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Opcodes listed by entry in UFN table

| op  | '09 | '08 | '00 | '32 | '32L | '86-4 | '86-8 | Name                       |
|-----|-----|-----|-----|-----|------|-------|-------|----------------------------|
| 000 | X   | X   | X   | X   | -    | X     | X     | -X-                        |
| 001 | X   | X   | X   | X   | X    | X     | X     | CAR                        |
| 002 | X   | X   | X   | X   | X    | X     | X     | CDR                        |
| 003 | X   | X   | X   | X   | X    | X     | X     | LISTP                      |
| 004 | X   | X   | X   | X   | X    | X     | X     | NTYPX                      |
| 005 | X   | X   | X   | X   | X    | X     | X     | TYPEP                      |
| 006 | X   | X   | X   | X   | X    | X     | X     | DTEST {new COERCE}         |
| 007 | -   | -   | -   | -   | -    | -     | -     | CDDR {unused}              |
| 010 | X   | X   | X   | X   | X    | X     | X     | FNO                        |
| ... | X   | X   | X   | X   | X    | X     | X     | ...                        |
| 015 | X   | X   | X   | X   | X    | X     | X     | FNX                        |
| 016 | X   | X   | X   | X   | X    | X     | X     | APPLYFN                    |
| 017 | -   | -   | -   | -   | X    | -     | -     | CHECKAPPLY{?}              |
| 020 | X   | X   | X   | X   | X    | X     | X     | RETURN                     |
| 021 | X   | X   | X   | X   | X    | X     | X     | BIND                       |
| 022 | X   | X   | X   | X   | X    | X     | X     | UNBIND                     |
| 023 | X   | X   | X   | X   | X    | X     | X     | DUNBIND                    |
| 024 | X   | X   | X   | X   | X    | X     | X     | RPLPTR.N                   |
| 025 | X   | X   | X   | X   | X    | X     | X     | GCREF                      |
| 026 | X   | -   | -   | -   | -    | -     | -     | ASSOC                      |
| 027 | X   | X   | X   | X   | X    | X     | X     | GVAR←                      |
| 030 | X   | -   | X   | X   | X    | X     | X     | RPLACA                     |
| 031 | X   | -   | X   | X   | X    | X     | X     | RPLACD                     |
| 032 | X   | X   | X   | X   | X    | X     | X     | CONS                       |
| 033 | -   | -   | -   | -   | -    | -     | -     | {unused}{will be GETPROP}  |
| 034 | X   | -   | -   | -   | -    | -     | -     | FMEMB                      |
| 035 | -   | -   | -   | -   | -    | -     | -     | {unused}{will be GETHASH}  |
| 036 | -   | -   | -   | -   | -    | -     | -     | {unused}{will be PUTHASH}  |
| 037 | X   | -   | X   | X   | X    | X     | X     | CREATECELL                 |
| 040 | X   | -   | X   | X   | X    | X     | X     | BIN                        |
| 041 | -   | -   | -   | -   | -    | -     | -     | BOUT {unused}              |
| 042 | P   | -   | -   | -   | -    | -     | -     | {Prolog}OPFETCHPLUSOPDISP  |
| 043 | -   | -   | -   | -   | -    | -     | -     | {unused}{will be LIST1}    |
| 044 | -   | -   | -   | -   | -    | -     | -     | DOCOLLECT {unused}         |
| 045 | -   | -   | -   | -   | -    | -     | -     | ENDCOLLECT {unused}        |
| 046 | X   | -   | X   | -   | -    | X     | X     | RPLCONS                    |
| 047 | X   | -   | -   | -   | -    | -     | -     | LISTGET                    |
| 050 | -   | -   | -   | -   | -    | -     | -     | ELT                        |
| 051 | -   | -   | -   | -   | -    | -     | -     | NTHCHC                     |
| 052 | -   | -   | -   | -   | -    | -     | -     | SETA                       |
| 053 | -   | -   | -   | -   | -    | -     | -     | RPLCHARCODE {unused}       |
| 054 | X   | X   | X   | X   | X    | X     | X     | EVAL                       |
| 055 | -   | -   | -   | -   | -    | -     | -     | {unused}EVALV              |
| 056 | X   | X   | X   | -   | X    | X     | X     | TYPECHECK                  |
| 057 | X   | X   | X   | ?   | X    | X     | X     | STKSCAN                    |
| 060 | X   | -   | -   | -   | -    | -     | -     | BUSBLT                     |
| 061 | X   | -   | -   | -   | -    | -     | -     | MISC8{IBLT1 and IBLT2}     |
| 062 | X   | -   | -   | -   | -    | -     | -     | POLY {Poly; Mat. Multiply} |
| 063 | X   | X   | -   | -   | X    | X     | X     | TYPEMASK.N                 |
| 064 | P   | -   | -   | -   | -    | -     | -     | {Prolog}PROLOGREADPTR      |
| 065 | P   | -   | -   | -   | -    | -     | -     | {Prolog}PROLOGREADTAG      |
| 066 | P   | -   | -   | -   | -    | -     | -     | {Prolog}PROLOGWRITETAGPTR  |
| 067 | P   | -   | -   | -   | -    | -     | -     | {Prolog}PROLOGWRITEOPTR    |



