

| 指令 | flag_hlt | a_en | m_en | r_en_r | r_en_w | j_en | [2:0]a_op |
|--------------------------|----------|------|------|--------|--------|------|-----------|
| nop | 0 | 0 | 0 | 0 | 0 | 0 | ??? |
| hlt | 1 | 0 | 0 | 0 | 0 | 0 | ??? |
| push num | 0 | 0 | 1 | 1 | 1 | 0 | 001 |
| push reg | 0 | 0 | 1 | 1 | 1 | 0 | 001 |
| pop reg | 0 | 0 | 1 | 1 | 1 | 0 | 000 |
| call num | 0 | 0 | 1 | 1 | 1 | 1 | 001 |
| call reg | 0 | 0 | 1 | 1 | 1 | 1 | 001 |
| ret | 0 | 0 | 1 | 1 | 1 | 1 | 000 |
| jmp num | 0 | 0 | 0 | 0 | 0 | 1 | ??? |
| jmp reg | 0 | 0 | 0 | 1 | 0 | 1 | ??? |
| je num | 0 | 0 | 0 | 0 | 0 | 1 | ??? |
| je reg | 0 | 0 | 0 | 1 | 0 | 1 | ??? |
| jne num | 0 | 0 | 0 | 0 | 0 | 1 | ??? |
| jne reg | 0 | 0 | 0 | 1 | 0 | 1 | ??? |
| ja num | 0 | 0 | 0 | 0 | 0 | 1 | ??? |
| ja reg | 0 | 0 | 0 | 1 | 0 | 1 | ??? |
| jb num | 0 | 0 | 0 | 0 | 0 | 1 | ??? |
| jb reg | 0 | 0 | 0 | 1 | 0 | 1 | ??? |
| jc num | 0 | 0 | 0 | 0 | 0 | 1 | ??? |
| jc reg | 0 | 0 | 0 | 1 | 0 | 1 | ??? |
| jnc num | 0 | 0 | 0 | 0 | 0 | 1 | ??? |
| jnc reg | 0 | 0 | 0 | 1 | 0 | 1 | ??? |
| | | | | | | | |
| mov reg,num | 0 | 0 | 0 | 0 | 1 | 0 | ??? |
| mov reg,reg | 0 | 0 | 0 | 1 | 1 | 0 | ??? |
| mov reg,[num] | 0 | 0 | 1 | 0 | 1 | 0 | ??? |
| mov reg,[reg] | 0 | 0 | 1 | 1 | 1 | 0 | ??? |
| mov [num],reg | 0 | 0 | 1 | 1 | 0 | 0 | ??? |
| mov [reg],reg | 0 | 0 | 1 | 1 | 0 | 0 | ??? |
| | | | | | | | |
| add reg,num | 0 | 1 | 0 | 1 | 1 | 0 | xxx |
| sub reg,num cmp reg,num | 0 | 1 | 0 | 1 | 1 | 0 | xxx |
| and reg,num test reg,num | 0 | 1 | 0 | 1 | 1 | 0 | xxx |
| or reg,num | 0 | 1 | 0 | 1 | 1 | 0 | xxx |
| not reg | 0 | 1 | 0 | 1 | 1 | 0 | xxx |
| xor reg,num | 0 | 1 | 0 | 1 | 1 | 0 | xxx |
| shl reg,num | 0 | 1 | 0 | 1 | 1 | 0 | xxx |
| shr reg,num | 0 | 1 | 0 | 1 | 1 | 0 | xxx |
| | | | | | | | |
| add reg,reg | 0 | 1 | 0 | 1 | 1 | 0 | xxx |
| sub reg,reg cmp reg,reg | 0 | 1 | 0 | 1 | 1 | 0 | xxx |
| and reg,reg test reg,reg | 0 | 1 | 0 | 1 | 1 | 0 | xxx |
| or reg,reg | 0 | 1 | 0 | 1 | 1 | 0 | xxx |
| not reg,reg | 0 | 1 | 0 | 1 | 1 | 0 | xxx |
| xor reg,reg | 0 | 1 | 0 | 1 | 1 | 0 | xxx |
| shl reg,reg | 0 | 1 | 0 | 1 | 1 | 0 | xxx |
| shr reg,reg | 0 | 1 | 0 | 1 | 1 | 0 | xxx |

| 指令 | [2:0]j_op | mem_rw | [2:0]reg1 | [2:0]reg2 | [2:0]regw1 |
|--------------------------|-----------|--------|-----------|-----------|------------|
| nop | ??? | ? | 111 | 111 | 111 |
| hlt | ??? | ? | 111 | 111 | 111 |
| push num | ??? | 1 | 110 | 111 | 110 |
| push reg | ??? | 1 | 110 | xxx | 110 |
| pop reg | ??? | 0 | 110 | 111 | 110 |
| call num | 000 | 1 | 110 | 111 | 110 |
