

| MNEMONIC | # | A<br>B<br>S | D  | # | S | # | N | EFFECTS     | ALIAS | TYPE | SHORT DESC               |
|----------|---|-------------|----|---|---|---|---|-------------|-------|------|--------------------------|
| ROR      |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  | Rotate right             |
| ROL      |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  | Rotate left              |
| SHR      |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  | Shift right              |
| SHL      |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  | Shift left               |
| RCR      |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  | Rotate Carry Right       |
| RCL      |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  | Rotate Carry Left        |
| SAR      |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  | Shift Arithmetic Right   |
| SAL      |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  | Shift Arithmetic Left    |
| ADD      |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  | Add                      |
| ADDX     |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  | Add extended             |
| ADDS     |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  | Add Signed               |
| ADDSX    |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  | Add Signed Extended      |
| SUB      |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  | Subtract                 |
| SUBX     |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  | Subtract Extended        |
| SUBS     |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  | Subtract Signed          |
| SUBSX    |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  | Subtract Signed Extended |
| SUBR     |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  | Subtract Reverse         |
| CMPSUB   |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  | Compare & Subtract       |
| SUMC     |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  | Sum +/- C                |
| SUMNC    |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  |                          |
| SUMZ     |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  |                          |
| SUMNZ    |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  |                          |
| MUL      |   |             | D  | # | S |   |   | {WZ}        |       | ALU  | 16x16 Multiply Unsigned  |
| MULS     |   |             | D  | # | S |   |   | {WZ}        |       | ALU  | 16x16 Multiply signed    |
| CMP      |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  | Compare                  |
| CMPX     |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  | Compare Extended         |
| CMPS     |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  | Compare Signed           |
| CMPSX    |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  | COmpare Signed Extended  |
| CMPR     |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  | Compare Reverse          |
| CMPM     |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  | Compare MSB              |
| FGE      |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  |                          |
| FLE      |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  |                          |
| FGES     |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  |                          |
| FLES     |   |             | D, | # | S |   |   | {WC/WZ/WCZ} |       | ALU  |                          |
| TESTB    |   |             | D, | # | S |   |   | WC/WZ       |       | ALU  | Test Bit                 |
| TESTBN   |   |             | D, | # | S |   |   | WC/WZ       |       | ALU  | Test Bit Not             |
| TESTB    |   |             | D, | # | S |   |   | ANDC/ANDZ   |       | ALU  |                          |
| TESTBN   |   |             | D, | # | S |   |   | ANDC/ANDZ   |       | ALU  |                          |
| TESTB    |   |             | D, | # | S |   |   | ORC/ORZ     |       | ALU  |                          |
| TESTBN   |   |             | D, | # | S |   |   | ORC/ORZ     |       | ALU  |                          |
| TESTB    |   |             | D, | # | S |   |   | XORC/XORZ   |       | ALU  |                          |
| TESTBN   |   |             | D, | # | S |   |   | XORC/XORZ   |       | ALU  |                          |
| BITL     |   |             | D, | # | S |   |   | {WCZ}       |       | ALU  |                          |
| BITH     |   |             | D, | # | S |   |   | {WCZ}       |       | ALU  |                          |

| MNEMONIC | # | A<br>B | S | D  | # | S  | # | N | EFFECTS       | A<br>L<br>I<br>A<br>S | TYPE | SHORT DESC |
|----------|---|--------|---|----|---|----|---|---|---------------|-----------------------|------|------------|
| BITC     |   |        |   | D, | # | S  |   |   | {WCZ}         |                       | ALU  |            |
| BITNC    |   |        |   | D, | # | S  |   |   | {WCZ}         |                       | ALU  |            |
| BITZ     |   |        |   | D, | # | S  |   |   | {WCZ}         |                       | ALU  |            |
| BITNZ    |   |        |   | D, | # | S  |   |   | {WCZ}         |                       | ALU  |            |
| BITRND   |   |        |   | D, | # | S  |   |   | {WCZ}         |                       | ALU  |            |
| BITNOT   |   |        |   | D, | # | S  |   |   | {WCZ}         |                       | ALU  |            |
| AND      |   |        |   | D, | # | S  |   |   | {WC/WZ/WCZ}   |                       | ALU  |            |
| ANDN     |   |        |   | D, | # | S  |   |   | {WC/WZ/WCZ}   |                       | ALU  |            |
| OR       |   |        |   | D, | # | S  |   |   | {WC/WZ/WCZ}   |                       | ALU  |            |
