```
SIM 28> run -all
                                                      IR=00000000, pc=xxxx,
IR=00000000, pc=xxxx,
IR=xxxxxxxx, pc=0000,
IR=00000000, pc=0001,
                                                                                                               35
                                                       IR=00000000, pc=0001,
                                                                                                                                                                                                                                                                                                                         ALU OP=2,
                                                                                                                                                                                                                                                                                                                                                   WB SEL=0,
                                                                                                                                                                                                                                                                                                                                                                                                          SEL=0,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               pc write=0,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            write data=xxxxxxxx
                                                       TR=000
                                                                                         pc=0001,
                                                                                                                                                 R1=00000000
                                                                                                                                                                                                                                                                                                                         ALU OP=2.
                                                                                                                                                                                                                                                                                                                                                  WB SEL=0.
                                                                                                                                                                                                                                                                                                                                                                                                          SEL=0.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               pc write=0.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            write data=00000000
                                                                                          pc=0001.
                                                                                                                                                 R1=00000000
                                                                                                                                                                                                                                                                                                                         ALU OP=0.
                                                                                                                                                                                                                                                                                                                                                  WB SEL=0.
                                                                                                                                                                                                                                                                                                                                                                                                         SEL=0.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    write=1, write data=00000000
                                                                                                                                                                                                                                                                                                                                                  WB_SEL=0,
WB_SEL=0,
WB_SEL=0,
                                                       TR=88100001.
                                                                                                                                                 R1=00000000
                                                                                                                                                                                                                                                                                                                         ALU
                                                                                                                                                                                                                                                                                                                                                                            RF WE=0,RD SEL=0,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               pc_write=0, write_data=00000000
pc_write=0, write_data=00000000
                                                                                                                                                                                                                                                                                                                                                                            RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=00000000
  Setting rf
                                                                                                                                                                                                                                                                                                                        105 IR-88100001, pc=0002, R0=00000000, R1=00000000, li5 IR=88100001, pc=0002, R0=00000000, R1=00000001, l25 IR=80211001, pc=0003, R0=00000000, R1=00000001,
                                                                                                                                                                                                                    R3=00000000,
                                                                                                                                                                                   R2=00000000, R3=00000000, R2=00000000, R3=00000000,
                                                                                                                                                                                                                                                      R4=00000000,
R4=00000000,
                                             145 IR=80211001, pc=0003,
                                                                                                                R0=00000000.
                                                                                                                                                 R1=00000001,
                                                                                                                                                                                   R2=000000000.
                                                                                                                                                                                                                    R3=000000000,
                                                                                                                                                                                                                                                      R4=000000000
 Setting rf we=1
                                                                                                                                                                                                                                                                                                                        ALU_OP=0, WB_SEL=0, RF_WE=1,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=00000002
ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=1, write_data=00000002
ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=00000002
ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=000000003
                                             155 IR=80211001, pc=0003, R0=00000000, R1=00000001, R2=00000000, R3=00000000, R4=00000000,
                                                                                                                                                                                                                                                                                       R5=000000000.
                                               155 IR=80211001, pc=0003, R0=00000000, R1=00000001, l165 IR=80211001, pc=0004, R0=00000000, R1=00000001, l175 IR=8032200b, pc=0004, R0=00000000, R1=00000001,
 Setting rf_we=1
                                                                                                                                                                                                                                                                                                                         ALU OP=0, WB SEL=0, RF WE=1,RD SEL=0, pc sel=0, br sel=0, pc write=0, write data
                                             215 IR=8032200b, pc=0004, R0=00000000, R1=00000001, 
225 IR=80412002, pc=0005, R0=00000000, R1=0000001, 
235 IR=80412002, pc=0005, R0=00000000, R1=0000001, 
245 IR=80412002, pc=0005, R0=0000000, R1=0000001,
                                                                                                                                                                                  R2=00000002, R3=0000008,
R2=00000002, R3=0000008,
R2=00000002, R3=0000008,
R2=00000002, R3=0000008,
                                                                                                                                                                                                                                                                                                                        ALU OP=0, WB SEL=0, RF WE=0,RD SEL=0, pc_sel=0, br_sel=0, pc_write=1, write_data=00000008
ALU OP=0, WB SEL=0, RF WE=0,RD SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=00000008
ALU OP=0, WB SEL=0, RF WE=0,RD SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=00000000
ALU OP=0, WB SEL=0, RF WE=0,RD SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=ffffffff
                                                                                                                                                                                                                                                      R4=000000000,
                                                                                                                                                                                                                                                                                       R5=000000000
                                                                                                                                                                                                                                                      R4=000000000.
                                                                                                                                                                                                                                                                                       R5=000000000
  Setting rf_
                                                               =80412002, pc=0005,
                                                                                                                                                                                                                                                                                                                        AUU OP=0, MB SEL=0, RF WE=0, RD SEL=0, pc sel=0, br sel=0, pc write=1, write data=ffffffff
AUU OP=0, WB SEL=0, RF WE=0, RD SEL=0, pc sel=0, br sel=0, pc write=0, write data=ffffffff
AUU OP=0, WB SEL=0, RF WE=0, RD SEL=0, pc sel=0, br sel=0, pc write=0, write data=fffffffff
AUU OP=0, WB SEL=0, RF WE=0, RD SEL=0, pc sel=0, br sel=0, pc write=0, write data=monoconomo
                                              265 IR=80412002, pc=0005, 275 IR=8044300a, pc=0006,
                                                                                                                R0=00000000, R1=00000001, R2=00000002, R3=00000008, R0=00000000, R1=00000001, R2=00000002, R3=00000008,
                                                                                                                                                                                                                                                     R4=ffffffff, R5=000000000.
                                                                                                                                                                                                                                                      R4=ffffffff,
                                                                                                                                                                                                                                                                                       R5=000000000,
                                                       IR=8044300a,
                                                                                                                                                                                                                     R3=00000008
                                                                                                                                                                                                                                                       R4=ffffffff.
                                             295 IR=8044300a, pc=0006,
                                                                                                                                                                                                                                                                                                                         ALU OP=0,
                                                                                                                                                                                                                                                                                                                                                   WB SEL=0,
                                                                                                                                                                                                                                                                                                                                                                            RF WE=0,RD SEL=0,
 Setting rf v
                                              305 IR=8044300a, pc=0006, R0=00000000, R1=00000001, R2=00000002, R3=00000008, R4=ffffffff, R5=00000000, ALU_OP=0, WB_SEL=0, RF_WE=1,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=00ffffff
315 IR=8044300a, pc=0006, R0=0000000, R1=00000001, R2=00000002, R3=00000008, R4=00ffffff, R5=00000000, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, br_sel=0, br_sel=0, pc_write=1, write_data=00ffffff
325 IR=80234007, pc=0007, R0=0000000, R1=00000001, R2=00000002, R3=00000008, R4=00ffffff, RS=00000000, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, br_sel=0, br_sel=0, pc_write=0, write_data=00ffffff
                                               335 IR=80234007, pc=0007,
                                                                                                                R0=000000000, R1=00000001,
                                                                                                                                                                                  R2=000000002, R3=000000008,
                                                                                                                                                                                                                                                      R4=00ffffff.
                                                                                                                                                                                                                                                                                       R5=000000000.