| call reg | 000 | 1 | 110 | xxx | 110 |
| ret | 000 | 0 | 110 | 111 | 110 |
| jmp num | xxx | ? | 111 | 111 | 111 |
| jmp reg | xxx | ? | xxx | 111 | 111 |
| je num | xxx | ? | 111 | 111 | 111 |
| je reg | xxx | ? | xxx | 111 | 111 |
| jne num | xxx | ? | 111 | 111 | 111 |
| jne reg | xxx | ? | xxx | 111 | 111 |
| ja num | xxx | ? | 111 | 111 | 111 |
| ja reg | xxx | ? | xxx | 111 | 111 |
| jb num | xxx | ? | 111 | 111 | 111 |
| jb reg | xxx | ? | xxx | 111 | 111 |
| jc num | xxx | ? | 111 | 111 | 111 |
| jc reg | xxx | ? | xxx | 111 | 111 |
| jnc num | xxx | ? | 111 | 111 | 111 |
| jnc reg | xxx | ? | xxx | 111 | 111 |
| | | | | | |
| mov reg,num | ??? | ? | 111 | 111 | xxx |
| mov reg,reg | ??? | ? | xxx | 111 | xxx |
| mov reg,[num] | ??? | 0 | 111 | 111 | xxx |
| mov reg,[reg] | ??? | 0 | xxx | 111 | xxx |
| mov [num],reg | ??? | 1 | xxx | 111 | 111 |
| mov [reg],reg | ??? | 1 | xxx | xxx | 111 |
| | | | | | |
| add reg,num | ??? | ? | xxx | 111 | xxx |
| sub reg,num cmp reg,num | ??? | ? | xxx | 111 | xxx |
| and reg,num test reg,num | ??? | ? | xxx | 111 | xxx |
| or reg,num | ??? | ? | xxx | 111 | xxx |
| not reg | ??? | ? | xxx | 111 | xxx |
| xor reg,num | ??? | ? | xxx | 111 | xxx |
| shl reg,num | ??? | ? | xxx | 111 | xxx |
| shr reg,num | ??? | ? | xxx | 111 | xxx |
| | | | | | |
| add reg,reg | ??? | ? | xxx | xxx | xxx |
| sub reg,reg cmp reg,reg | ??? | ? | xxx | xxx | xxx |
| and reg,reg test reg,reg | ??? | ? | xxx | xxx | xxx |
| or reg,reg | ??? | ? | xxx | xxx | xxx |
| not reg,reg | ??? | ? | xxx | xxx | xxx |
| xor reg,reg | ??? | ? | xxx | xxx | xxx |
| shl reg,reg | ??? | ? | xxx | xxx | xxx |
| shr reg,reg | ??? | ? | xxx | xxx | xxx |

| 指令 | [2:0]regw2 | [7:0]num | [7:0]alub | [1:0]mem_data_addr_selector |
|--------------------------|------------|----------|-----------|-----------------------------|
| nop | 111 | ???????? | ???????? | ?? |
| hlt | 111 | ???????? | ???????? | ?? |
| push num | 111 | xxxxxxxx | 00000001 | 11 |
| push reg | 111 | ???????? | 00000001 | 11 |
| pop reg | xxx | ???????? | 00000001 | 00 |
| call num | 111 | xxxxxxxx | 00000001 | 11 |
| call reg | 111 | ???????? | 00000001 | 11 |
| ret | 111 | ???????? | 00000001 | 00 |
| jmp num | 111 | xxxxxxxx | ???????? | ?? |
| jmp reg | 111 | ???????? | ???????? | ?? |
| je num | 111 | xxxxxxxx | ???????? | ?? |
| je reg | 111 | ???????? | ???????? | ?? |
| jne num | 111 | xxxxxxxx | ???????? | ?? |
| jne reg | 111 | ???????? | ???????? | ?? |
| ja num | 111 | xxxxxxxx | ???????? | ?? |
| ja reg | 111 | ???????? | ???????? | ?? |
