT	787B	MOD10	195C	PILERR	77E9	SAVRTN	27D3	TRG500	1FB6
AON	133C	DAT385	2E00	FLTYCK	7865	MP1-10	184F	PILINI	+706B	SCHDEV	72DD	TRGSET	21D4
AOUT1	7234	DAT400	2E05	FLTYER	788A	MP2-10	184D	PKIOAS	2114	SCMD	70BA	TRITON	+16D3
AOUT2	+7239	DATALL	7EC1	FNDCAS	7176	MP2-13	1852	PKM05	+2116	SCMDER	70C6	TSTMAP	14A1
AOUTFL	7236	DATOFF	0390	FNDDEV	7181	MSG	1C6B	PLERCK	77E7	SCMDWT	7418	TWOTON	+16D7
AOUTIN	72B6	DCPLRT	2F0B	FNDEND	1730	MSG105	1C80	PLEREX	77B3	SCR0L2	2CE8	TXTLB1	2FC6
AFND-	1FF3	DCRST10	2F0D	FNDPT	1790	MSG108	+1C84	PMESSG	6FE3	SCR0L5	2CEA	TXTLBL	2FC7
AFND10	1FF5	DDL0	70DA	FNDPTR	717D	MSGA	1C6C	PMPT50	+05E4	SCROLL	2CDC		
AFND15	1FF6	DDL1	77B0	FNID60	7C32	MSGDLY	037C	PPROMP	6FE1	SDATA	7128	UNL	70AF
AFNDDG	1FFA	DDL2	70D3	FNID65	7C33	MSGE	1C71	PROMF0	+05D2	SDATA0	7126	UNLCHK	7336
AFNDNW	2D14	DDT0	70D0	FNSTS	71C2	MSGX	1C75	PROMF1	05CB	SEARC1	2434	UNLRSF	7123
AFNDPT	+1FFB	DDT1	+77AC	FNTDEV	7BAF			PROMF2	05D3	SEARC7	+243A	UNT	70AC
APPEND	2D0E	DECAD	29C7	FORMAT	0A7B	NAME21	0EE9	PROMFC	05C7	SEARCH	2433	UNTCHK	77E5
ARCL10	169C	DECAD1	+29C8	FOUND1	178F	NAME30	0EF6	PRT11?	7514	SEEK	7F75	UPLINK	2235
ARCL20	16B3	DECADA	29CA	FSP50	71F7	NAME35	0F06	PRTCAT	6FD7	SEEK40	7FA0		
ARGOUT	2C10	DECMLP	2EC2	FSTIN	14C2	NAME39	+0F21	PTBYTA	2323	SEEK	7F74	WAITS	741A
ASCLCA	+2C5E	DELLIN	2306			NAME41	+0F38	PTBYTM	2921	SEEKN	7F72	WKUP10	0184
ASCLCD	2C5D	DELOOP	1706	GCPKC	2B80	NAME43	+0F5C	PTCNTR	+0B8C	SEEKR2	7F6F	WKUP80	01FF
ASN15	27C2	DEROVS	08EB	GCPKC0	2B89	NATNRD	70EA	PTLINK	231A	SEEKRC	7F79	WPRM	791A
ASN20	27CC	DERRT1	08E7	GENLNK	239A	NBYTA0	2D04	PTLNKA	231B	SEEKRD	7F7A	WRTA17	+7D67
ASP	7085	DF030	0571	GENNUM	05E8	NBYTAB	2D06	PUTPC	2337	SEEKRN	7F77	WRTDAT	70D8
ASRCH	26C5	DF034	+057C	GETDEV	7150	NEXT	0E50	PUTPCA	2339	SEKSUB	70D6	WRTP00	7903
AVAIL	28C4	DF036	+057E	GETLIN	1419	NEXT00	+0E52	PUTPCD	232C	SETBPC	7FA5	WRTP45	+7961
AVAILA	28C7	DF100	058D	GETN	1CEA	NEXT0A	+0E54	PUTPCF	2331	SETBPL	7F97	WRTP75	+7975
AVIEW	10B2	DF140	+0480	GETPC	2950	NEXT0B	+0E58	PUTPCL	2AF3	SETP=P	0B15	WRTP85	+797C
AVW10	036A	DF152	+0483	GETPCA	2952	NEXT1	0E45	PUTPCX	232F	SETSST	17F9	WRTS10	+7B52