| XOR      |   |        |   | D, | # | S  |   |   | {WC/WZ/WCZ}   |                       | ALU  |            |
| MUXC     |   |        |   | D, | # | S  |   |   | {WC/WZ/WCZ}   |                       | ALU  |            |
| MUXNC    |   |        |   | D, | # | S  |   |   | {WC/WZ/WCZ}   |                       | ALU  |            |
| MUXZ     |   |        |   | D, | # | S  |   |   | {WC/WZ/WCZ}   |                       | ALU  |            |
| MUXNZ    |   |        |   | D, | # | S  |   |   | {WC/WZ/WCZ}   |                       | ALU  |            |
| MOV      |   |        |   | D, | # | S  |   |   | {WC/WZ/WCZ}   |                       | ALU  |            |
| NOT      |   |        |   | D, | # | S  |   |   | {WC/WZ/WCZ}   |                       | ALU  |            |
| NOT      |   |        |   | D  |   |    |   |   | {WC/WZ/WCZ} * |                       | ALU  |            |
| ABS      |   |        |   | D, | # | S  |   |   | {WC/WZ/WCZ}   |                       | ALU  |            |
| ABS      |   |        |   | D  |   |    |   |   | {WC/WZ/WCZ} * |                       | ALU  |            |
| NEG      |   |        |   | D, | # | S  |   |   | {WC/WZ/WCZ}   |                       | ALU  |            |
| NEG      |   |        |   | D  |   |    |   |   | {WC/WZ/WCZ} * |                       | ALU  |            |
| NEGC     |   |        |   | D, | # | S  |   |   | {WC/WZ/WCZ}   |                       | ALU  |            |
| NEGC     |   |        |   | D  |   |    |   |   | {WC/WZ/WCZ} * |                       | ALU  |            |
| NEGNC    |   |        |   | D, | # | S  |   |   | {WC/WZ/WCZ}   |                       | ALU  |            |
| NEGNC    |   |        |   | D  |   |    |   |   | {WC/WZ/WCZ} * |                       | ALU  |            |
| NEGZ     |   |        |   | D, | # | S  |   |   | {WC/WZ/WCZ}   |                       | ALU  |            |
| NEGZ     |   |        |   | D  |   |    |   |   | {WC/WZ/WCZ} * |                       | ALU  |            |
| NEGNZ    |   |        |   | D, | # | S  |   |   | {WC/WZ/WCZ}   |                       | ALU  |            |
| NEGNZ    |   |        |   | D  |   |    |   |   | {WC/WZ/WCZ} * |                       | ALU  |            |
| INCMOD   |   |        |   | D, | # | S  |   |   | {WC/WZ/WCZ}   |                       | ALU  |            |
| DECMOD   |   |        |   | D, | # | S  |   |   | {WC/WZ/WCZ}   |                       | ALU  |            |
| ZEROX    |   |        |   | D, | # | S  |   |   | {WC/WZ/WCZ}   |                       | ALU  |            |
| SIGNX    |   |        |   | D, | # | S  |   |   | {WC/WZ/WCZ}   |                       | ALU  |            |
| ENCOD    |   |        |   | D, | # | S  |   |   | {WC/WZ/WCZ}   |                       | ALU  |            |
| ENCOD    |   |        |   | D  |   |    |   |   | {WC/WZ/WCZ} * |                       | ALU  |            |
| ONES     |   |        |   | D, | # | S  |   |   | {WC/WZ/WCZ}   |                       | ALU  |            |
| ONES     |   |        |   | D  |   |    |   |   | {WC/WZ/WCZ} * |                       | ALU  |            |
| TEST     |   |        |   | D, | # | S  |   |   | {WC/WZ/WCZ}   |                       | ALU  |            |
| TEST     |   |        |   | D  |   |    |   |   | {WC/WZ/WCZ} * |                       | ALU  |            |
| TESTN    |   |        |   | D, | # | S  |   |   | {WC/WZ/WCZ}   |                       | ALU  |            |
| SETNIB   |   |        |   | D, | # | S, | # | N |               |                       | ALU  |            |
| SETNIB   |   |        |   | #  | S |    |   |   |               | *                     | ALU  |            |
| GETNIB   |   |        |   | D  | # | S, | # | N |               |                       | ALU  |            |

| MNEMONIC | # | A<br>B<br>S<br>D | # | S  | # | N | EFFECTS     | A<br>L<br>I<br>A<br>S | T<br>Y<br>P<br>E | SHORT DESC |
|----------|---|------------------|---|----|---|---|-------------|-----------------------|------------------|------------|
| GETNIB   |   | D                |   |    |   |   |             | *                     | ALU              |            |
| ROLNIB   |   | D,               | # | S, | # | N |             |                       | ALU              |            |
| ROLNIB   |   | D                |   |    |   |   |             | *                     | ALU              |            |
| SETBYTE  |   | D,               | # | S, | # | N |             |                       | ALU              |            |
| SETBYTE  |   |                  | # | S  |   |   |             | *                     | ALU              |            |
| GETBYTE  |   | D                | # | S, | # | N |             |                       | ALU              |            |
| GETBYTE  |   | D                |   |    |   |   |             | *                     | ALU              |            |
| ROLBYTE  |   | D,               | # | S, | # | N |             |                       | ALU              |            |
| ROLBYTE  |   | D                |   |    |   |   |             | *                     | ALU              |            |
| SETWORD  |   | D,               | # | S, | # | N |             |                       | ALU              |            |
| SETWORD  |   |                  | # | S  |   |   |             | *                     | ALU              |            |
| GETWORD  |   | D,               | # | S, | # | N |             |                       | ALU              |            |
| GETWORD  |   | D                |   |    |   |   |             | *                     | ALU              |            |
| ROLWORD  |   | D,               | # |    | # | N |             |                       | ALU              |            |
| ROLWORD  |   | D                |   |    |   |   |             | *                     | ALU              |            |
