# Opcodes

The following table lists the 8051 instructions by HEX code.

| Hex Code | Bytes | Mnemonic | Operands |
|---|---|---|---|
| 00 | 1 | NOP | |
| 01 | 2 | AJMP | addr11 |
| 02 | 3 | LJMP | addr16 |
| 03 | 1 | RR | A |
| 04 | 1 | INC | A |
| 05 | 2 | INC | direct |
| 06 | 1 | INC | @R0 |
| 07 | 1 | INC | @R1 |
| 08 | 1 | INC | R0 |
| 09 | 1 | INC | R1 |
| 0A | 1 | INC | R2 |
| 0B | 1 | INC | R3 |
| 0C | 1 | INC | R4 |
| 0D | 1 | INC | R5 |
| 0E | 1 | INC | R6 |
| 0F | 1 | INC | R7 |
| 10 | 3 | JBC | bit, offset |
| 11 | 2 | ACALL | addr11 |
| 12 | 3 | LCALL | addr16 |
| 13 | 1 | RRC | A |
| 14 | 1 | DEC | A |
| 15 | 2 | DEC | direct |
| 16 | 1 | DEC | @R0 |
| 17 | 1 | DEC | @R1 |
| 18 | 1 | DEC | R0 |
| 19 | 1 | DEC | R1 |
| 1A | 1 | DEC | R2 |
| 1B | 1 | DEC | R3 |
| 1C | 1 | DEC | R4 |
| 1D | 1 | DEC | R5 |
| 1E | 1 | DEC | R6 |
| 1F | 1 | DEC | R7 |
| 20 | 3 | JB | bit, offset |
| 21 | 2 | AJMP | addr11 |
| 22 | 1 | RET | |
| 23 | 1 | RL | A |
| 24 | 2 | ADD | A, #immed |
| 25 | 2 | ADD | A, direct |
| 26 | 1 | ADD | A, @R0 |
| 27 | 1 | ADD | A, @R1 |
| 28 | 1 | ADD | A, R0 |
| 29 | 1 | ADD | A, R1 |
| 2A | 1 | ADD | A, R2 |
| 2B | 1 | ADD | A, R3 |
| 2C | 1 | ADD | A, R4 |
| 2D | 1 | ADD | A, R5 |
| 2E | 1 | ADD | A, R6 |
| 2F | 1 | ADD | A, R7 |
| 30 | 3 | JNB | bit, offset |

| Hex Code | Bytes | Mnemonic | Operands |
|---|---|---|---|
| 80 | 2 | SJMP | offset |
| 81 | 2 | AJMP | addr11 |
| 82 | 2 | ANL | C, bit |
| 83 | 1 | MOVC | A, @A+PC |
| 84 | 1 | DIV | AB |
| 85 | 3 | MOV | direct, direct |
| 86 | 2 | MOV | direct, @R0 |
| 87 | 2 | MOV | direct, @R1 |
| 88 | 2 | MOV | direct, R0 |
| 89 | 2 | MOV | direct, R1 |
| 8A | 2 | MOV | direct, R2 |
| 8B | 2 | MOV | direct, R3 |
| 8C | 2 | MOV | direct, R4 |
| 8D | 2 | MOV | direct, R5 |
| 8E | 2 | MOV | direct, R6 |
| 8F | 2 | MOV | direct, R7 |
| 90 | 3 | MOV | DPTR, #immed |
| 91 | 2 | ACALL | addr11 |
| 92 | 2 | MOV | bit, C |
| 93 | 1 | MOVC | A, @A+DPTR |
| 94 | 2 | SUBB | A, #immed |
| 95 | 2 | SUBB | A, direct |
| 96 | 1 | SUBB | A, @R0 |
| 97 | 1 | SUBB | A, @R1 |
| 98 | 1 | SUBB | A, R0 |
| 99 | 1 | SUBB | A, R1 |
| 9A | 1 | SUBB | A, R2 |
| 9B | 1 | SUBB | A, R3 |
| 9C | 1 | SUBB | A, R4 |
| 9D | 1 | SUBB | A, R5 |
| 9E | 1 | SUBB | A, R6 |
| 9F | 1 | SUBB | A, R7 |
| A0 | 2 | ORL | C, /bit |
| A1 | 2 | AJMP | addr11 |
| A2 | 2 | MOV | C, bit |
| A3 | 1 | INC | DPTR |
| A4 | 1 | MUL | AB |
| A5 | | reserved | |