		DFBDCK	7E60	GOLNGA	+0FDB	NEXT2	0E48	PVIEW	6FDB	SFRMC	70BC		
BCDBIN	02E3	DIGENT	0837	GOTINT	02F8	NEXT3	0E4B	PXTR	6FED	SIGMA	1C88	X-BER	77A6
BEEP	10BB	DIRFUL	7726	GOTOC	+0097	NFRG	00F1			SIGMA1	1C8B	X-BIN	778A
BINBCD	7FD6	DIV15	18A9	GSUBS3	+23CB	NFRENT	00C4	R/SCAT	0BB7	SINFR	1947	X/Y13	1893
BINBD0	7FD4	DVBSTE	+09D6	GSUBS4	+23CC	NFRKB	00C7	RG=R5	73E2	SIZSUB	1797	X10^X	1BF8
BINBDC	7FD5	DOCHK	1CCC	GT3DBA	+0FEE	NFRNC	00A5	RAK07	070A	SKIP	+0C53	X<>Y	12FC
BLDAPC	74BC	DOSKP	1631	GT3DBT	0FEB	NFRPR	00EE	RALL05	+7DAF	SKP	162E	XARCL	1696
BLDAPH	74BB	DOSRC1	24E3	GTACOD	1FDB	NFRPRX	+00ED	RCL	122E	SKPF30	78EA	XASN	276A
BLINK	0899	DOSRCH	24E4	GTBYT	29B0	NFRPU	00F0	RCSCR	1934	SKPFRM	78E1	XASNRC	+2777
BLINK1	089C	DROPST	00EA	GTBYT0	29B2	NFRPU0	+07DD	RCSCR*	1932	SKPLIN	2AF9	XASTO	175C
BRT090	+1D64	DRSY40	+018C	GTBYTA	29B8	NFRSIG	00C2	RDDFRM	7110	SKPROM	2B00	XAVIEW	0364
BRT100	1D80	DRVERR	7426	GTGNTR	08BD	NFRSX	00CC	RDEFNT	78A1	SNBYTS	7FBC	XBEEP	16D1
BRTS10	1D6B	DSDLY	7736	GTEND0	+20EA	NFRXY	00DA	RDFM20	7118	SNCMD	732E	XBST	2250
BSTCAT	08BA	DSPCRG	0B26	GTEND	20E8	NODRVE	7CF4	RDFMR	711E	SNCMDDB	+732F	XCAT	08B0
BSTCNT	0B91	DSPERR	7D05	GTLINK	224E	NOXNT	771D	RDLPBK	77AA	SNCRLF	+728A	XCF	164D
BSTE2	2AF2	DSPL10	0FD2	GTLNKA	2247	NOOVF	0BF6	RDNSUB	14E9	SNDATA	70E6	XCLSIG	14B0
BSTEP	28DE	DSPL15	+0FD3	GTRMAD	0800	NOREG9	095E	RDRG10	7613	SNDRD0	+75AC	XDSE	159F
		DSPL20	+0FD5	GTSRCH	24DF	NORMCX	79C5	RDRGA	763E	SNDRDN	75A8	XEQ20	24F2
CALDSP	29C3	DSPLN+	0FC7			NOROOM	79CE	RDTYPE	7136	SNDRGA	7593	XEQ21	+24F3
CAT20	+0B84	DTOR	1981	IFC	7C4B	NOSKP	1619	RDTYPC	7134	SNDRGC	75CF	XEQ49	2500
CAT22	+0B85	DUPFLN	7692	IFCOFF	+7F42	NOTAPE	740B	REGAL	+16B2	SNPTBS	+7FBD	XEQ50	2501
CENT	+14F0	DV1-10	189A	INA	7365	NOTRAM	17EC	REGALP	16B0	SNRM	2400	XFT100	18EC
CHK\$S	14D8	DV2-10	1898	INBYT	29E6	NPRCL	1231	REMOPT	+7329	SQR10	18BE	XGA00	248D
CHK\$S1	14D4	DV2-13	189D	INBYT0	29C3	NRD	70F4	REMOTE	7327	SQR13	18C1	XGI53	+24AD
CHK\$S2	14D9			INBYT1	29EA	NRDC	70F6	RENT10	78A3	SRBMAP	2FA5	XIONRM	79C7
CHKADR	166E	ENCP00	0952	INBYTA	+29E8	NULTST	0EC6	RENTPH	73F8	SSTBST	22DD	XLN1+X	1B73