                                                                                                                                                                                                                                                                                                                         ALU_OP=0, WB_SEL=0, RF_WE=0, RD_SEL=0, pc_sel=0, br_sel=0,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                              pc write=0, write data=00fffff7
  Setting rf we=1
                                                                                                                                                                                                                                                                                                                       ALU_OP=0, WB_SEL=0, RF_WE=1,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=00ffffff ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=1, write_data=00ffffff ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=00fffffff ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=fffffffff ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=ff000008
                                              355 IR=80234007, pc=0007,
365 IR=80234007, pc=0007,
375 IR=80220004, pc=0008,
385 IR=80220004, pc=0008,
                                                                                                                                                                                  R2=00000002, R3=00000008,
R2=00fffff7, R3=00000008,
R2=00fffff7, R3=00000008,
R2=00fffff7, R3=00000008,
                                                                                                                                                                                                                                                     R4=00ffffff.
                                                                                                                                                 P1=00000001
                                                                                                                                                                                                                                                     R4=00ffffff,
R4=00ffffff,
R4=00ffffff,
                                                                                                                                                                                  R2=00ffffff7, R3=00000008, R4=00ffffff,
                                             395 IR=80220004, pc=0008,
                                                                                                                R0=00000000,
                                                                                                                                                 R1=00000001,
                                                                                                                                                                                                                                                                                       R5=000000000.
 Setting rf we=1
                                              405 IR-80220004, pc=0008, R0=00000000, R1=00000001, R2=00fffff, R3=00000008, R4=00fffff, R5=00000000, ALU_OP=0, WB_SEL=0, RF_WE=1,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=ff000008
                                               405 IR-80220004, pc=0008, R0=00000000, R1=00000001,
415 IR-80220004, pc=0008, R0=00000000, R1=00000001,
425 IR-80421009, pc=0009, R0=0000000, R1=00000001,
445 IR-80421009, pc=0009, R0=0000000, R1=00000001,
                                                                                                                                                                                   R2=ff000008, R3=00000008, R4=00ffffff, R5=0000000, R2=ff000008, R3=00000008, R4=00ffffff, R5=0000000, R2=ff000008, R3=0000008, R4=00ffffff, R5=00000000,
                                                                                                                                                                                                                                                                                                                        ALU OP-0, WB_SEL-0, RF_WE=1, RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=fr000008
ALU OP-0, WB_SEL-0, RF_WE=0, RD_SEL-0, pc_sel=0, br_sel=0, pc_write=0, write_data=fr000008
ALU_OP=0, WB_SEL-0, RF_WE=0, RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=fe000011
ALU_OP=0, WB_SEL-0, RF_WE=0, RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=fe000011
  Setting rf_we=
                                                                                                                                                                                                                                                                                                                         ALU OP=0, WB SEL=0,
                                              465 IR=80421009, pc=0009, R0=00000000, R1=00000001, 475 IR=80524005, pc=000a, R0=00000000, R1=00000001, 485 IR=80524005, pc=000a, R0=00000000, R1=00000001,
                                                                                                                                                                                  R2=ff000008, R3=00000008,
R2=ff000008, R3=00000008,
R2=ff000008, R3=00000008,
                                                                                                                                                                                                                                                                                                                        ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=1, write_data=fe000011
ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=fe000011
ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=ff000009
ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=ff000019
                                                                                                                                                                                                                                                     R4=fe000011,
                                                                                                                                                                                                                                                                                       R5=000000000,
                                                                                                                                                                                                                                                     R4=fe000011.
                                                                                                                                                                                                                                                                                       R5=000000000.
                                                                                                                                                                                                                                                       R4=fe000011.
  Setting rf_w
                                                               =80524005, pc=000a,
                                                                                                                                                                                                                                                      R4=fe000011,
                                                                                                                                                                                  R2=ff000008, R3=00000008, R4=fe000011, R5=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=1, write_data=ff000018 R2=ff000008, R3=00000008, R4=fe000011, R5=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=ff000019 R2=ff000019, R3=ff000019, R4=ff000011, R5=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=ff000019 R3=ff00019, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=ff000019 R3=ff00019 
                                               515 IR=80524005, pc=000a,
                                                                                                                R0=00000000, R1=00000001,
                                               525 IR=80324006, pc=000b,
                                                                                                                R0=00000000, R1=00000001,
                                             535 IR=80324006, pc=000b.
                                                                                                                                                 R1=00000001.
 Setting rf_we=1
                                              555 TR=80324006, pc=000b.
                                                                                                                                                                                                                    R3=000000008
                                                                                                                                                                                                                                                      R4=fe000011
                                                                                                                                                                                                                                                                                                                         ALU OP=0, WB SEL=0,
ALU OP=0, WB SEL=0,
ALU OP=0, WB SEL=0,
ALU OP=2, WB SEL=0,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                              pc_write=1, write_data=fe000000
pc_write=0, write_data=fe000000
pc_write=0, write_data=fd000019
                                               595 IR=00000000, pc=000c,
                                                                                                                                                 R1=00000001
                                                                                                                                                                                   R2=ff00
                                                                                                                                                                                                                     R3=fe000000,
                                                                                                                                                                                                                                                       R4=fe000011,
                                                                                                                                                                                                                                                                                       R5=ff000019.
                                                                                                                                                                                                                                                                                                                         ALU_OP=2,
                                                                                                                                                                                                                                                                                                                                                  WB SEL=0.
                                                                                                                                                                                                                                                                                                                                                                            RF WE=0.RD
                                                                                                                                                                                                                                                                                                                                                                                                          SEL=0,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       write=0,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            write_data=00000000
                                                                                                                                                                                                                                                                                       R5=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, RS=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, RS=ff000019, ALU_OP=1, WB_SEL=0, pc_sel=0, RS=ff000019, ALU_OP=1, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, R5=ff000019, ALU_OP=1, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, RS=ff000019, ALU_OP=1, WB_SEL=0, RS=ff000019, ALU_OP=1, WB_SEL=0, RS=ff000019, RS=ff000019, ALU_OP=1, WB_SEL=0, RS=ff000019, RS=ff000019,
                                              615 IR=000000000, pc=000c,
                                                                                                                                                 R1=00000001
                                                                                                                                                                                   R2=ff000008,
                                                                                                                                                                                                                    R3=fe0000000,
                                                                                                                                                                                                                                                      R4=fe000011,
                                                                                                                                                                                                                                                                                                                                                                                                                                                    br sel=0,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               pc write=1, write data=00000000
                                               625 IR=88100001, pc=000d,
                                                                                                                                                                                    R2=ff000008.
                                                                                                                                                                                                                    R3=fe0000000
                                                                                                                                                                                                                                                      R4=fe000011.
                                                                                                                                                                                                                                                                                                                                                                                                                                                    br sel=0.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               pc_write=0, write_data=00000000
pc_write=0, write_data=00000000
                                                       IR=88100001.
                                                                                          pc=000d.
                                                                                                                                                                                    R2=ff0000008.
                                                                                                                                                                                                                     R3=fe0000000.
                                                                                                                                                                                                                                                      R4=fe000011,
  Setting rf v
                                                                                                                                                                                                                                                     R4=fe000011.