| A6 | 2 | MOV | @R0, direct |
| A7 | 2 | MOV | @R1, direct |
| A8 | 2 | MOV | R0, direct |
| A9 | 2 | MOV | R1, direct |
| AA | 2 | MOV | R2, direct |
| AB | 2 | MOV | R3, direct |
| AC | 2 | MOV | R4, direct |
| AD | 2 | MOV | R5, direct |
| AE | 2 | MOV | R6, direct |
| AF | 2 | MOV | R7, direct |
| B0 | 2 | ANL | C, /bit |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 31 | 2 | ACALL | addr11 | | B1 | 2 | ACALL | addr11 |
| 32 | 1 | RETI | | | B2 | 2 | CPL | bit |
| 33 | 1 | RLC | A | | B3 | 1 | CPL | C |
| 34 | 2 | ADDC | A, #immed | | B4 | 3 | CJNE | A, #immed, offset |
| 35 | 2 | ADDC | A, direct | | B5 | 3 | CJNE | A, direct, offset |
| 36 | 1 | ADDC | A, @R0 | | B6 | 3 | CJNE | @R0, #immed, offset |
| 37 | 1 | ADDC | A, @R1 | | B7 | 3 | CJNE | @R1, #immed, offset |
| 38 | 1 | ADDC | A, R0 | | B8 | 3 | CJNE | R0, #immed, offset |
| 39 | 1 | ADDC | A, R1 | | B9 | 3 | CJNE | R1, #immed, offset |
| 3A | 1 | ADDC | A, R2 | | BA | 3 | CJNE | R2, #immed, offset |
| 3B | 1 | ADDC | A, R3 | | BB | 3 | CJNE | R3, #immed, offset |
| 3C | 1 | ADDC | A, R4 | | BC | 3 | CJNE | R4, #immed, offset |
| 3D | 1 | ADDC | A, R5 | | BD | 3 | CJNE | R5, #immed, offset |
| 3E | 1 | ADDC | A, R6 | | BE | 3 | CJNE | R6, #immed, offset |
| 3F | 1 | ADDC | A, R7 | | BF | 3 | CJNE | R7, #immed, offset |
| 40 | 2 | JC | offset | | C0 | 2 | PUSH | direct |
| 41 | 2 | AJMP | addr11 | | C1 | 2 | AJMP | addr11 |
| 42 | 2 | ORL | direct, A | | C2 | 2 | CLR | bit |
| 43 | 3 | ORL | direct, #immed | | C3 | 1 | CLR | C |
| 44 | 2 | ORL | A, #immed | | C4 | 1 | SWAP | A |
| 45 | 2 | ORL | A, direct | | C5 | 2 | XCH | A, direct |
| 46 | 1 | ORL | A, @R0 | | C6 | 1 | XCH | A, @R0 |
| 47 | 1 | ORL | A, @R1 | | C7 | 1 | XCH | A, @R1 |
| 48 | 1 | ORL | A, R0 | | C8 | 1 | XCH | A, R0 |
| 49 | 1 | ORL | A, R1 | | C9 | 1 | XCH | A, R1 |
| 4A | 1 | ORL | A, R2 | | CA | 1 | XCH | A, R2 |
| 4B | 1 | ORL | A, R3 | | CB | 1 | XCH | A, R3 |
| 4C | 1 | ORL | A, R4 | | CC | 1 | XCH | A, R4 |
| 4D | 1 | ORL | A, R5 | | CD | 1 | XCH | A, R5 |
| 4E | 1 | ORL | A, R6 | | CE | 1 | XCH | A, R6 |
| 4F | 1 | ORL | A, R7 | | CF | 1 | XCH | A, R7 |
| 50 | 2 | JNC | offset | | D0 | 2 | POP | direct |
| 51 | 2 | ACALL | addr11 | | D1 | 2 | ACALL | addr11 |
| 52 | 2 | ANL | direct, A | | D2 | 2 | SETB | bit |
| 53 | 3 | ANL | direct, #immed | | D3 | 1 | SETB | C |
| 54 | 2 | ANL | A, #immed | | D4 | 1 | DA | A |