| SETR     |   | D                | # | S  |   |   |             |                       | ALU              |            |
| SETD     |   | D                | # | S  |   |   |             |                       | ALU              |            |
| SETS     |   | D                | # | S  |   |   |             |                       | ALU              |            |
| DECOD    |   | D                | # | S  |   |   |             |                       | ALU              |            |
| DECOD    |   | D                |   |    |   |   |             | *                     | ALU              |            |
| BMASK    |   | D                | # | S  |   |   |             |                       | ALU              |            |
| BMASK    |   | D                |   |    |   |   |             | *                     | ALU              |            |
| CRCBIT   |   | D                | # | S  |   |   |             |                       | ALU              |            |
| CRCNIB   |   | D                | # | S  |   |   |             |                       | ALU              |            |
| MUXNITS  |   | D                | # | S  |   |   |             |                       | ALU              |            |
| MUXNIBS  |   | D                | # | S  |   |   |             |                       | ALU              |            |
| MUXQ     |   | D                | # | S  |   |   |             |                       | ALU              |            |
| MOVBYTS  |   | D                | # | S  |   |   |             |                       | ALU              |            |
| SCA      |   | D                | # | S  |   |   | {WZ}        |                       | ALU              |            |
| SCAS     |   | D                | # | S  |   |   | {WZ}        |                       | ALU              |            |
| SPLITB   |   |                  |   |    |   |   |             |                       |                  |            |
| MERGE    |   |                  |   |    |   |   |             |                       |                  |            |
| SPLITW   |   | D                |   |    |   |   |             |                       | ALU              |            |
| MERGEW   |   | D                |   |    |   |   |             |                       | ALU              |            |
| SEUSSF   |   | D                |   |    |   |   |             |                       | ALU              |            |
| SEUSSR   |   | D                |   |    |   |   |             |                       | ALU              |            |
| XOR032   |   | D                |   |    |   |   |             |                       | ALU              |            |
| REV      |   | D                |   |    |   |   |             |                       | ALU              |            |
| RCZR     |   | D                |   |    |   |   | {WC/WZ/WCZ} |                       | ALU              |            |

| MNEMONIC | # | A | B | # | S   | # | N | EFFECTS     | ALIAS | TYPE  | SHORT DESC                                |
|----------|---|---|---|---|-----|---|---|-------------|-------|-------|---|
| RCZL     |   | D |   |   |     |   |   | {WC/WZ/WCZ} |       | ALU   |   |
| WRC      |   | D |   |   |     |   |   |             |       | ALU   |   |
| WRNC     |   | D |   |   |     |   |   |             |       | ALU   |   |
| WRZ      |   | D |   |   |     |   |   |             |       | ALU   |   |
| WRNZ     |   | D |   |   |     |   |   |             |       | ALU   |   |
| MODCZ    |   |   |   |   |     |   |   | {WC/WZ/WCZ} |       | ALU   |   |
| MODC     |   |   |   |   |     |   |   | {WC}        | *     | ALU   |   |
| MODZ     |   |   |   |   |     |   |   | {WZ}        | *     | ALU   |   |
| ALTSN    |   | D |   | # | S   |   |   |             |       | ALT   |   |
| ALTSN    |   | D |   |   |     |   |   |             |       | * ALT |   |
| ALTGN    |   | D |   | # | S   |   |   |             |       | ALT   |   |
| ALTGN    |   | D |   |   |     |   |   |             |       | * ALT |   |
| ALTSB    |   | D |   | # | S   |   |   |             |       | ALT   |   |
| ALTSB    |   | D |   |   |     |   |   |             |       | * ALT |   |
| ALTGB    |   | D |   | # | S   |   |   |             |       | ALT   |   |
| ALTGB    |   | D |   |   |     |   |   |             |       | * ALT |   |
| ALTSW    |   | D |   | # | S   |   |   |             |       | ALT   |   |
| ALTSW    |   | D |   |   |     |   |   |             |       | * ALT |   |
| ALTGW    |   | D |   | # | S   |   |   |             |       | ALT   |   |
| ALTGW    |   | D |   |   |     |   |   |             |       | * ALT |   |
| ALTR     |   | D |   | # | S   |   |   |             |       | ALT   |   |
| ALTR     |   | D |   |   |     |   |   |             |       | * ALT |   |
| ALTD     |   | D |   | # | S   |   |   |             |       | ALT   |   |
| ALTD     |   | D |   |   |     |   |   |             |       | * ALT |   |
| ALTS     |   | D |   | # | S   |   |   |             |       | ALT   |   |
| ALTS     |   | D |   |   |     |   |   |             |       | * ALT |   |
| ALTB     |   | D |   | # | S   |   |   |             |       | ALT   |   |
| ALTB     |   | D |   |   |     |   |   |             |       | * ALT |   |
| ALTI     |   | D |   | # | S   |   |   |             |       | ALT   |   |
| ALTI     |   | D |   |   |     |   |   |             |       | * ALT |   |
| AUGS     |   |   |   |   |     |   |   |             |       | ALT   | Augment b31:9 of next S                   |
| AUGD     |   |   |   |   |     |   |   |             |       | ALT   | Augment b31:9 of next D                   |
| WMLONG   |   | D |   | # | S/P |   |   |             |       | HUB   |   |
| RDBYTE   |   | D |   | # | S/P |   |   | {WC/WZ/WCZ} |       | HUB   | Read byte from hub (zero-extended)        |