                                                                                                                                                                                                                                                                                       R5=ff000019, ALU_OP=1, WB_SEL=0, RF_WE=1,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data-
                                                                                                                                                                                  R2=ff000008, R3=fe000000, R4=fe000011, R5=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=1, write_data=00000001
R2=ff000008, R3=fe000000, R4=fe000011, R5=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=00000000
                                              665 IR=88100001, pc=000d, R0=00000000, R1=00000001, 675 IR=80211002, pc=000e, R0=00000000, R1=00000001,
 Setting rf we=1
                                                                                                                                                                                  R2=ff000008, R3=fe000000, R4=fe000011, R5=ff000015, ALU_OP=0, WB_SEL=0, RF_WE=1,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write data=00000000 R2=00000000, R3=fe0000000, R3=fe000001, R5=ff000015, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=1, write_data=00000000 R2=00000000, R3=fe0000000, R4=fe000011, R5=ff000015, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=00000000 R2=00000000, R3=fe0000000, R3=fe000010, R5=ff000015, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=ffffffff
                                             705 IR=80211002, pc=000e, R0=00000000, R1=00000001, 715 IR=80211002, pc=000e, R0=00000000, R1=0000001, 725 IR=8021002, pc=000f, R0=0000000, R1=0000001, 745 IR=80201002, pc=000f, R0=0000000, R1=00000001,
 Setting rf_we=1
                                                                                                                                                                                   R2=00000000, R3=fe000000, R4=fe000011,
                                                                                                                                                                                                                                                                                       R5=ff000019, ALU OP=0, WB SEL=0, RF WE=1.RD SEL=0, pc sel=0, br sel=0, pc write=0, write data=ffffffff
                                               755 IR=80201002, pc=000f, R0=00000000, R1=00000001,
                                              755 IR=80201002, pc=000f, R0=00000000, R1=00000001, 
775 IR=80311008, pc=0010, R0=00000000, R1=00000001, 
755 IR=80311008, pc=0010, R0=00000000, R1=00000001, 
755 IR=80311008, pc=0010, R0=0000000, R1=00000001, 
755 IR=80311008, pc=0010, R0=00000000, R1=0000001,
                                                                                                                                                                                   R2=ffffffff, R3=fe000000,
R2=ffffffff, R3=fe000000,
R2=ffffffff, R3=fe000000,
R2=ffffffff, R3=fe000000,
                                                                                                                                                                                                                                                                                       R4=fe000011.
                                                                                                                                                                                                                                                     R4=fe000011.
  Setting rf_we=1
                                               805 IR=80311008, pc=0010, R0=00000000, R1=00000001,
                                                                                                                                                                                   R2=ffffffff, R3=fe000000, R4=fe000011,
                                                                                                                                                                                                                                                                                       R5=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=1,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=80000000
                                              815 IR=80311008, pc=0010, R0=00000000, R1=00000001, 825 IR=80423001, pc=0011, R0=00000000, R1=00000001, 835 IR=80423001, pc=0011, R0=00000000, R1=00000001,
                                                                                                                                                                                  845 IR=80423001.
  Setting rf_
                                              855 IR=80423001, pc=0011,
                                                                                                                                                                                                                                                     R4=fe000011.
                                                                                                                                                                                                                                                                                       R5=ff000019, ALU_OP=0, WB_SEL=0,
                                              865 IR=80423001, pc=0011,
875 IR=00000000, pc=0012,
                                                                                                                                                                                                                    R3=80000000,
R3=80000000,
                                                                                                                                                                                                                                                     R4=7fffffff,
R4=7fffffff,
                                                                                                                                                                                                                                                                                                                                                  WB_SEL=0,
WB_SEL=0,
                                                                                                                                                 R1=00000001,
R1=00000001
                                                                                                                                                                                                                                                                                                                         ALU_OP=0,
ALU_OP=0,
                                                                                                                                                                                                                                                                                                                                                                            RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0,
RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0,
                                                                                                                                                                                   R2=ffffffff,
                                                                                                                                                                                                                                                                                        R5=ff000019,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                              pc_write=1, write_data=7fffffff
                                                                                                                                                                                   R2=ffffffff,
                                                                                                                                                                                                                                                                                       R5=ff000019,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               pc write=0, write data=7fffffff
                                                                                                                                                                                                                                                                                                                                                                           RF_WE=0,RD_SEL=0, pc_sel=0,
RF_WE=0,RD_SEL=0, pc_sel=0,
RF_WE=0,RD_SEL=0, pc_sel=0,
                                               885 IR=00000000, pc=0012,
                                                                                                                                                 R1=00000001
                                                                                                                                                                                   R2=ffffffff, R3=80000000,
                                                                                                                                                                                                                                                     R4=7fffffff,
                                                                                                                                                                                                                                                                                       R5=ff000019,
                                                                                                                                                                                                                                                                                                                        ALU_OP=2, WB_SEL=0,
ALU_OP=2, WB_SEL=0,
                                                                                                                                                                                                                                                                                                                                                                                                                                                    br sel=0,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               pc write=0, write data=7fffffff
                                                                                         pc=0012.
                                                                                                                                                 R1=00000001
                                                                                                                                                                                   R2=ffffffff, R3=80000000,
R2=ffffffff, R3=80000000,
                                                                                                                                                                                                                                                      R4=7fffffff.
                                                                                                                                                                                                                                                                                        R5=ff000019.
                                                                                                                                                                                                                                                                                                                                                                                                                                                    br sel=0,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               pc write=0, write data=000000
                                               915
                                                                                          pc=0012.
                                                                                                                                                                                                                                                      R4=7fffffff
                                                                                                                                                                                                                                                                                        R5=ff000019.
                                                                                                                                                                                                                                                                                                                        ALU OP=0. WB SEL=0.
                                                                                                                                                                                                                                                                                         R5=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=0, RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=00000000
  Setting rf_
                                               955 IR=80400001, pc=0013,
                                                                                                                                                                                   R2=fffffff, R3=80000000, R4=7ffffff,
                                                                                                                                                                                                                                                                                       R5=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=1,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=00000000
                                               965 IR=80400001, pc=0013,
                                                                                                                                                 R1=00000001
                                                                                                                                                                                   R2=fffffff, R3=80000000, R4=00000000, R2=fffffff, R3=80000000, R4=000000000,
                                                                                                                                                                                                                                                                                       R5=ff000019, ALU_OP=0, WB_SEL=0, R5=ff000019, ALU_OP=0, WB_SEL=0, R5=ff000019, ALU_OP=2, WB_SEL=0,
                                                                                                                                                                                                                                                                                                                                                                           RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0,
RF_WE=0,RD_SEL=0, pc_sel=1, br_sel=0,
RF_WE=0,RD_SEL=0, pc_sel=1, br_sel=0,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               pc_write=1, write_data=00000000
pc_write=0, write_data=00000000
                                               975 IR=6100001d, pc=0014,
                                                                                                                                                 R1=00000001
                                               985 IR=6100001d, pc=0014,
                                                                                                                                                 R1=00000001
                                                                                                                                                                                   R2=ffffffff, R3=80000000, R4=00000000
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               pc write=0, write data=00000000
                                                                                                                                                                                                                                                                                       R5=ff000019, ALU OP=0, WB SEL=0, R5=ff000019, ALU OP=0, WB SEL=0, R5=ff000019, ALU OP=1, WB SEL=0, R5=ff000019, ALU OP=1, WB SEL=0, R5=ff000019, ALU OP=1, WB SEL=0,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               pc_write=1, write_data=00000000
pc_write=0, write_data=0000000
pc_write=0, write_data=00000000
pc_write=0, write_data=00000001
                                            1015 IR=6100001d, pc=0014.
                                                                                                                                                  R1=00000001
                                                                                                                                                                                   R2=fffffffff R3=800000000.