| 55 | 2 | ANL | A, direct | | D5 | 3 | DJNZ | direct, offset |
| 56 | 1 | ANL | A, @R0 | | D6 | 1 | XCHD | A, @R0 |
| 57 | 1 | ANL | A, @R1 | | D7 | 1 | XCHD | A, @R1 |
| 58 | 1 | ANL | A, R0 | | D8 | 2 | DJNZ | R0, offset |
| 59 | 1 | ANL | A, R1 | | D9 | 2 | DJNZ | R1, offset |
| 5A | 1 | ANL | A, R2 | | DA | 2 | DJNZ | R2, offset |
| 5B | 1 | ANL | A, R3 | | DB | 2 | DJNZ | R3, offset |
| 5C | 1 | ANL | A, R4 | | DC | 2 | DJNZ | R4, offset |
| 5D | 1 | ANL | A, R5 | | DD | 2 | DJNZ | R5, offset |
| 5E | 1 | ANL | A, R6 | | DE | 2 | DJNZ | R6, offset |
| 5F | 1 | ANL | A, R7 | | DF | 2 | DJNZ | R7, offset |
| 60 | 2 | JZ | offset | | E0 | 1 | MOVX | A, @DPTR |
| 61 | 2 | AJMP | addr11 | | E1 | 2 | AJMP | addr11 |
| 62 | 2 | XRL | direct, A | | E2 | 1 | MOVX | A, @R0 |
| 63 | 3 | XRL | direct, #immed | | E3 | 1 | MOVX | A, @R1 |
| 64 | 2 | XRL | A, #immed | | E4 | 1 | CLR | A |
| 65 | 2 | XRL | A, direct | | E5 | 2 | MOV | A, direct |
| 66 | 1 | XRL | A, @R0 | | E6 | 1 | MOV | A, @R0 |
| 67 | 1 | XRL | A, @R1 | | E7 | 1 | MOV | A, @R1 |
| 68 | 1 | XRL | A, R0 | | E8 | 1 | MOV | A, R0 |
| 69 | 1 | XRL | A, R1 | | E9 | 1 | MOV | A, R1 |
| 6A | 1 | XRL | A, R2 | | EA | 1 | MOV | A, R2 |
| 6B | 1 | XRL | A, R3 | | EB | 1 | MOV | A, R3 |
| 6C | 1 | XRL | A, R4 | | EC | 1 | MOV | A, R4 |
| 6D | 1 | XRL | A, R5 | | ED | 1 | MOV | A, R5 |
| 6E | 1 | XRL | A, R6 | | EE | 1 | MOV | A, R6 |
| 6F | 1 | XRL | A, R7 | | EF | 1 | MOV | A, R7 |
| 70 | 2 | JNZ | offset | | F0 | 1 | MOVX | @DPTR, A |
| 71 | 2 | ACALL | addr11 | | F1 | 2 | ACALL | addr11 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 72 | 2 | ORL | C, bit | | F2 | 1 | MOVX | @R0, A |
| 73 | 1 | JMP | @A+DPTR | | F3 | 1 | MOVX | @R1, A |
| 74 | 2 | MOV | A, #immed | | F4 | 1 | CPL | A |
| 75 | 3 | MOV | direct, #immed | | F5 | 2 | MOV | direct, A |
| 76 | 2 | MOV | @R0, #immed | | F6 | 1 | MOV | @R0, A |
| 77 | 2 | MOV | @R1, #immed | | F7 | 1 | MOV | @R1, A |
| 78 | 2 | MOV | R0, #immed | | F8 | 1 | MOV | R0, A |
| 79 | 2 | MOV | R1, #immed | | F9 | 1 | MOV | R1, A |
| 7A | 2 | MOV | R2, #immed | | FA | 1 | MOV | R2, A |
| 7B | 2 | MOV | R3, #immed | | FB | 1 | MOV | R3, A |
| 7C | 2 | MOV | R4, #immed | | FC | 1 | MOV | R4, A |
| 7D | 2 | MOV | R5, #immed | | FD | 1 | MOV | R5, A |
| 7E | 2 | MOV | R6, #immed | | FE | 1 | MOV | R6, A |
| 7F | 2 | MOV | R7, #immed | | FF | 1 | MOV | R7, A |

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