CHKCS0	7CDE	END21	03B7	INBYTC	29E4	NXYBT3	29B7	REQADR	7E40	SSTCAT	08BA	XPRMNP	+03A2
CHKCST	7CDD	ENLCD	07F6	INBYTM	+29E9	NXYBT4	29B9	RFD503	+08F3	STBT10	2EA3	XR/S	079D
CHKLAD	72C8	ERR110	22FB	INBYTP	29E5	NXYBTO	2D0B	RFD504	+08F4	STBT31	2FE5	XRM04	+2FB3
CHKPCT	7D0C	ERRAD	14E2	INCAD	29CF	NXYBTP	+2D08	RG-BY#	7BF1	STK	0DF3	XRM06	+2FB8
CHRLCD	05B9	ERRDE	282D	INCAD2	29D3	NXL3B2	2B63	RG9LCD	08EF	STK05	0E09	XRM08	+2FBB
CHSA1	1CDC	ERRNE	02E0	INCADA	29D6	NXLDEL	2AFD	RMCK10	27F3	STK15	0E1E	XRM10	2FBE
CIL09	77CC	ERROF	00A2	INCADP	29D1	NXLIN	2B14	RMCK15	27F4	STMSGF	037E	XROM	2FAF
CK+LAD	+734E	ERROR	22F5	IND22	+0DC5	NXLINA	2B1F	ROBK10	2E47	STOAXR	+1925	XRS45	07BE
CKANGB	7F52	ERRPR	2184	INSSUB	23B2	NXLSS1	2AFB	ROCNTR	+0B8E	STOLCS	2E5B	XRS47	+07C0
CKANGL	7F51	ERRRAM	2172	INSTR	2A73	NXLSS2	2AF7	ROLBAK	2E42	STOMSG	+0380	XR^	14E5
CKSMER	7AA6	ERRR00	+21F0	INSTR1	2A74	NXLTX	2B77	ROMCHK	27E6	STOPS	03A7	XSF	164A
CLA	10D1	ERRRTN	77F7	INSUBA	23B7	NXTBYT	2D07	ROMH05	066C	STORC5	+07E9	XSSST	2260
CLD	1E00	ERRSUB	22E8	INTARG	07E1	NXTDEI	7165	ROMHED	066A	STORCP	+07EA	XSTYON	1411
CLLCDE	2CF0	ERRTA	2F17	INTCAL	7F13	NXTDEV	7161	ROMSTG	2FD2	STORFC	07E8	XTOHRS	19B2
CLRG	1E0D	EXP10	1A0A	INTFRC	193B			ROUND	0A35	STOST0	013B	XTOHNE	16DE
CLRLCD	2CF6	EXP13	1A0D	INTINT	02FB	OFF	11C8	ROUND8	+0A34	STSCR	1922	XVIEW	036F
CLRPGM	228C	EXSCR	192A	INTXC	2A7D	OFFSHF	0750	ROW940	0487	STSCR*	1920	XVIEWA	0374
CLRSB2	C0C0					OFFSHFT	0749	RP100	7991	SUBONE	1802	XYN	162C
CMSDSA	+70E8	FDEV10	7187	KEYOP	068A	OPPCHK	722D	RREG2	+711F	SUMCHK	1667	XYX	1617
CNTBYT	7FA7	FDIGIT	0E2F			OPPROMT	2E4C	RST05	009B	SVBREN	7ECF		
COLDST	0232	FILLA	+10D2	L1+X13	+1B76	OUTROM	2FEE	RST10	009D	SVNTR	7EF3	Y-X	1421
CONV3C	7F22	FILLCX	+00B0	LADERM	72D7	OVFL10	1429	RSTANN	0759	SVMODE	7F0F	YX13	1B33
CONV3D	7F35	FILLST	+10FA	LADcx	70E2			RSTBP	7FA4			YXTEN	1B35
COPYBF	7CC6	FILLX	+00EC	LADr5	70DD	PACKE	2002	RSTKB	0098	TADcx	70B5		
CPGM10	067F	FILLXL	00EA	LD90	1995	PACKN	2000	RSTKCA	7AD0	TADR5	70B2	ZEROFL	75BD
CPGMHD	067B	FILLY	00AE	LDDP10	0B1E	PADV	6FDD	RSTMS0	038E	TAPERR	742E		
CRF2ND	76BF	FINDID	7C06	LDSST0	0797	PAR110	0CEB	RSTSEQ	0384	TBITMA	2F7F		