|     |   |   |   |   |   |   |   |  |
|-----|---|---|---|---|---|---|---|--|
| 247 | X | X | X | X | X | X | X | TJUMP07  |
| 250 | X | X | X | X | X | X | X | TJUMP10  |
| ... | X | X | X | X | X | X | X | ...  |
| 257 | X | X | X | X | X | X | X | TJUMP17  |
| 260 | X | X | X | X | X | X | X | JUMPX  |
| 261 | X | X | X | X | X | X | X | JUMPPX   |
| 262 | X | X | X | X | X | X | X | FJUMPX   |
| 263 | X | X | X | X | X | X | X | TJUMPM   |
| 264 | X | X | X | X | X | X | X | NFJUMPM  |
| 265 | X | X | X | X | X | X | X | NTJUMPM  |
| 266 | X | - | - | - | - | - | - | ARRAYINDEX1  |
| 267 | X | - | - | - | - | - | - | ARRAYINDEX2  |
| 270 | X | X | X | X | X | X | X | PVAR0←   |
| ... | X | X | X | X | X | X | X | ...  |
| 276 | X | X | X | X | X | X | X | PVAR6←   |
| 277 | X | X | X | X | X | X | X | POP  |
| 300 | X | X | - | - | - | X | X | POP.N  |
| 301 | X | X | - | - | - | X | X | ATOMCELL.N   |
| 302 | X | X | X | X | X | X | X | GETBASEBYTE  |
| 303 | - | - | - | - | - | - | - | {unused}   |
| 304 | X | X | X | X | X | X | X | BLT  |
| 305 | X | - | - | - | - | - | - | PIXELBLT   |
| 306 | - | - | - | - | - | - | - | {unused}   |
| 307 | X | X | X | X | X | X | X | PUTBASEBYTE  |
| 310 | X | X | X | X | X | X | X | GETBASE.N  |
| 311 | X | X | X | X | X | X | X | GETBASEPTR.N   |
| 312 | X | X | X | X | X | X | X | GETBITS.N.FD   |
| 313 | - | - | - | - | - | - | - | {unused}{new GETBASEFIXP}  |
| 314 | - | - | - | - | - | - | - | {unused}{new PUTBASEFIXP}  |
| 315 | X | X | X | X | X | X | X | PUTBASE.N  |
| 316 | X | X | X | X | X | X | X | PUTBASEPTR.N   |
| 317 | X | X | X | X | X | X | X | PUTBITS.N.FD   |
| 320 | X | X | X | X | X | X | X | ADDBASE  |
| 321 | X | X | X | X | X | X | X | VAG2   |
| 322 | X | X | X | X | X | X | X | HILOC  |
| 323 | X | X | X | X | X | X | X | LOLOC  |
| 324 | X | X | X | X | X | X | X | PLUS2{see notes}   |
| 325 | X | X | X | X | X | X | X | DIFFERENCE{see notes}  |
| 326 | X | X | X | X | X | X | X | TIMES2{see notes}  |
| 327 | X | X | X | X | X | X | X | QUOTIENT{see notes}  |
| 330 | X | X | X | X | X | X | X | IPLUS2{see notes}  |
| 331 | X | X | X | X | X | X | X | IDIFFERENCE{see notes}   |
| 332 | X | X | X | X | X | X | X | ITIMES2{see notes}   |
| 333 | X | X | X | X | X | X | X | IQUOTIENT{see notes}   |
| 334 | X | X | X | X | X | X | X | IREMAINDER{see notes}  |
| 335 | - | - | - | - | - | X | X | {unused}{IPLUS.N}  |
| 336 | - | - | - | - | - | X | X | {unused}{IDIFFERENCE.N}  |
| 337 | - | - | - | - | - | - | - | {unused}   |
| 340 | X | X | X | X | X | X | X | LLSH1{see notes}   |
| 341 | X | X | X | X | X | X | X | LLSH8{see notes}   |
| 342 | X | X | X | X | X | X | X | LRSH1{see notes}   |
| 343 | X | X | X | X | X | X | X | LRSH8{see notes}   |
| 344 | X | X | X | X | X | X | X | LOGOR2{see notes}  |
| 345 | X | X | X | X | X | X | X | LOGAND2{see notes}   |
| 346 | X | X | X | X | X | X | X | LOGXOR2{see notes}   |
| 347 | - | - | - | - | - | - | - | {unused}{new ALSH}   |
| 350 | X | - | X | X | X | - | X | FPLUS2   |
| 351 | X | - | X | X | X | - | X | FDIFFERENCE  |
| 352 | X | - | X | X | X | - | X | FTIMES2  |
| 353 | X | - | X | X | X | - | X | FQUOTIENT  |
| 354 | X | - | - | - | - | - | - | UBFLOAT2 {UFADD, UFSUB,<br>UFISUB, UFMULT, UFDIV,<br>UGREAT, UMAX, UMIN, UREM} |
| 355 | X | - | - | - | X | - | - | UBFLOAT1 {UTOB, BTOU, UABS,<br>UNEG, UFIX}                                     |
| 356 | X | - | - | - | - | - | - | ARRAYREAD{GENERAL, UNBOXED}  |
| 357 | X | - | - | - | - | - | - | ARRAYWRITE{GENERAL, UNBOXED}   |
| 360 | X | X | X | X | X | X | X | EQ   |
| 361 | X | X | X | X | X | X | X | IGREATERP  |
| 362 | X | - | X | X | X | - | X | FGREATERP  |

