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| --- | --- | --- | --- |
| **Instruction (8bits)** | **Opcode**  **(decimal)** | **Microinstruction (6bits)** | **Operation** |
| idle  (internal) | - | idle | goto fetch1 if status == 1 else idle |
| fetch  (internal) | - | fetch1 | read IMEM |
| write ir |
| goto fetch2 |
| fetch2 | read IMEM |
| write ir |
| goto fetch3 |
| fetch3 | read IMEM |
| goto ir[5:0] |
| loadac | 4 | loadac1 | read ac |
| write dar |
| goto loadac2 |
| loadac2 | read ac |
| wrirte dar |
| goto loadac3 |
| loadac3 | read DMEM |
| write ac |
| goto loadac4 |
| loadac4 | read DMEM |
| write ac |
| increment pc |
| goto fetch1 |
| movacr | 8 | movacr | read ac |
| write r |
| increment pc |
| goto fetch1 |
| movacr1 | 9 | moveacr1 | read ac |
| write r1 |
| increment pc |
| goto fetch1 |
| movacr2 | 10 | moveacr2 | read ac |
| write r2 |
| increment pc |
| goto fetch1 |
| movacr3 | 11 | moveacr3 | read ac |
| write r3 |
| increment pc |
| goto fetch1 |
| movacr4 | 12 | moveacr4 | read ac |
| write r4 |
| increment pc |
| goto fetch1 |
| movacr5 | 13 | moveacr5 | read ac |
| write r5 |
| increment pc |
| goto fetch1 |
| movacdar | 14 | moveacdar | read ac |
| write dar |
| increment pc |
| goto fetch1 |
| movrac | 15 | moverac | read r |
| write ac |
| increment pc |
| goto fetch1 |
| movr1ac | 16 | mover1ac | read r1 |
| write ac |
| increment pc |
| goto fetch1 |
| movr2ac | 17 | mover2ac | read r2 |
| write ac |
| increment pc |
| goto fetch1 |
| movr3ac | 18 | mover3ac | read r3 |
| write ac |
| increment pc |
| goto fetch1 |
| movr4ac | 19 | mover4ac | read r4 |
| write ac |
| increment pc |
| goto fetch1 |
| movr5ac | 20 | mover5ac | read r5 |
| write ac |
| increment pc |
| goto fetch1 |
| movdarac | 21 | movedarac | read dar |
| write ac |
| increment pc |
| goto fetch1 |
| stac | 22 | stac1 | read ac |
| goto stac2 |
| stac2 | read ac |
| write dm |
| goto stac3 |
| stac3 | read ac |
| increment pc |
| goto fetch1 |
| add | 25 | add1 | add alu |
| goto add2 |
| add2 | add alu |
| write alu\_to\_ac |
| increment pc |
| goto fetch1 |
| sub | 27 | sub1 | sub alu |
| goto sub2 |
| sub2 | sub alu |
| write alu\_to\_ac |
| increment pc |
| goto fetch1 |
| lshift | 29 | lshift1 | lshift alu |
| goto lshift2 |
| lshift2 | lshift alu |
| write alu\_to\_ac |
| increment pc |
| goto fetch1 |
| rshift | 31 | rshift1 | rshift alu |
| goto rshift2 |
| rshift2 | rshift alu |
| write alu\_to\_ac |
| increment pc |
| goto fetch1 |
| incac | 33 | incac | increment ac |
| incremtnt pc |
| goto fetch1 |
| incdar | 34 | incdar | increment dar |
| incremtnt pc |
| goto fetch1 |
| incr1 | 35 | incr1 | increment r1 |
| incremtnt pc |
| goto fetch1 |
| incr2 | 36 | incr2 | increment r2 |
| incremtnt pc |
| goto fetch1 |
| incr3 | 37 | incr3 | increment r3 |
| incremtnt pc |
| goto fetch1 |
| loadim | 38 | loadim1 | increment pc |
| goto loadim2 |
| loadim2 | read IMEM |
| goto loadim3 |
| loadim3 | read IMEM |
| write ac |
| increment pc |
| goto fetch1 |
| jump | 49 | jump | increment pc |
| goto jumpz2 |
| jumpz | 41 | jumpz1 | increment pc |
| goto jumpz2 if z == 1 else jumpz6 |
| jumpz2 | read IMEM |
| write pc |
| goto jumpz3 |
| jumpz3 | read IMEM |
| write pc |
| goto jumpz4 |
| jumpz4 | read IMEM |
| write ir |
| goto jumpz5 |
| jumpz5 | read IMEM |
| write ir |
| goto fetch3 |
| jumpz6 | goto jumpz7 |
| jumpz7 | increment pc |
| goto jumpz4 |
| jumpnz | 48 | jumpnz1 | increment pc |
| goto jumpz3 if z == 0 else goto jumpz7 |
| endop | 51 | endop | read DMEM |
| goto endop |
| nop | 50 | nop | increment pc |
| goto fetch1 |