| RDWORD   |   | D |   | # | S/P |   |   | {WC/WZ/WCZ} |       | HUB   | Read 16-bit word from hub (zero-extended) |
| RDLONG   |   | D |   | # | S/P |   |   | {WC/WZ/WCZ} |       | HUB   | Read 32-bit long from hub                 |
| POPA     |   | D |   |   |     |   |   | {WC/WZ/WCZ} | *     | HUB   | Read 32-bit long from hub using --PTRA    |
| POPB     |   | D |   |   |     |   |   | {WC/WZ/WCZ} | *     | HUB   | Read 32-bit long from hub using --PTRB    |
| WRBYTE   | # | D |   | # | S/P |   |   |             |       | HUB   |   |
| WRWORD   | # | D |   | # | S/P |   |   |             |       | HUB   |   |
| WRLONG   | # | D |   | # | S/P |   |   |             |       | HUB   |   |
| PUSHA    | # | D |   |   |     |   |   |             |       | * HUB |   |
| PUSHB    | # | D |   |   |     |   |   |             |       | * HUB |   |

| MNEMONIC | #   | A<br>B<br>S<br>D | # | S<br>N | EFFECTS     | A<br>L<br>I<br>A<br>S | T<br>Y<br>P<br>E | SHORT DESC                                    |
|----------|-----|------------------|---|--------|-------------|-----------------------|------------------|---|
| RDFAST   | #   | D                | # | S      |             |                       | HUB              |   |
| WRFAST   | #   | D                | # | S      |             |                       | HUB              |   |
| FBLOCK   | #   | D                | # | S      |             |                       | HUB              |   |
| RFBYTE   |     | D                |   |        | {WC/WZ/WCZ} |                       | HUB              |   |
| RFWORD   |     | D                |   |        | {WC/WZ/WCZ} |                       | HUB              |   |
| RFLONG   |     | D                |   |        | {WC/WZ/WCZ} |                       | HUB              |   |
| RFVAR    |     | D                |   |        | {WC/WZ/WCZ} |                       | HUB              |   |
| RFVARS   |     | D                |   |        | {WC/WZ/WCZ} |                       | HUB              |   |
| WFBYTE   | #   | D                |   |        |             |                       | HUB              |   |
| WFWORD   | #   | D                |   |        |             |                       | HUB              |   |
| WFLONG   | #   | D                |   |        |             |                       | HUB              |   |
| GETPTR   |     | D                |   |        |             |                       | HUB              |   |
| REP      | #   | D                | # | S      |             |                       |                  | Repeat D instructions S times                 |
| DJZ      |     | D                | # | S      |             |                       |                  | Decrement & Jump if Zero                      |
| DJNZ     |     | D                | # | S      |             |                       |                  | Decrement & Jump if Not Zero                  |
| DJF      |     | D                | # | S      |             |                       |                  | Decrement & Jump if Full (\$FFFFFFFF)         |
| DJNF     |     | D                | # | S      |             |                       |                  | Decrement & Jump if Not Full (\$FFFFFFFF)     |
| IJZ      |     | D                | # | S      |             |                       |                  | Increment & Jump if Zero                      |
| IJNZ     |     | D                | # | S      |             |                       |                  | Increment & Jump if Not Zero                  |
| TJZ      |     | D                | # | S      |             |                       |                  | Test & Jump if Zero                           |
| TJNZ     |     | D                | # | S      |             |                       |                  | Test & Jump if Not Zero                       |
| TJF      |     | D                | # | S      |             |                       |                  | Test & Jump if Full (\$FFFFFFFF)              |
| TJNF     |     | D                | # | S      |             |                       |                  | Test & Jump if Not Full (\$FFFFFFFF)          |
| TJS      |     | D                | # | S      |             |                       |                  | Test & Jump if Signed                         |
| TJNS     |     | D                | # | S      |             |                       |                  | Test & Jump if Not Signed                     |
| TJV      |     | D                | # | S      |             |                       |                  | Test & Jump if Overflowed                     |
| CALLD    |     | D                | # | S      | {WC/WZ/WCZ} |                       |                  |   |
| CALLPA   | #   | D                | # | S      |             |                       |                  |   |
| CALLPB   | #   | D                | # | S      |             |                       |                  |   |
| JMP      | # \ | A                |   |        |             |                       |                  | Jump to 20-bit Relative Address or \ Absolute |
| CALL     | # \ | A                |   |        |             |                       |                  |   |
| CALLA    | # \ | A                |   |        |             |                       |                  |   |
| CALLB    | # \ | A                |   |        |             |                       |                  |   |
| CALLD    | # \ | A                |   |        |             |                       |                  |   |
| LOC      | # \ | A                |   |        |             |                       |                  |   |
| JMP      |     | D                |   |        | {WC/WZ/WCZ} |                       |                  |   |
| CALL     |     | D                |   |        | {WC/WZ/WCZ} |                       |                  |   |