                                                                                                                                                                                                                                                      R4=00000000
                                                                                                                                                                                                                                                                                                                                                                            RF WE=0.RD SEL=0.
                                                                                                                                                                                   R2=ffffffff, R3=80000000,
R2=ffffffff, R3=80000000,
R2=ffffffff, R3=80000000,
                                                                                                                                                                                                                                                                                                                                                                           RF_WE=0,RD_SEL=0, pc_sel=1,
RF_WE=0,RD_SEL=0, pc_sel=1,
RF_WE=0,RD_SEL=0, pc_sel=1,
                                                                                                                                                                                                                                                                                                                                                                                                                                                    br_sel=0,
br_sel=0,
                                            1025 IR=88100001, pc=0015,
1035 IR=88100001, pc=0015,
                                                                                                                                                 R1=00000001
                                                                                                                                                                                                                                                     R4=000000000
                                                                                                                                                                                                                                                                                        R5=ff000019, ALU_OP=1, WB_SEL=0, RF_WE=1,RD_SEL=0, pc_sel=1, br_sel=0, pc_write=0, write_data
                                                                                                                                                                                   R2=ffffffff, R3=80000000, R4=00000000,
                                                                                                                                                                                                                                                                                       RS=ff000019, ALU OP=0, WB_SEL=0, RF_WE=0, RD_SLL=0, pc_sel=0, br_sel=0, RS=ff000019, ALU OP=0, WB_SEL=0, RF_WE=0, RD_SEL=0, pc_sel=0, br_sel=0, RS=ff000019, ALU OP=1, WB_SEL=0, RF_WE=0, RD_SEL=0, pc_sel=0, br_sel=0, 
                                            1065 IR=88100001, pc=0015,
                                                                                                                R0=000000000, R1=00000001,
                                                                                                                                                                                   R2=ffffffff, R3=80000000, R4=000000000
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               pc write=1, write data=00000001
                                            1075 IR=88200004, pc=0016.
                                                                                                                R0=000000000.
                                                                                                                                                 R1=00000001.
                                                                                                                                                                                   R2=ffffffff, R3=80000000,
                                                                                                                                                                                                                                                     R4=000000000
                                                                                                                                                                                                                                                                                                                                                                                                                                                                               pc write=0, write data=00000000
                                                       TR=88200004
                                                                                                                                                                                     R2=ffffffff.
                                                                                                                                                                                                                    R3=800000000
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     write=0, write data=ffffffff
                                                       IR=88200004, pc=0016,
                                                                                                                                                                                                                                                                                                                         ALU_OP=1, WB_SEL=0,
                                                                                                                                                                                                                                                                                         R5=ff000019,
                                            1105 IR=88200004, pc=0016,
                                                                                                                R0=00000000, R1=00000001,
                                                                                                                                                                                  R2=ffffffff, R3=80000000, R4=00000000,
                                                                                                                                                                                                                                                                                       R5=ff000019, ALU_OP=1, WB_SEL=0, RF_WE=1,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=00000004
                                            1115 IR=88200004, pc=0016,
1115 IR=88200004, pc=0016,
1125 IR=8822ffff, pc=0017,
                                                                                                                                                                                                                                                                                       R4=00000000,
R4=00000000,
                                                                                                                R0=00000000, R1=00000001, R0=00000000, R1=00000001,
                                                                                                                                                                                   R2=00000004, R3=80000000, R2=00000004, R3=80000000,
                                            1135 IR=8822ffff, pc=0017.
                                                                                                                                                 R1=00000001.
                                                                                                                                                                                   R2=00000004, R3=80000000.
                                                                                                                                                                                                                                                      R4=00000000
                                            1145 TR=8822ffff, pc=0017.
                                                                                                                                                 R1=00000001
                                                                                                                                                                                   R2=000000004, R3=800000000,
                                                                                                                                                                                                                                                      R4=00000000
  Setting rf w
                                                                                                                                                                                                                                                                                      R5=ff000019, ALU_OP=1, WB_SEL=0, RF_WE=1,RD_SEL=0, pc_sel=0, br_sel=0, R5=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, RS=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=1, br_sel=0, R5=ff000019, ALU_OP=2, WB_SEL=0, PF_WE=0,RD_SEL=0, pc_sel=1, br_sel=0, R5=ff000019, ALU_OP=2, WB_SEL=0, PS_WE=0,RD_SEL=0, PC_sel=1, br_sel=0, R5=ff000019, ALU_OP=2, WB_SEL=0, PS_WE=0,RD_SEL=0, PS_WE=0,RD_SEL=0, PS_WE=0,RD_SEL=0, PS_WE=0,RD_SEL=0, PS_WE=0,RD_SEL=0, PS_WE=0,RD_SEL=0, PS_WE=0,RD_SEL=0, PS_WE=0,RD_SEL=0, PS_WE=0,RD_SEL=0, PS_WE=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL=0,RD_SEL
                                           1155 IR=8822ffff, pc=0017, R0=00000000, R1=00000001, 
1165 IR=822ffff, pc=0017, R0=00000000, R1=00000001, 
1175 IR=51000005, pc=0018, R0=00000000, R1=00000001, 
1185 IR=51000005, pc=0018, R0=00000000, R1=00000001,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            write_data=00000000
write_data=00000000
                                                                                                                                                                                                                                                                                                                                                                                                                                                                              pc write=0, write data=00000003
                                            1195 IR=51000005, pc=0018,
                                                                                                                                                 R1=00000001,
                                                                                                                                                                                   R2=00000003,
                                                                                                                                                                                                                    R3=80000000,
                                                                                                                                                                                                                                                                                                                                                                                                                                                                              pc write=0, write data=00000000
                                                                                                                                                                                                                                                                                                                        ATJI OP=0
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       write=1 write data=00000000
```

```
Setting rf w
                                     1255 IR=88320000, pc=0019,
                                                                                               R0=00000000, R1=00000001, R2=00000003, R3=80000000, R4=00000000,
                                                                                                                                                                                                                                                R5=ff000019, ALU OP=1, WB SEL=0, RF WE=1.RD SEL=0, pc sel=1, br sel=0, pc write=0, write data=0000000
                                                                                               R0=00000000,
R0=00000000,
R0=00000000,
R0=00000000,
                                                                                                                                                         RS=ff000019, ALU QP=0, MB SEL=0, RF WE=0,RD SEL=0, pc_sel=0, br_sel=0, pc_write=0, write data=00000003 RS=ff000019, ALU QP=0, MB SEL=0, RF WE=0,RD SEL=0, pc_sel=0, br_sel=0, pc_write=0, write data=00000003 RS=ff000019, ALU QP=1, MB SEL=0, RF WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write data=00000003 RS=ff000019, ALU QP=1, WB SEL=0, RF WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write data=00000003 RS=ff000019, ALU QP=1, WB SEL=0, RF WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write data=000000001
                                     1265 IR=88320000, pc=0019,
1275 IR=88440001, pc=001a,
1285 IR=88440001, pc=001a,
1295 IR=88440001, pc=001a,
                                                                                                                            R1=00000001,
R1=00000001,
R1=00000001,
 Setting rf v
                                     1305 IR=88440001, pc=001a,
                                                                                               R0=00000000, R1=00000001,
                                                                                                                                                         R2=00000003, R3=00000003,
                                                                                                                                                                                                                                                R5=ff000019, ALU_OP=1, WB_SEL=0,
                                                                                               R0=00000000, R1=00000001, R2=00000003, R3=00000003, R4=0000001, R0=00000000, R1=00000001, R2=00000003, R3=00000003, R4=0000001, R0=00000000, R1=00000001, R2=00000003, R3=00000003, R4=0000001, R0=000000001, R1=00000001, R1=0000001, R1=00000001, R1=000000001, R1=000000001, R1=000000001, R1=000000001, R1=00000001, R1=000000001, R1=
                                                                                                                                                                                                                                                R5=ff000019, ALU_OP=0, WB_SEL=0, R5=ff000019, ALU_OP=0, WB_SEL=0, R5=ff000019, ALU_OP=0, WB_SEL=0, R5=ff000019, ALU_OP=0, WB_SEL=0,
