ADD,ADC,ADZ,NDU,NDC,NDZ: I8-6 A1, I5-3 A2, I11-9 A3

ADI: I8-6 A1, I11-9 A3, Imm6 SE10, M9 M11 select Imm16

BEQ: I8-6 A1, I11-9 A2, Imm6 SE10, ALU inputs should be D1 and D2, Smaller ALU should have PC upper input and Imm16 lower input, M13 should pick small alu’s output, M16 picks NPC if branch taken and previously incremented PC if not taken

JAL: I11-9 A3, Imm9 SE7, PC into lower input and +1 into upper input of ALU; this is written into register at A3, PC into upper input and Imm16 into lower input of smaller ALU, M13 should pick small alu’s output, M16 picks NPC.

JLR: I8-6 A1, I11-9 A3, forwarded D1 at input1 of ALU is sent to M13 and then written into NPC, PC into upper input and +1 into lower input of smaller ALU, output of small alu sent directly to alu result in pipeline register via M18, M16 picks NPC.

LHI: I11-9 A3, Imm9 ZE, Imm16 sent to input2 and 0 to input1 of ALU; CRUCIAL that there be no forwarding,

LW: I11-9 A3, I8-6 A1, Imm6 SE10, D1 into upper input and Imm16 into lower input of ALU, M15 uses data memory

SW: I8-6 A1, I11-9 A2, Note input 1 of ALU is connected to M19 which is input 1 of smaller ALU and Imm16 goes to lower input of small alu; produces output which is written to alu result, Note input2 of ALU which is D2 goes to D2 in pipeline EX/MA and is written into memory.

LM: I11-9  A2, addr A3, D2 in RR/EX pipeline is self incremented by topmost ALU conditional on value of done which determines select value of M8, index is new LM instr fed back into IR(last 8 bits are scanned from right, first 1 located, then AND with a string of 1’s with 0 only at location where 1 found in 8 bit string, and this is appended to rest of instruction and fed back into IR), done also controls PC\_Write(check xl file for logic expression), upper input of ALU is 0

SM: I11-9  A2, addr A1, A1 -> D1, note forwarded D1 at input 1 of ALU is put directly into pipeline EX/MA’s D1 and written into MEM, D2 goes to M19 and upper input of small ALU, +0 to lower input of small ALU, and this is written to ALU\_result(make change in hardware)