| RET      |     |                  |   |        | {WC/WZ/WCZ} |                       |                  |   |
| CALLA    |     | D                |   |        | {WC/WZ/WCZ} |                       |                  |   |
| RETA     |     |                  |   |        | {WC/WZ/WCZ} |                       |                  |   |
| CALLB    |     | D                |   |        | {WC/WZ/WCZ} |                       |                  |   |
| RETB     |     |                  |   |        | {WC/WZ/WCZ} |                       |                  |   |
| JMPREL   | #   | D                |   |        |             |                       |                  |   |
| SKIP     | #   | D                |   |        |             |                       |                  |   |

| MNEMONIC | # | A<br>B<br>S<br>D | # | S<br>N | EFFECTS | A<br>L<br>I<br>A<br>S | T<br>Y<br>P<br>E | SHORT | DESC |
|----------|---|------------------|---|--------|---------|-----------------------|------------------|-------|------|
| SKIPF    | # | D                |   |        |         |                       |                  |       |      |
| EXECF    | # | D                |   |        |         |                       |                  |       |      |
| RESI3    |   |                  |   |        |         | *                     |                  |       |      |
| RESI2    |   |                  |   |        |         | *                     |                  |       |      |
| RESI1    |   |                  |   |        |         | *                     |                  |       |      |
| RESI0    |   |                  |   |        |         | *                     |                  |       |      |
| RETI3    |   |                  |   |        |         | *                     |                  |       |      |
| RETI2    |   |                  |   |        |         | *                     |                  |       |      |
| RETI1    |   |                  |   |        |         | *                     |                  |       |      |
| RETI0    |   |                  |   |        |         | *                     |                  |       |      |
| JINT     |   |                  | # | S      |         |                       |                  |       |      |
| JCT1     |   |                  | # | S      |         |                       |                  |       |      |
| JCT2     |   |                  | # | S      |         |                       |                  |       |      |
| JCT3     |   |                  | # | S      |         |                       |                  |       |      |
| JSE1     |   |                  | # | S      |         |                       |                  |       |      |
| JSE2     |   |                  | # | S      |         |                       |                  |       |      |
| JSE3     |   |                  | # | S      |         |                       |                  |       |      |
| JSE4     |   |                  | # | S      |         |                       |                  |       |      |
| JPAT     |   |                  | # | S      |         |                       |                  |       |      |
| JFBW     |   |                  | # | S      |         |                       |                  |       |      |
| JXMT     |   |                  | # | S      |         |                       |                  |       |      |
| JXFI     |   |                  | # | S      |         |                       |                  |       |      |
| JXRO     |   |                  | # | S      |         |                       |                  |       |      |
| JXRL     |   |                  | # | S      |         |                       |                  |       |      |
| JATN     |   |                  | # | S      |         |                       |                  |       |      |
| JQMT     |   |                  | # | S      |         |                       |                  |       |      |
| JNINT    |   |                  | # | S      |         |                       |                  |       |      |
| JNCT1    |   |                  | # | S      |         |                       |                  |       |      |
| JNCT2    |   |                  | # | S      |         |                       |                  |       |      |
| JNCT3    |   |                  | # | S      |         |                       |                  |       |      |
| JNSE1    |   |                  | # | S      |         |                       |                  |       |      |
| JNSE2    |   |                  | # | S      |         |                       |                  |       |      |
| JNSE3    |   |                  | # | S      |         |                       |                  |       |      |
| JNSE4    |   |                  | # | S      |         |                       |                  |       |      |
| JNPAT    |   |                  | # | S      |         |                       |                  |       |      |
| JNFBW    |   |                  | # | S      |         |                       |                  |       |      |
| JNXMT    |   |                  | # | S      |         |                       |                  |       |      |
| JNXFI    |   |                  | # | S      |         |                       |                  |       |      |
| JNXRO    |   |                  | # | S      |         |                       |                  |       |      |
| JNXRL    |   |                  | # | S      |         |                       |                  |       |      |
| JNATN    |   |                  | # | S      |         |                       |                  |       |      |