                                                                                                                                                                                                                                                                                                                         RF WE-0,RD SEL-0, pc_sel-0, br_sel-0, pc_write-1, write data=00000001
RF WE-0,RD SEL-0, pc_sel-0, br_sel-0, pc write-0, write data=00000000
RF WE-0,RD SEL-0, pc_sel-0, br_sel-0, pc_write-0, write data=00000000
RF WE-0,RD SEL-0, pc_sel-0, br_sel-0, pc_write-0, write data=00000002
                                     1315 IR=88440001, pc=001a,
1325 IR=80331002, pc=001b,
                                     1335 TR=80331002.
                                                                             pc=001b.
 Setting rf
                                                                                                                                                                                                                                                RS=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=1,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=00000002 RS=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=1, write_data=00000002
                                    1365 IR=80331002, pc=001b, R0=00000000, R1=00000001, R2=00000003, R3=00000002,
                                                                                                                                                                                                                    R4=00000001,
 Took BNR branch
                                    1375 IR=7100fffd, pc=001c, R0=0000000, R1=00000001, R2=0000003, R3=0000002, R4=0000001, 1385 IR=7100fffd, pc=0019, R0=00000000, R1=0000001, R2=0000003, R3=0000002, R4=0000001, 1415 IR=7100fffd, pc=0019, R0=00000000, R1=0000001, R2=0000003, R3=0000002, R4=0000001,
                                                                                                                                                                                                                                                R2=00000003, R3=00000002,
R2=00000003, R3=00000002,
R2=00000003, R3=00000002,
                                                                                                                                                                                                                   R4=00000001,
R4=00000001,
R4=00000001,
                                                                                                                                                                                                                                                R5=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=1, br_sel=0, pc_write=0, write_data=00000000 RS=ff000019, ALU_OP=1, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=1, br_sel=0, pc_write=0, write_data=000000002 RS=ff000019, ALU_OP=1, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=1, br_sel=0, pc_write=0, write_data=000000002
                                    1435 IR=88440001, pc=001a, 1445 IR=88440001, pc=001a,
                                                                                               R0=00000000, R1=00000001, R0=00000000, R1=00000001,
Setting rf we=1
                                                                                                                                                                                                                                                RS=ff000019, ALU_OP=1, WB_SEL=0, RF_WE=1,RD_SEL=0, pc_sel=1, br_sel=0, pc_write=0, write_data=00000002 RS=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=1, write_data=00000002 RS=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_0 data=00000001 RS=ff000019, ALU_OP=0, WB_SEL=0, FF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=00000001 RS=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=00000001
                                     1455 TR=88440001, pc=001a.
                                                                                               R0=000000000 R1=00000001.
                                                                                                                                                         R2=00000003, R3=00000002,
                                                                                                                                                                                                                    R4=00000001.
                                    1465 IR=88440001, pc=001a,
1465 IR=88440001, pc=001a,
1475 IR=80331002, pc=001b,
1485 IR=80331002, pc=001b,
                                                                                                                            R1=00000001,
R1=00000001,
R1=00000001,
R1=00000001,
                                                                                                                                                         R2=00000003, R3=00000002,
R2=00000003, R3=00000002,
R2=00000003, R3=00000002,
R2=00000003, R3=00000002,
                                                                                                                                                                                                                    R4=00000002
                                                                                                                                                                                                                    P4=00000002,
Setting rf w
                                                                                                                                                                                                                                                R5=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=1,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=00000001
                                     1505 IR=80331002, pc=001b, R0=00000000, R1=00000001, R2=00000003, R3=00000002, R4=00000002,
                                    1515 IR=80331002, pc=001b.
                                                                                               R0=000000000. R1=00000001.
                                                                                                                                                         R2=00000003, R3=00000001,
                                                                                                                                                                                                                                                 R5=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=0, RD_SEL=0, pc_sel=0, br_sel=0,
 Took BNR branch
                                    1525 IR=7100fffd, pc=001c, R0=0000000, R1=00000001, R2=0000003, R3=0000001, R4=0000002, l535 IR=7100fffd, pc=0019, R0=00000000, R1=0000001, R2=0000003, R3=0000001, R4=0000002, l565 IR=7100fffd, pc=0019, R0=00000000, R1=0000001, R2=0000003, R3=0000001, R4=0000002,
                                                                                                                                                                                                                                                Took BNR branch
                                     1575 IR=88440001, pc=001a, R0=00000000, R1=00000001, R2=00000003, R3=00000001, R4=00000002,
                                                                                                                                                                                                                                                R5=ff000019, ALU OP=0, WB SEL=0, RF WE=0,RD SEL=0, pc sel=1, br sel=0, pc write=0, write data=0000000
                                     1585 IR=88440001, pc=001a, R0=00000000, R1=00000001, R2=00000003, R3=00000001, R4=00000002, 1595 IR=88440001, pc=001a, R0=00000000, R1=00000001, R2=00000003, R3=00000001, R4=00000002,
                                                                                                                                                                                                                                                R5=ff000019, ALU OP=1, WB SEL=0, RF WE=0, RD SEL=0, pc_sel=1, br_sel=0, pc_write=0, write data=00000000 R5=ff000019, ALU OP=1, WB SEL=0, RF WE=0, RD SEL=0, pc_sel=1, br_sel=0, pc_write=0, write data=00000003
Setting rf_w
                                                                                                                                                         R2=00000003,
                                                                                                                                                                                      R3=00000001,
                                                                                                                                                                                                                                                R5=ff000019, ALU_OP=1, WB_SEL=0, RF_WE=1,RD_SEL=0, pc_sel=1, br_sel=0, pc_write=0, write_data=00000003 R5=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=1, write_data=00000003 R5=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=00000003 R5=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=00000003
                                     1605 IR=88440001, pc=001a,
                                                                                               R0=00000000, R1=00000001,
                                     1615 IR=88440001, pc=001a,
1625 IR=80331002, pc=001b,
                                                                                                                            R1=00000001,
R1=00000001,
                                                                                                                                                         R2=00000003,
R2=00000003,
                                                                                                                                                                                      R3=00000001,
R3=00000001,
                                     1635 IR=80331002, pc=001b,
                                                                                                                                                          R2=00000003,
                                                                                                                                                                                       R3=00000001,
                                     1645 IR=80331002, pc=001b,
                                                                                                                            R1=00000001,
                                                                                                                                                          R2=00000003,
                                                                                                                                                                                      R3=00000001,
                                                                                                                                                                                                                    R4=00000003
                                                                                                                                                                                                                                                R5=ff000019, ALU OP=0,
                                                                                                                                                                                                                                                                                                   WB SEL=0,
                                                                                                                                                                                                                                                                                                                          RF WE=0, RD SEL=0,
                                                                                                                                                                                                                                                                                                                                                                                                               pc write=0,
                                                                                                                                                                                                                                                                                                                                                                                                                                         write data=00000000
Setting rf v
                                     1655 IR=80331002, pc=001b,
                                                                                               R0=00000000, R1=00000001, R2=00000003, R3=00000001, R4=00000003,
                                                                                                                                                                                                                                                R5=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=1,RD_SEL=0, pc_sel=0, br_sel=0,
                                                                                                                                                                                                                                                                                                                                                                                                               nc write=0, write data=000000000
                                                                                                                                                                                                                                                RS=ff000019, ALU_OP=0, WB_SEL=0, RS=ff000019, ALU_OP=0, WB_SEL=0, RS=ff000019, ALU_OP=2, WB_SEL=0, RS=ff000019, ALU_OP=0, WB_SEL=0, RS=ff000019, ALU_OP=0, WB_SEL=0,
                                     1715 IR=7100fffd, pc=001c,
                                                                                                                            R1=00000001.
