```
"00000000000000000000100000010000",--0 ADD RO,RO, R1 R1=0
"00000000000000000001000000010000",--1 ADD R0,RO, R2 R2=0
"00000000000000000001100000010000",--2 ADD RO,RO, R3 R3=0
"00000100000111100000000000000000",--3 ****ADDI,RO,R30,skey(31 downto 16) R30=XXX..skey(31 downto 16)
"00010111101111000000000000010000",--4 SHL R30 R30 16 R30=skey(31 downto 16)...000
"00000100000111010000000000000000",--5 ****ADDI,RO,R29,SKEY(15 downto 0) R29=XXXi-..skey(15 downto 0)
"00010111101111010000000000010000",--6 SHL R29 R29 16 R29=skey(15 downto 0)i-000     remove sign extension
"00011011101111010000000000010000",--7 SHR R29 R29 16 R29=000i-..skey(15 downto 0)     remove sign extension
"00000011110111011111000000010000",--8 ADD,R30 R29,R30 R30=skey(31 downto 0)
"00100000000111100000000000011010",--9 SW RO, R30 offset M[0+offset1]<-R30
"00000100000111100000000000000000",--10 *****ADDI,RO,R30,skey(63 downto 48) R30=XXX..skey(63 downto 48)
"00010111101111000000000000010000",--11 SHL R30 R30 16 R30=skey(63 downto 48)...000
"00000100000111010000000000000000",--12 **** ADDI,RO,R29,SKEY(47 downto 32) R29=XXXi-..skey(47 downto 32)
"00010111101111010000000000010000",--13 SHL R29 R29 16 R29=skey(47 downto 32)i-000     remove sign extension
"00011011101111010000000000010000",--14 SHR R29 R29 16 R29=000i-..skey(47 downto 32)     remove sign extension
"00000011110111011111000000010000",--15 ADD,R30 R29,R30 R30=skey(63 downto 32)
"00100000000111100000000000011011",--16 SW RO, R30 offset M[0+offset2]<-R30
"00000100000111100000000000000000",--17 ****ADDI,RO,R30,skey(95 downto 80) R30=XXX..skey(95 downto 80)
"00010111101111000000000000010000",--18 SHL R30 R30 16 R30=skey(95 downto 80)...000
"00000100000111010000000000000000",--19 **** ADDI,RO,R29,SKEY(79 downto 64) R29=XXXi-..skey(79 downto 64)
"00010111101111010000000000010000",--20 SHL R29 R29 16 R29=skey(79 downto 64)i-000     remove sign extension
"00011011101111010000000000010000",--21 SHR R29 R29 16 R29=000i-..skey(79 downto 64)     remove sign extension
"00000011110111011111000000010000",--22 ADD,R30 R29,R30 R30=skey(95 downto 64)
"00100000000111100000000000011100",--23 SW RO, R30 offset M[0+offset3]<-R30
"00000100000111100000000000000000",--24 ******ADDI,RO,R30,skey(127 downto 112) R30=XXX..skey(127 downto 112)
"00010111101111000000000000010000",--25 SHL R30 R30 16 R30=skey(127 downto 112)...000
"00000100000111010000000000000000",--26******* ADDI,RO,R29,SKEY(111 downto 96) R29=XXXi-..skey(111 downto 96)
"00010111101111010000000000010000",--27 SHL R29 R29 16 R29=skey(111 downto 96)i-000     remove sign extension
"00011011101111010000000000010000",--28 SHR R29 R29 16 R29=000i-..skey(111 downto 96)     remove sign extension
"00000011110111011111000000010000",--29 ADD,R30 R29,R30 R30=skey(127 downto 96)
"00100000000111100000000000011101",--30 SW RO, R30 offset M[0+offset4]<-R30
"00000100000101010000000000000100",--31 ADDI,RO,R21,4 R21=4
"00000100000101100000000000011010",--32 ADDI RO R22,26 R22=26
"00000100000101110000000001001110",--33 ADDI R0 R23,78 R23=78
"00000000000000000010000000010000",--34 ADD RO RO R4 R4=0
"00000000000000000010100000010000",--35 ADD RO RO R5 R5=0
"00011100010010000000000000000000",--36 R8<-MEM[R2+IMM_S) S[i]
"00011100001010010000000000011010",--37 R9<-MEM(R1+IMM_l) L[j]
"00000000100001010011000000010000",--38 ADD R4 R5,R6  A+B
"00000001000001100101000000010000",--39 ADD R8 R6 R10 A+B+S[i]
"00000100000010110000000000000011",--40 ADDI RO R11 3
"00000000000000000110000000010000",--41 ADD RO RO R12
"00101001011011000000000000000101",--42 BEQ R11 R12 IMM go to 48
"00010101010011010000000000000001",--43 SHL R10 R13 1
"00011001010011100000000000011111",--44 SHR R10 R14 1
"00000001101011100101000000010000",--45 ADD R13 R14 R10  rotate 1 bit of R10, do it 3 times
"00000101100011000000000000000001",--46 ADDI R12 R12 1
"00110000000000000000000000101010",--47 JMP IMM go to 42
"00100000010010100000000000000000",--48 SW R2 R10 IMM_S branch here update S[i]
"00000000000010100010000000010000",--49 add RO R10 R4 put value of A into R4