| JNQMT    |   |                  | # | S      |         |                       |                  |       |      |
| SETPAT   | # | D                | # | S      |         |                       |                  |       |      |
| ADDCT1   |   | D                | # | S      |         |                       |                  |       |      |
| ADDCT2   |   | D                | # | S      |         |                       |                  |       |      |

| MNEMONIC | # | A<br>B<br>S<br>D | # | S<br>N | EFFECTS     | A<br>L<br>I<br>A<br>S | TYPE | SHORT | DESC |
|----------|---|------------------|---|--------|-------------|-----------------------|------|-------|------|
| ADDCT3   |   | D                | # | S      |             |                       |      |       |      |
| SETSE1   | # | D                |   |        |             |                       |      |       |      |
| SETSE2   | # | D                |   |        |             |                       |      |       |      |
| SETSE3   | # | D                |   |        |             |                       |      |       |      |
| SETSE4   | # | D                |   |        |             |                       |      |       |      |
| POLLINT  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| POLLCT1  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| POLLCT2  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| POLLCT3  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| POLLSE1  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| POLLSE2  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| POLLSE3  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| POLLSE4  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| POLLPAT  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| POLLFBW  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| POLLXMT  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| POLLXFI  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| POLLXRO  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| POLLXRL  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| POLLATN  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| POLLQMT  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| WAITINT  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| WAITCT1  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| WAITCT2  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| WAITCT3  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| WAITSE1  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| WAITSE2  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| WAITSE3  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| WAITSE4  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| WAITPAT  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| WAITFBW  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| WAITXMT  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| WAITXFI  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| WAITXRO  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| WAITXRL  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| WAITATN  |   |                  |   |        | {WC/WZ/WCZ} |                       |      |       |      |
| COGATN   | # | D                |   |        |             |                       |      |       |      |
| COGINIT  | # | D                | # | S      | {WC}        |                       | COG  |       |      |
| HUBSET   | # | D                |   |        |             |                       | COG  |       |      |
| COGID    | # | D                |   |        | {WC}        |                       | COG  |       |      |
| COGSTOP  | # | D                |   |        |             |                       | COG  |       |      |
| LOCKNEW  |   | D                |   |        | {WC}        |                       | COG  |       |      |
| LOCKRET  | # | D                |   |        |             |                       | COG  |       |      |
| LOCKTRY  | # | D                |   |        | {WC}        |                       | COG  |       |      |
| LOCKREL  | # | D                |   |        | {WC}        |                       | COG  |       |      |

| MNEMONIC | # | A<br>B<br>S<br>D | # | S<br>N | EFFECTS     | A<br>L<br>I<br>A<br>S | TYPE | SHORT DESC                         |
|----------|---|------------------|---|--------|-------------|-----------------------|------|------------------------------------|
| XINIT    | # | D                | # | S      |             |                       | STR  |                                    |
| XSTOP    |   |                  |   |        |             | *                     | STR  |                                    |
| XZERO    | # | D                | # | S      |             |                       | STR  |                                    |
| XCONT    | # | D                | # | S      |             |                       | STR  |                                    |
| SETXFRQ  | # | D                |   |        |             |                       | STR  |                                    |
| GETXACC  |   | D                |   |        |             |                       | STR  |                                    |
| QMUL     | # | D                | # | S      |             |                       | CORD |                                    |
| QDIV     | # | D                | # | S      |             |                       | CORD |                                    |
| QFRAC    | # | D                | # | S      |             |                       | CORD |                                    |
| QSQRT    | # | D                | # | S      |             |                       | CORD |                                    |
| QROTATE  | # | D                | # | S      |             |                       | CORD |                                    |