                                                                                                                                                         R2=00000003,
                                                                                                                                                                                      R3=000000000.
                                                                                                                                                                                                                                                                                                                          RF WE=0.RD SEL=0, pc sel=0, br sel=0.
                                                                                                                                                                                                                                                                                                                                                                                                               pc write=1, write data=00000000
Took BNE branch
                                     1725 IR=60000016, pc=001d, R0=00000000, R1=00000001, R2=00000003, R3=00000000, R4=00000003,
                                                                                                                                                                                                                                                R5=ff000019, ALU OP=0, WB SEL=0, RF WE=0.RD SEL=0, pc sel=1, br sel=1, pc write=1, write data=0000000
                                     R5=ff000019, ALU_OP=2, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=1, br_sel=1, R5=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0,
                                                                                                                                                                                                                                                1785 IR=8822ffff, pc=0017,
                                                                                                                            R1=00000001,
                                                                                                                                                         R2=00000003, R3=00000000, R4=00000003, R2=00000003, R3=00000000, R4=00000003,
                                     1795 IR=8822ffff, pc=0017,
                                                                                               R0=000000000, R1=00000001,
Setting of week
                                     1805 TR=8822ffff no
                                                                                                                                                                                                                                                 R5=ff000019. ALU OP=1. WB SEL=0.
                                                                                                                                                                                                                                                                                                                                                                                                               pc_write=0, write_data=00000002
pc_write=1, write_data=00000002
pc_write=0, write_data=00000000
pc_write=0, write_data=00000002
                                                                                                                                                                                                                                                                             ALU_OP=0, WB_SEL=0,
ALU_OP=0, WB_SEL=0,
ALU_OP=0, WB_SEL=0,
ALU_OP=2, WB_SEL=0,
ALU_OP=2, WB_SEL=0,
                                                                                                                                                                                                                                                                                                                         RF_WE=1,RD_SEL=0, pc_sel=1,
RF_WE=0,RD_SEL=0, pc_sel=0,
RF_WE=0,RD_SEL=0, pc_sel=1,
RF_WE=0,RD_SEL=0, pc_sel=1,
RF_WE=0,RD_SEL=0, pc_sel=1,
                                     1845 IR=51000005,
                                                                           pc=0018,
                                                                                                                            R1=00000001
                                                                                                                                                                                                                                                 R5=ff000019,
                                                                                                                                                                                                                                                                                                                                                                                                               pc write=0, write data=00000000
                                                                                                                                                                                                                                                RS=ff000019, ALU_OP=0, WB_SEL=0, RS=ff000019, ALU_OP=0, WB_SEL=0, RS=ff000019, ALU_OP=1, WB_SEL=0, RS=ff000019, ALU_OP=1, WB_SEL=0, RS=ff000019, ALU_OP=1, WB_SEL=0,
                                     1865 IR=51000005, pc=0018,
                                                                                                                            R1=00000001
                                                                                                                                                          R2=000000002.
                                                                                                                                                                                       R3=000000000
                                                                                                                                                                                                                    R4=00000003
                                                                                                                                                                                                                                                                                                                          RF WE=0.RD SEL=0.
                                                                                                                                                                                                                                                                                                                                                                        sel=0.
                                                                                                                                                                                                                                                                                                                                                                                               sel=0.
                                                                                                                                                                                                                                                                                                                                                                                                               pc write=1, write data=00000000
                                     1875 IR=88320000.
                                                                            pc=0019.
                                                                                                                            R1=00000001.
                                                                                                                                                          R2=000000002.
                                                                                                                                                                                       R3=000000000
                                                                                                                                                                                                                    R4=00000003
                                                                                                                                                                                                                                                                                                                          RF WE=0.RD SEL=0.
                                                                                                                                                                                                                                                                                                                                                                   pc sel=1.
                                                                                                                                                                                                                                                                                                                                                                                         br sel=0.
                                                                                                                                                                                                                                                                                                                                                                                                               pc write=0, write data=00000000
                                      1885 TR=88320000
                                                                             nc=0019.
                                                                                                                                                                                       R3=00000000
                                                                                                                                                                                                                    R4=00000003
                                                                                                                                                                                                                                                                                                                          RF WF=0.RD SEL=0.
                                                                                                                                                                                                                                                R5=ff000019, ALU_OP=1, WB_SEL=0, RF_WE=1,RD_SEL=0, pc_sel=1, br_sel=0, pc_write=0, write_data=00000002 R5=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=1, write_data=00000002 R5=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=00000002 R5=ff000019, ALU_OP=1, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=00000002
                                     1915 IR=88320000, pc=0019,
                                                                                                                            R1=00000001,
                                                                                                                                                         R2=00000002, R3=00000002, R2=00000002, R3=00000002,
                                     1925 IR=88440001, pc=001a,
                                                                                               R0=00000000,
                                                                                                                            R1=00000001,
                                                                                                                                                                                                                    R4=00000003,
                                               IR=88440001.
                                                                             nc=001a
                                     1945 IR=88440001,
                                                                           pc=001a,
                                                                                                                                                                                                                                                 R5=ff000019, ALU OP=1,
                                                                                                                                                                                                                                                                                                   WB_SEL=0,
                                                                                                                                                                                                                                                                                                                          RF WE=0,RD SEL=0,
                                                                                                                                                                                       R3=000000002.