| jb num | 111 | xxxxxxxx | ???????? | ?? |
| jb reg | 111 | ???????? | ???????? | ?? |
| jc num | 111 | xxxxxxxx | ???????? | ?? |
| jc reg | 111 | ???????? | ???????? | ?? |
| jnc num | 111 | xxxxxxxx | ???????? | ?? |
| jnc reg | 111 | ???????? | ???????? | ?? |
| | | | | |
| mov reg,num | 111 | xxxxxxxx | ???????? | ?? |
| mov reg,reg | 111 | ???????? | ???????? | ?? |
| mov reg,[num] | 111 | xxxxxxxx | ???????? | 10 |
| mov reg,[reg] | 111 | ???????? | ???????? | 00 |
| mov [num],reg | 111 | xxxxxxxx | ???????? | 10 |
| mov [reg],reg | 111 | ???????? | ???????? | 00 |
| | | | | |
| add reg,num | 111 | xxxxxxxx | ???????? | ?? |
| sub reg,num cmp reg,num | 111 | xxxxxxxx | ???????? | ?? |
| and reg,num test reg,num | 111 | xxxxxxxx | ???????? | ?? |
| or reg,num | 111 | xxxxxxxx | ???????? | ?? |
| not reg | 111 | xxxxxxxx | ???????? | ?? |
| xor reg,num | 111 | xxxxxxxx | ???????? | ?? |
| shl reg,num | 111 | xxxxxxxx | ???????? | ?? |
| shr reg,num | 111 | xxxxxxxx | ???????? | ?? |
| | | | | |
| add reg,reg | 111 | ???????? | ???????? | ?? |
| sub reg,reg cmp reg,reg | 111 | ???????? | ???????? | ?? |
| and reg,reg test reg,reg | 111 | ???????? | ???????? | ?? |
| or reg,reg | 111 | ???????? | ???????? | ?? |
| not reg,reg | 111 | ???????? | ???????? | ?? |
| xor reg,reg | 111 | ???????? | ???????? | ?? |
| shl reg,reg | 111 | ???????? | ???????? | ?? |
| shr reg,reg | 111 | ???????? | ???????? | ?? |

| 指令 | [1:0]mem_data_buf_w_selector | alu_a_selector |
|--------------------------|------------------------------|----------------|
| nop | ?? | ? |
| hlt | ?? | ? |
| push num | 11 | 0 |
| push reg | 10 | 0 |
| pop reg | 00 | 0 |
| call num | 00 | 0 |
| call reg | 00 | 0 |
| ret | 00 | 0 |
| jmp num | ?? | ? |
| jmp reg | ?? | ? |
| je num | ?? | ? |
| je reg | ?? | ? |
| jne num | ?? | ? |
| jne reg | ?? | ? |
| ja num | ?? | ? |
| ja reg | ?? | ? |
| jb num | ?? | ? |
| jb reg | ?? | ? |
| jc num | ?? | ? |
| jc reg | ?? | ? |
| jnc num | ?? | ? |
| jnc reg | ?? | ? |
| | | |
| mov reg,num | ?? | ? |
| mov reg,reg | ?? | ? |
| mov reg,[num] | 00 | ? |
| mov reg,[reg] | 00 | ? |
| mov [num],reg | 01 | ? |
| mov [reg],reg | 10 | ? |
| | | |
| add reg,num | ?? | 0 |
| sub reg,num cmp reg,num | ?? | 0 |
| and reg,num test reg,num | ?? | 0 |
| or reg,num | ?? | 0 |
| not reg | ?? | 0 |
| xor reg,num | ?? | 0 |
| shl reg,num | ?? | 0 |
| shr reg,num | ?? | 0 |
| | | |
| add reg,reg | ?? | 0 |
| sub reg,reg cmp reg,reg | ?? | 0 |
| and reg,reg test reg,reg | ?? | 0 |
| or reg,reg | ?? | 0 |
| not reg,reg | ?? | 0 |