| QVECTOR  | # | D                | # | S      |             |                       | CORD |                                    |
| QLOG     | # | D                |   |        |             |                       | CORD |                                    |
| QEXP     | # | D                |   |        |             |                       | CORD |                                    |
| GETQX    |   | D                |   |        | {WC/WZ/WCZ} |                       | CORD |                                    |
| GETQY    |   | D                |   |        | {WC/WZ/WCZ} |                       | CORD |                                    |
| ALLOWI   |   |                  |   |        |             |                       | INT  |                                    |
| STALLI   |   |                  |   |        |             |                       | INT  |                                    |
| TRGINT1  |   |                  |   |        |             |                       | INT  |                                    |
| TRGINT2  |   |                  |   |        |             |                       | INT  |                                    |
| TRGINT3  |   |                  |   |        |             |                       | INT  |                                    |
| NIXINT1  |   |                  |   |        |             |                       | INT  |                                    |
| NIXINT2  |   |                  |   |        |             |                       | INT  |                                    |
| NIXINT3  |   |                  |   |        |             |                       | INT  |                                    |
| SETINT1  | # | D                |   |        |             |                       | INT  |                                    |
| SETINT2  | # | D                |   |        |             |                       | INT  |                                    |
| SETINT3  | # | D                |   |        |             |                       | INT  |                                    |
| GETBRK   |   | D                |   |        | WC/WZ/WCZ   |                       | INT  |                                    |
| COGBRK   | # | D                |   |        |             |                       | INT  |                                    |
| BRK      | # | D                |   |        |             |                       | INT  |                                    |
| TESTP    | # | D                |   |        | WC/WZ       |                       | PIN  |                                    |
| TESTPN   | # | D                |   |        | WC/WZ       |                       | PIN  |                                    |
| TESTP    | # | D                |   |        | ANDC/ANDZ   |                       | PIN  |                                    |
| TESTPN   | # | D                |   |        | ANDC/ANDZ   |                       | PIN  |                                    |
| TESTP    | # | D                |   |        | ORC/ORZ     |                       | PIN  |                                    |
| TESTPN   | # | D                |   |        | ORC/ORZ     |                       | PIN  |                                    |
| TESTP    | # | D                |   |        | XORC/XORZ   |                       | PIN  |                                    |
| TESTPN   | # | D                |   |        | XORC/XORZ   |                       | PIN  |                                    |
| DIRL     | # | D                |   |        | {WCZ}       |                       | PIN  | Clear direction register bit(s)    |
| DIRH     | # | D                |   |        | {WCZ}       |                       | PIN  | Set direction register bit(s)      |
| DIRC     | # | D                |   |        | {WCZ}       |                       | PIN  | C write direction register bit(s)  |
| DIRNC    | # | D                |   |        | {WCZ}       |                       | PIN  | NC write direction register bit(s) |
| DIRZ     | # | D                |   |        | {WCZ}       |                       | PIN  | Z write direction register bit(s)  |
| DIRNZ    | # | D                |   |        | {WCZ}       |                       | PIN  | NZ write direction register bit(s) |



| MNEMONIC | # | A<br>B<br>S<br>D | # | S<br>N | EFFECTS     | A<br>L<br>I<br>A<br>S | TYPE | SHORT DESC                             |
|----------|---|------------------|---|--------|-------------|-----------------------|------|--|
| DIRRND   | # | D                |   |        | {WCZ}       |                       | PIN  | Random write direction register bit(s) |
| DIRNOT   | # | D                |   |        | {WCZ}       |                       | PIN  | Toggle direction register bit(s)       |
| OUTL     | # | D                |   |        | {WCZ}       |                       | PIN  | Clear output register bit(s)           |
| OUTH     | # | D                |   |        | {WCZ}       |                       | PIN  | Set output register bit(s)             |
| OUTC     | # | D                |   |        | {WCZ}       |                       | PIN  | C write output register bit(s)         |
| OUTNC    | # | D                |   |        | {WCZ}       |                       | PIN  | NC write output register bit(s)        |
| OUTZ     | # | D                |   |        | {WCZ}       |                       | PIN  | Z write output register bit(s)         |
| OUTNZ    | # | D                |   |        | {WCZ}       |                       | PIN  | NZ write output register bit(s)        |
| OUTRND   | # | D                |   |        | {WCZ}       |                       | PIN  | Random write output register bit(s)    |