 Setting rf
                                     1955 IR=88440001, pc=001a,
                                                                                                      =00000000, R1=00000001, R2=00000002, R3=00000002, R4=00000003,
                                                                                                                                                                                                                                                R5=ff000019, ALU_OP=1, WB_SEL=0,
                                     1965 IR=88440001, pc=001a,
1975 IR=80331002, pc=001b,
                                                                                                                                                         R2=00000002, R3=00000002, R4=00000004, R2=00000002, R3=00000002, R4=00000004,
                                                                                                                            R1=00000001,
R1=00000001,
                                                                                                                                                                                                                                                R5=ff000019, ALU_OP=0, WB_SEL=0, R5=ff000019, ALU_OP=0, WB_SEL=0, R5=ff000019, ALU_OP=0, WB_SEL=0, R5=ff000019, ALU_OP=0, WB_SEL=0,
                                                                                                                                                                                                                                                                                                                          RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=1, write_data=00000004
RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data=00000003
                                     1985 IR=80331002, pc=001b,
                                                                                                                            R1=00000001,
                                                                                                                                                          R2=00000002,
                                                                                                                                                                                      R3=000000002,
                                                                                                                                                                                                                    R4=00000004,
                                                                                                                                                                                                                                                                                                                          RF WE=0, RD SEL=0, pc sel=0, br sel=0,
                                                                                                                                                                                                                                                                                                                                                                                                               pc write=0, write data=000000004
                                     1995 IR=80331002, pc=001b.
                                                                                                                            R1=00000001.
                                                                                                                                                          R2=000000002.
                                                                                                                                                                                      R3=000000002.
                                                                                                                                                                                                                    R4=00000004.
                                                                                                                                                                                                                                                                                                                          RF WE=0.RD SEL=0.
                                                                                                                                                                                                                                                                                                                                                                                                                    write=0.
Setting rf_we=1
                                                                                                                                                                                                                                                RS=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=1,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=0, write_data RS=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=0, br_sel=0, pc_write=1, write_data
                                     2005 IR=80331002. pc=001b. R0=00000000. R1=00000001. R2=00000002. R3=00000002. R4=00000004.
                                                                                                                                                                                                                                                R5=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=0, RD_SEL=0, pc_sel=1, br_sel=0, pc_write=1, write_data=00000001
                                     2025 IR=7100fffd, pc=001c, R0
                                     2035 IR=7100fffd,
                                                                            pc=0019,
                                                                                                                            R1=00000001,
                                                                                                                                                          R2=00000002,
                                                                                                                                                                                      R3=00000001,
                                                                                                                                                                                                                                                 R5=ff000019,
                                                                                                                                                                                                                                                                             ALU OP=2, WB SEL=0,
                                                                                                                                                                                                                                                                                                                          RF WE=0, RD SEL=0, pc sel=1, br sel=0,
                                                                                                                                                                                                                                                                                                                                                                                                               pc write=0, write data=00000000
                                     2065 IR=7100fffd, pc=0019,
                                                                                               R0=000000000,
                                                                                                                            R1=00000001,
                                                                                                                                                         R2=000000002,
                                                                                                                                                                                      R3=00000001,
                                                                                                                                                                                                                    R4=00000004
                                                                                                                                                                                                                                                 R5=ff000019, ALU OP=0,
                                                                                                                                                                                                                                                                                                   WB_SEL=0,
                                                                                                                                                                                                                                                                                                                          RF_WE=0, RD_SEL=0,
                                                                                                                                                                                                                                                                                                                                                                                                               pc_write=1,
                                     2075 IR=88440001, pc=001a, R0=00000000, R1=00000001, R2=00000002, R3=00000001, R4=00000004,
                                                                                                                                                                                                                                                R5=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, po_sel=1, br_sel=0, po_write=0, write_data=00000000
                                    2085 IR=88440001, pc=001a,
2095 IR=88440001, pc=001a,
                                                                                               R0=00000000, R1=00000001, R2=00000002, R3=00000001, R4=00000004, R0=00000000, R1=00000001, R2=00000002, R3=00000001, R4=00000004,
                                                                                                                                                                                                                                                R5=ff000019, ALU_OP=1, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=1, br_sel=0, pc_write=0, write_data=00000000 R5=ff000019, ALU_OP=1, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=1, br_sel=0, pc_write=0, write_data=00000005
 Setting rf we=1
                                     2105 IR=88440001, pc=001a,
                                                                                               R0=00000000. R1=00000001.
                                                                                                                                                         R2=00000002, R3=00000001, R4=00000004.
                                                                                                                                                                                                                                                R5=ff000019, ALU_OP=1, WB_SEL=0, RF_WE=1, RD_SEL=0, pc_sel=1, br_sel=0,
                                                                                                                                                                                                                                                                                                                                                                                                               nc write=0, write data=000000005
                                                                                                                                                                                                                                                RS=ff000019, ALU OP=0, WB SEL=0, RF WE=0,RD SEL=0, pc_sel=0, br_sel=0, RS=ff000019, ALU OP=0, WB SEL=0, RF WE=0,RD SEL=0, pc_sel=0, br_sel=0, RS=ff000019, ALU OP=0, WB SEL=0, RF WE=0,RD SEL=0, pc_sel=0, br_sel=0, RS=ff000019, ALU OP=0, WB SEL=0, RF WE=0,RD SEL=0, pc_sel=0, br_sel=0, RS=ff000019, ALU OP=0, WB SEL=0, RF WE=0,RD SEL=0, pc_sel=0, br_sel=0, RS=ff000019, ALU OP=0, WB SEL=0, RF WE=0,RD SEL=0, pc_sel=0, br_sel=0, RS=ff000019, ALU OP=0, WB SEL=0, RF WE=0,RD SEL=0, pc_sel=0, br_sel=0, RS=ff000019, ALU OP=0, WB SEL=0, RF WE=0,RD SEL=0, pc_sel=0, br_sel=0, RS=ff000019, ALU OP=0, WB SEL=0, RF WE=0,RD SEL=0, pc_sel=0, br_sel=0, RS=ff000019, ALU OP=0, WB SEL=0, RF WE=0,RD SEL=0, pc_sel=0, br_sel=0, RS=ff000019, ALU OP=0, WB SEL=0, RF WE=0,RD SEL=0, pc_sel=0, br_sel=0, RS=ff000019, ALU OP=0, WB SEL=0, RF WE=0,RD SEL=0, pc_sel=0, br_sel=0, RS=ff000019, ALU OP=0, WB SEL=0, RF WE=0,RD SEL=0, pc_sel=0, br_sel=0, RS=ff000019, ALU OP=0, WB SEL=0, RF WE=0,RD SEL=0, pc_sel=0, br_sel=0, RS=ff000019, ALU OP=0, WB SEL=0, RF WE=0,RD SEL=0, pc_sel=0, br_sel=0, RS=ff000019, ALU OP=0, WB SEL=0, RF WE=0,RD SEL=0, pc_sel=0, br_sel=0, RS=ff000019, ALU OP=0, WB SEL=0, RF WE=0,RD SEL=0, pc_sel=0, br_sel=0, RS=ff000019, ALU OP=0, WB SEL=0, RF WE=0,RD SEL=0, pc_sel=0, br_sel=0, RS=ff000019, ALU OP=0, WB SEL=0, RS=ff0000
                                                                                                                                                                                                                                                                                                                                                                                                               pc_write=0, write_data=00000005
pc_write=0, write_data=00000004
pc_write=0, write_data=00000005
pc_write=0, write_data=00000000
                                     2115 IR=88440001, pc=001a,
2125 IR=80331002, pc=001b.
                                                                                                                            R1=00000001.
                                                                                                                                                          R2=000000002.
