

Figure 4-6. The complete block diagram of our example microarchitecture, the Mic-1.

F₀	F₁	ENA	ENB	INVA	INC	Function
0	1	1	0	0	0	A
0	1	0	1	0	0	B
0	1	1	0	1	0	\bar{A}
1	0	1	1	0	0	\bar{B}
1	1	1	1	0	0	A + B
1	1	1	1	0	1	A + B + 1
1	1	1	0	0	1	A + 1
1	1	0	1	0	1	B + 1
1	1	1	1	1	1	B - A
1	1	0	1	1	0	B - 1
1	1	1	0	1	1	-A
0	0	1	1	0	0	A AND B
0	1	1	1	0	0	A OR B
0	1	0	0	0	0	0
1	1	0	0	0	1	1
1	1	0	0	1	0	-1

Figure 4-2. Useful combinations of ALU signals and the function performed.

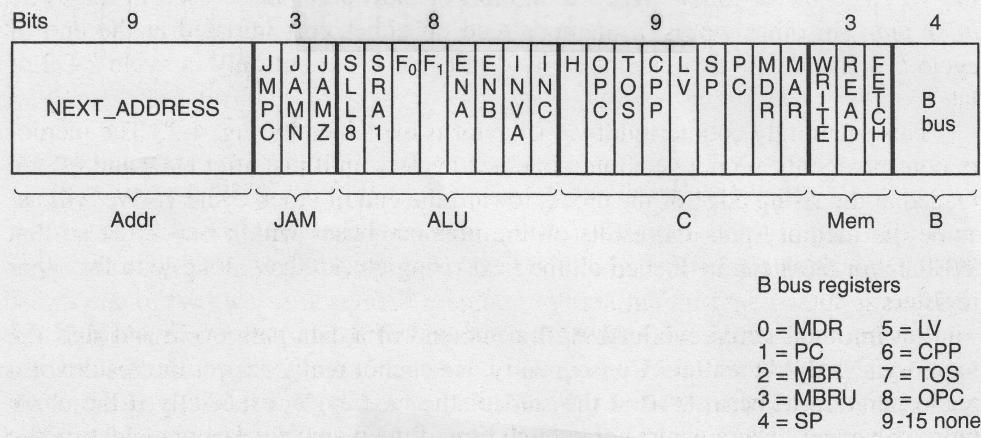


Figure 4-5. The microinstruction format for the Mic-1 (to be described shortly).

The Bbus group gives the source of data on the B bus.

The C group gives the destination(s) of the value on the C bus

The ALU group controls the ALU [table on reverse side.]

The JAM group helps with jumping

The Mem group controls memory accessing

The Next-Addr field is the μ -code address of the next instruction to execute.

Every μ -instructor has an explicit "goto" field.

Label	Operations	Comments
Main1	PC = PC + 1; fetch; goto (MBR)	MBR holds opcode; get next byte; dispatch
nop1	goto Main1	Do nothing
iadd1	MAR = SP = SP - 1; rd	Read in next-to-top word on stack
iadd2	H = TOS	H = top of stack
iadd3	MDR = TOS = MDR + H; wr; goto Main1	Add top two words; write to top of stack
isub1	MAR = SP = SP - 1; rd	Read in next-to-top word on stack
isub2	H = TOS	H = top of stack
isub3	MDR = TOS = MDR - H; wr; goto Main1	Do subtraction; write to top of stack
iand1	MAR = SP = SP - 1; rd	Read in next-to-top word on stack
iand2	H = TOS	H = top of stack
iand3	MDR = TOS = MDR AND H; wr; goto Main1	Do AND; write to new top of stack
ior1	MAR = SP = SP - 1; rd	Read in next-to-top word on stack
ior2	H = TOS	H = top of stack
ior3	MDR = TOS = MDR OR H; wr; goto Main1	Do OR; write to new top of stack
dup1	MAR = SP = SP + 1	Increment SP and copy to MAR
dup2	MDR = TOS; wr; goto Main1	Write new stack word
pop1	MAR = SP = SP - 1; rd	Read in next-to-top word on stack
pop2		Wait for new TOS to be read from memory
pop3	TOS = MDR; goto Main1	Copy new word to TOS
swap1	MAR = SP - 1; rd	Set MAR to SP - 1; read 2nd word from stack
swap2	MAR = SP	Set MAR to top word
swap3	H = MDR; wr	Save TOS in H; write 2nd word to top of stack
swap4	MDR = TOS	Copy old TOS to MDR
swap5	MAR = SP - 1; wr	Set MAR to SP - 1; write as 2nd word on stack
swap6	TOS = H; goto Main1	Update TOS
bipush1	SP = MAR = SP + 1	MBR = the byte to push onto stack
bipush2	PC = PC + 1; fetch	Increment PC, fetch next opcode
bipush3	MDR = TOS = MBR; wr; goto Main1	Sign-extend constant and push on stack
iload1	H = LV	MBR contains index; copy LV to H
iload2	MAR = MBRU + H; rd	MAR = address of local variable to push
iload3	MAR = SP = SP + 1	SP points to new top of stack; prepare write
iload4	PC = PC + 1; fetch; wr	Inc PC; get next opcode; write top of stack
iload5	TOS = MDR; goto Main1	Update TOS
istore1	H = LV	MBR contains index; copy LV to H
istore2	MAR = MBRU + H	MAR = address of local variable to store into
istore3	MDR = TOS; wr	Copy TOS to MDR; write word
istore4	SP = MAR = SP - 1; rd	Read in next-to-top word on stack
istore5	PC = PC + 1; fetch	Increment PC; fetch next opcode
istore6	TOS = MDR; goto Main1	Update TOS
wide1	PC = PC + 1; fetch;	Fetch operand byte or next opcode
wide2	goto (MBR OR 0x100)	Multiway branch with high bit set
wide_iload1	PC = PC + 1; fetch	MBR contains 1st index byte; fetch 2nd
wide_iload2	H = MBRU << 8	H = 1st index byte shifted left 8 bits
wide_iload3	H = MBRU OR H	H = 16-bit index of local variable
wide_iload4	MAR = LV + H; rd; goto iload3	MAR = address of local variable to push
wide_istore1	PC = PC + 1; fetch	MBR contains 1st index byte; fetch 2nd
wide_istore2	H = MBRU << 8	H = 1st index byte shifted left 8 bits
wide_istore3	H = MBRU OR H	H = 16-bit index of local variable
wide_istore4	MAR = LV + H; goto istore3	MAR = address of local variable to store into
ldc_w1	PC = PC + 1; fetch	MBR contains 1st index byte; fetch 2nd
ldc_w2	H = MBRU << 8	H = 1st index byte << 8
ldc_w3	H = MBRU OR H	H = 16-bit index into constant pool
ldc_w4	MAR = H + CPP; rd; goto iload3	MAR = address of constant in pool