| OUTNOT   | # | D                |   |        | {WCZ}       |                       | PIN  | Toggle output register bit(s)          |
| FLTL     | # | D                |   |        | {WCZ}       |                       | PIN  |  |
| FLTH     | # | D                |   |        | {WCZ}       |                       | PIN  |  |
| FLTC     | # | D                |   |        | {WCZ}       |                       | PIN  |  |
| FLTNC    | # | D                |   |        | {WCZ}       |                       | PIN  |  |
| FLTZ     | # | D                |   |        | {WCZ}       |                       | PIN  |  |
| FLTNZ    | # | D                |   |        | {WCZ}       |                       | PIN  |  |
| FLTRND   | # | D                |   |        | {WCZ}       |                       | PIN  |  |
| FLTNOT   | # | D                |   |        | {WCZ}       |                       | PIN  |  |
| DRVL     | # | D                |   |        | {WCZ}       |                       | PIN  |  |
| DRVH     | # | D                |   |        | {WCZ}       |                       | PIN  |  |
| DRVC     | # | D                |   |        | {WCZ}       |                       | PIN  |  |
| DRVNC    | # | D                |   |        | {WCZ}       |                       | PIN  |  |
| DRVZ     | # | D                |   |        | {WCZ}       |                       | PIN  |  |
| DRVNZ    | # | D                |   |        | {WCZ}       |                       | PIN  |  |
| DRVNRD   | # | D                |   |        | {WCZ}       |                       | PIN  |  |
| DRVNOT   | # | D                |   |        | {WCZ}       |                       | PIN  |  |
| RQPIN    |   | D                | # | S      | {WC}        |                       | SP   |  |
| RDPIN    |   | D                | # | S      | {WC}        |                       | SP   |  |
| AKPIN    |   |                  | # | S      |             | *                     | SP   |  |
| WRPIN    | # | D                | # | S      |             |                       | SP   |  |
| WXPIN    | # | D                | # | S      |             |                       | SP   |  |
| WYPIN    | # | D                | # | S      |             |                       | SP   |  |
| SETDACS  | # | D                |   |        |             |                       | SP   |  |
| SETSCP   | # | D                |   |        |             |                       |      |  |
| GETSCP   |   | D                |   |        |             |                       |      |  |
| WRLUT    | # | D                | # | S/P    |             |                       |      |  |
| RDLUT    |   | D                | # | S/P    | {WC/WZ/WCZ} |                       |      |  |
| SETLUTS  | # | D                |   |        |             |                       |      |  |
| SETCY    | # | D                |   |        |             |                       |      |  |
| SETCI    | # | D                |   |        |             |                       |      |  |
| SETCQ    | # | D                |   |        |             |                       |      |  |
| SETCFRQ  | # | D                |   |        |             |                       |      |  |
| SETCMOD  | # | D                |   |        |             |                       |      |  |
| SETPIV   | # | D                |   |        |             |                       |      |  |
| SETPIX   | # | D                |   |        |             |                       |      |  |

| MNEMONIC | # | A<br>B<br>S<br>D | # | S<br>S<br>S<br>S | #<br>N | EFFECTS     | A<br>L<br>I<br>A<br>S | TYPE | SHORT DESC |
|----------|---|------------------|---|------------------|--------|-------------|-----------------------|------|------------|
| ADDPIX   |   | D                | # | S                |        |             |                       |      |            |
| MULPIX   |   | D                | # | S                |        |             |                       |      |            |
| BLNPIX   |   | D                | # | S                |        |             |                       |      |            |
| MIXPIX   |   | D                | # | S                |        |             |                       |      |            |
| RGBSQZ   |   | D                |   |                  |        |             |                       | ALU  |            |
| RGBEXP   |   | D                |   |                  |        |             |                       | ALU  |            |
| SETQ     | # | D                |   |                  |        |             |                       |      |            |
| SETQ2    | # | D                |   |                  |        |             |                       |      |            |
| PUSH     | # | D                |   |                  |        |             |                       |      |            |
| POP      |   | D                |   |                  |        | {WC/WZ/WCZ} |                       |      |            |
| GETCT    |   | D                |   |                  |        | {WC}        |                       |      |            |
| GETRND   |   | D                |   |                  |        | {WC/WZ/WCZ} |                       |      |            |
| GETRND   |   |                  |   |                  |        | WC/WZ/WCZ   | *                     |      |            |
| WAITX    | # | D                |   |                  |        | {WC/WZ/WCZ} |                       |      |            |
| <empty>  | # | D                | # | S                |        |             |                       |      |            |
| <empty>  | # | D                | # | S                |        |             |                       |      |            |
| NOP      |   |                  |   |                  |        |             |                       |      |            |