                                                                                                                                                                                      R3=00000001.
                                                                                                                                                                                                                    R4=00000005.
                                                                                                                            R1=00000001
                                                                                                                                                          R2=00000002
                                                                                                                                                                                      R3=00000001
                                                                                                                                                                                                                    R4=00000005
                                     2135 IR=80331002, pc=001b,
2145 IR=80331002, pc=001b,
                                                                                                                                                                                       R3=00000001,
Setting rf w
                                                                                                                                                                                                                                                                             ALU_OP=0, WB_SEL=0, RF_WE=0, RD_SEL=0, pc_sel=0, br_sel=0, ALU_OP=0, WB_SEL=0, RF_WE=0, RD_SEL=0, pc_sel=1, br_sel=0, ALU_OP=2, WB_SEL=0, RF_WE=0, RD_SEL=0, pc_sel=1, br_sel=0, ALU_OP=0, WB_SEL=0, RF_WE=0, RD_SEL=0, pc_sel=0, br_sel=0, alu_OP=0, WB_SEL=0, pc_sel=0, br_sel=0, br_sel=0, alu_OP=0, wB_SEL=0, pc_sel=0, br_sel=0, br_s
                                                                                                                                                                                                                                                                                                                                                                                                              pc_write=1, write_data=00000000
pc_write=0, write_data=00000000
pc_write=0, write_data=00000000
                                     2165 IR=80331002, pc=001b,
                                                                                                                            R1=00000001,
                                                                                                                                                          R2=000000002,
                                                                                                                                                                                      R3=000000000,
                                                                                                                                                                                                                    R4=00000005
                                                                                                                                                                                                                                                 R5=ff000019,
                                     2175 IR=7100fffd, pc=001c.
                                                                                               R0=000000000.
                                                                                                                            R1=00000001.
                                                                                                                                                          R2=000000002.
                                                                                                                                                                                      R3=000000000.
                                                                                                                                                                                                                    R4=00000005
                                                                                                                                                                                                                                                R5=ff000019.
                                                                             pc=001c.
                                   2225 IR=6000016, pc=001d, R0=0000000, R1=00000001, R2=00000002, R3=0000000, R4=0000005, 2235 IR=60000016, pc=0016, R0=00000000, R1=0000001, R2=00000002, R3=00000000, R4=00000005, 2265 IR=6000016, pc=0016, R0=00000000, R1=0000001, R2=00000002, R3=00000000, R4=0000005,
                                                                                                                                                                                                                                                Took BNE branch
                                   2275 IR-8822ffff, pc=0017, R0=00000000, R1=00000001, R2=00000002, R3=00000000, R4=00000005, 2285 IR-8822ffff, pc=0017, R0=00000000, R1=00000001, R2=00000002, R3=00000000, R4=00000005, 2295 IR-8822ffff, pc=0017, R0=00000000, R1=00000001, R2=00000002, R3=00000000, R4=00000005,
                                                                                                                                                                                                                                                R5=ff000019, ALU_OP=0, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=1, br_sel=1, pc_write=0, write_data=00000000 R5=ff000019, ALU_OP=1, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=1, br_sel=1, pc_write=0, write_data=00000000 R5=ff000019, ALU_OP=1, WB_SEL=0, RF_WE=0,RD_SEL=0, pc_sel=1, br_sel=1, pc_write=0, write_data=00000001
                                     2305 IR=8822ffff, pc=0017,
                                                                                                                                                                                                                                                 R5=ff000019, ALU_OP=1, WB_SEL=0, RF_WE=1,RD_SEL=0, pc_sel=1, br_sel=1, pc_write=0, write_data=00000001
                                     2315 IR=8822ffff,
                                                                             pc=0017,
                                                                                                                            R1=00000001,
                                                                                                                                                          R2=00000001,
                                                                                                                                                                                                                                                 R5=ff000019,
                                                                                                                                                                                                                                                                             ALU_OP=0, WB_SEL=0,
ALU_OP=0, WB_SEL=0,
                                                                                                                                                                                                                                                                                                                          RF_WE=0, RD_SEL=0,
RF_WE=0, RD_SEL=0,
                                                                                                                                                                                                                                                                                                                                                                                                               pc write=1, write data=00000001
                                     2325 IR=51000005,
                                                                            pc=0018,
                                                                                                                            R1=00000001,
                                                                                                                                                          R2=00000001,
                                                                                                                                                                                       R3=000000000
                                                                                                                                                                                                                    R4=00000005
                                                                                                                                                                                                                                                R5=ff000019,
                                                                                                                                                                                                                                                                                                                                                                  pc_sel=1,
pc_sel=1,
                                                                                                                                                                                                                                                                                                                                                                                         br sel=0,
                                                                                                                                                                                                                                                                                                                                                                                                               pc_write=0, write_data=00000000
                                                                                                                                                                                                                                                                                                                                                                                                               pc_write=0, write_data=00000001
pc_write=0, write_data=00000000
pc_write=1, write_data=00000000
pc_write=0, write_data=00000000
                                     2335
                                               IR=51000005.
                                                                             pc=0018.
                                                                                                                            R1=00000001.
                                                                                                                                                                                                                    R4=00
                                                                                                                                                                                                                                                 R5=ff000019.
                                                                                                                                                                                                                                                                              ALU
                                                                                                                                                                                                                                                                                                    WB SEL=0.
                                                                                                                                                                                                                                                                                                                                 WE=0.RD SEL=0.
                                                                                                                                                                                                                                                                                                   WB_SEL=0,
WB_SEL=0,
WB_SEL=0,
WB_SEL=0,
                                                                                                                                                                                                                                                                                                                          RF_WE=0,RD_SEL=0, pc_sel=1,
RF_WE=0,RD_SEL=0, pc_sel=0,
RF_WE=0,RD_SEL=0, pc_sel=1,
RF_WE=0,RD_SEL=0, pc_sel=1,
                                     2345 TR=51000005.
                                                                             pc=0018,
                                                                                                                            R1=00000001
                                                                                                                                                                                                                                                 R5=ff000019
                                                                                                                                                                                                                                                                              ALU_OP=2,
                                                                                                                                                                                                                                                  R5=ff000019,
                                                                                                                                                                                                                                                                                                                                                                                         br_sel=0, pc_write=0, write_data=0000
                                    2395 IR=88320000, pc=0019, R0=00000000,
                                                                                                                            R1=00000001,
                                                                                                                                                         R2=00000001.
                                                                                                                                                                                                                                                R5=ff000019, ALU OP=1, WB SEL=0, RF WE=0,RD SEL=0, pc sel=1, br sel=0, pc write=0, write data=00000001
 Setting rf we=1
```

```
Setting rf we=1
   Setting rf we=1
   Took BNE branch
   Took BNE branch
   Setting rf_we=1
   Took BRR branch
   Halt.
    : C:/Users/User/OneDrive - University of Iowa/2019 Spring Semester/Computer Architecture & Organization/Comp-Arch-Org-Project/ctrl.v(221)
Time: 2730 ns
Time: 2730 ns Iteration: 0 Instance: /sisc_tb/uut/ctrll
Break in Module ctrl at C:/Users/User/OneDrive - University of Iowa/2019 Spring Semester/Computer Architecture & Organization/Comp-Arch-Org-Project/ctrl.v line 221
```