| xor reg,reg | ?? | 0 |
| shl reg,reg | ?? | 0 |
| shr reg,reg | ?? | 0 |

| 指令 | [1:0]alu_b_selector | [1:0]reg_buf_w1_selector |
|--------------------------|---------------------|--------------------------|
| nop | ?? | ?? |
| hlt | ?? | ?? |
| push num | 11 | 10 |
| push reg | 11 | 10 |
| pop reg | 11 | 10 |
| call num | 11 | 10 |
| call reg | 11 | 10 |
| ret | 11 | 10 |
| jmp num | ?? | ?? |
| jmp reg | ?? | ?? |
| je num | ?? | ?? |
| je reg | ?? | ?? |
| jne num | ?? | ?? |
| jne reg | ?? | ?? |
| ja num | ?? | ?? |
| ja reg | ?? | ?? |
| jb num | ?? | ?? |
| jb reg | ?? | ?? |
| jc num | ?? | ?? |
| jc reg | ?? | ?? |
| jnc num | ?? | ?? |
| jnc reg | ?? | ?? |
| | | |
| mov reg,num | ?? | 01 |
| mov reg,reg | ?? | 11 |
| mov reg,[num] | ?? | 00 |
| mov reg,[reg] | ?? | 00 |
| mov [num],reg | ?? | ?? |
| mov [reg],reg | ?? | ?? |
| | | |
| add reg,num | 10 | 10 |
| sub reg,num cmp reg,num | 10 | 10 |
| and reg,num test reg,num | 10 | 10 |
| or reg,num | 10 | 10 |
| not reg | 10 | 10 |
| xor reg,num | 10 | 10 |
| shl reg,num | 10 | 10 |
| shr reg,num | 10 | 10 |
| | | |
| add reg,reg | 01 | 10 |
| sub reg,reg cmp reg,reg | 01 | 10 |
| and reg,reg test reg,reg | 01 | 10 |
| or reg,reg | 01 | 10 |
| not reg,reg | 01 | 10 |
| xor reg,reg | 01 | 10 |
| shl reg,reg | 01 | 10 |
| shr reg,reg | 01 | 10 |

| 指令 | [1:0]reg_buf_w2_selector | [1:0]jmp_addr_selector |
|--------------------------|--------------------------|------------------------|
| nop | ?? | ?? |
| hlt | ?? | ?? |
| push num | ?? | ?? |
| push reg | ?? | ?? |
| pop reg | 00 | ?? |
| call num | ?? | 01 |
| call reg | ?? | 11 |
| ret | ?? | 00 |
| jmp num | ?? | 01 |
| jmp reg | ?? | 10 |
| je num | ?? | 01 |
| je reg | ?? | 10 |
| jne num | ?? | 01 |
| jne reg | ?? | 10 |
| ja num | ?? | 01 |
| ja reg | ?? | 10 |
| jb num | ?? | 01 |
| jb reg | ?? | 10 |
| jc num | ?? | 01 |
| jc reg | ?? | 10 |
| jnc num | ?? | 01 |
| jnc reg | ?? | 10 |
| | | |
| mov reg,num | ?? | ?? |
| mov reg,reg | ?? | ?? |
| mov reg,[num] | ?? | ?? |
| mov reg,[reg] | ?? | ?? |
| mov [num],reg | ?? | ?? |
| mov [reg],reg | ?? | ?? |
| | | |
| add reg,num | ?? | ?? |
| sub reg,num cmp reg,num | ?? | ?? |
| and reg,num test reg,num | ?? | ?? |
| or reg,num | ?? | ?? |
| not reg | ?? | ?? |
| xor reg,num | ?? | ?? |
| shl reg,num | ?? | ?? |
| shr reg,num | ?? | ?? |
| | | |
| add reg,reg | ?? | ?? |
| sub reg,reg cmp reg,reg | ?? | ?? |
| and reg,reg test reg,reg | ?? | ?? |
| or reg,reg | ?? | ?? |
| not reg,reg | ?? | ?? |
| xor reg,reg | ?? | ?? |
| shl reg,reg | ?? | ?? |
| shr reg,reg | ?? | ?? |