|     |   |   |   |   |   |   |   |  |
|-----|---|---|---|---|---|---|---|--|
| 363 | X | X | X | X | X | X | X | GREATERP   |
| 364 | X | X | ? | ? | X | - | X | EQUAL  |
| 365 | X | - | X | X | X | - | X | MAKENUMBER   |
| 366 | X | - | X | X | X | - | - | BOXIPLUS   |
| 367 | X | - | X | X | X | - | - | BOXIDIFFERENCE   |
| 370 | - | - | - | - | - | - | - | MISC5  |
| 371 | X | - | - | - | - | - | - | FFTSTEP  |
| 372 | X | - | - | - | - | - | - | MISC3  |
|     |   |   |   |   |   |   |   | {Floating Point Array ops:<br>EXP, MAG, FLOAT, COMPLEX,<br>BLKMAX, BLKMIN, BLKABSMAX,<br>BLKABSMIN, FLOATTOBYTE} |
| 373 | X | - | - | - | - | - | - | MISC4  |
|     |   |   |   |   |   |   |   | {Floating Point Array ops:<br>TIMES, PERM, PLUS,<br>DIFFERENCE, MAGIC,<br>BITMAPBIT}                             |
| 374 | - | - | ? | - | X | - | - | {reserved for DOLPHIN}   |
| 375 | X | X | X | X | X | X | X | SWAP   |
| 376 | X | X | X | X | X | X | X | NOP  |
| 377 | - | - | - | - | - | - | - | {unused}   |

## notes:

## 4K microcode:

PLUS2, DIFFERENCE, TIMES2, QUOTIENT will ufn if args not INTEGERS

IPLUS2, IDIFFERENCE will accept FIXP's as arguments, but will ufn if result is not a smallp or smallneg

ITIMES2, IQUOTIENT, IREMAINDER will ufn if both args are not smallp

## 12K microcode:

PLUS2, DIFFERENCE, TIMES2, QUOTIENT will try floating point if args not INTEGERS

IPLUS2, IDIFFERENCE will accept FIXP's as arguments, and box the result if it is not a smallp or smallneg

ITIMES2, IQUOTIENT, IREMAINDER will ufn if both args are not smallp