"00000000100001010011000000010000",--50 add R4 R5 R6 A + B
"00000001001001100101000000010000",--51 add R9 R6 R10 R10 = L[i] + A + B
"00001100110010110000000000011111",--52 ANDI R6 R11 00....11111
"00000000000000000110000000010000",--53 AND RO RO R12
"00101001011011000000000000000101",--54 bEQ R11 R12 IMM
"00010101010011010000000000000001",--55 SHL R10 R13 1
"00011001010011100000000000011111",--56 SHR R10 R14 31
"00000001101011100101000000010000",--57 ADD R13 R14 R10
"00000101100011000000000000000001",--58 ADDI R12 R12 1
"00110000000000000000000000110110",--59 JMP IMM go to 54
"00100000001010100000000000011010",--60 SW R1 R10 IMML branch here  update L[i]
```

```
"00000000000010100010100000010000",--61 ADD RO R10 R5
"00000100001000010000000000000001",--62 ADDI R1 R1 1
"00000100010000100000000000000001",--63 ADDI R2 R2 1
"00000100011000110000000000000001",--64 ADDI R3 R3 1
"00101100001101010000000000000001",--65 BNE R1 R21 IMM
"00000000000000000000100000010000",--66 ADD RO RO R1
"00101100010101100000000000000001",--67 BNE R2 R22 IMM
"00000000000000000001000000010000",--68 ADD RO RO R2
"00101000011101110000000000000001",--69 BEQ R3 R22 IMM
"00110000000000000000000000100100",--70 JMP RETURN
"00000000000000000001100000010000",--71 ADD RO RO R3

----ENCode-----
"00011100000000110000000000000000",   --72   Lw   0(R00)   S[0](R03)      0(Imm£©   Load s[0] to R3
"00011100000001000000000000000001",   --73   Lw   0(R00)   S[1](R04)      1(Imm)   Load s[1] to R4
"00000100000001010000000000000000",   --74   Addi   0(R00)   Temp1(R05)      Din(63 downto 48)
"00010100101001010000000000010000",   --75   Shl   Temp1(R05)   Temp1(R05)      16   Load Din(63 downto 48)
"00000100000001100000000000000000",   --76   Addi   0(R00)   Temp2(R06)      Din(47 downto 32)
"00010100110001100000000000010000",   --77   Shl   Temp2(R06)   Temp2(R06)      16
"00011000110001100000000000010000",   --78   Shr   Temp2(R06)   Temp2(R06)      16   Load Din(47 downto 32)
"00000000101001100000100000010000",   --79   Add   Temp1(R05)   Temp2(R06)   A(R01)      Load A
"00000100000001010000000000000000",   --80   Addi   0(R00)   Temp1(R05)      Din(31 downto 16)
"00010100101001010000000000010000",   --81   Shl   Temp1(R05)   Temp1(R05)      16   Load Din(31 downto 16)
"00000100000001100000000000000000",   --82   Addi   0(R00)   Temp2(R06)      Din(15 downto 0)
"00010100110001100000000000010000",   --83   Shl   Temp2(R06)   Temp2(R06)      16
"00011000110001100000000000010000",   --84   Shr   Temp2(R06)   Temp2(R06)      16   Load Din(15 downto 0)
"00000000101001100001000000010000",   --85   Add   Temp1(R05)   Temp2(R06)   B(R02)      Load A
"00000000001000110000100000010000",   --86   Add   A(R01)   S[0](R03)   A(R01)      A+s[0]
"00000000010001000001000000010000",   --87   Add   B(R02)   S[1](R04)   B(R02)      B+s[1]
"00000000000000000010100000010000",   --88   Add   0(R00)   0(R00)   I(R05)      Initialize I
"00000100000010100000000000011000",   --89   Addi   0(R00)   24(R10)      24
"00101000101010100000000000011100",   --90   Beq   I(R05)   24(R10)      28   ±û
"00000100101001010000000000000010",   --91   Addi   I(R05)   I(R05)      2   I=I+2
"00011100101000110000000000000000",   --92   Lw   I(R05)   S[2*i](R03)      0   Load s[2*i]
"00011100101001000000000000000001",   --93   Lw   I(R05)   S[2*i+1](R04)      1   Load s[2*i+1]
"00000000001000100011000000010010",   --94   And   A(R01)   B(R02)   C(R06)
"00000000110000000011000000010100",   --95   Nor   C(R06)   0(R00)   C(R06)
"00000000001000100011100000010011",   --96   Or   A(R01)   B(R02)   D(R07)
"00000000110001110000100000010010",   --97   And   C(R06)   D(R07)   A(R01)      A Xor B
"00001100010001110000000000011111",   --98   Andi   B(R02)   Rotator(R07)      0000¡-11111   B(4 downto0)
"00101000111000000000000000000101",   --99   Beq   Rotator(R07)   0(R00)      5   ¼×
"00010100001010000000000000000001",   --100   Shl   A(R01)   Temp_left(R08)      1
"00011000001010010000000000011111",   --101   Shr   A(R01)   Temp_right(R09)      31
"00000001000010010000100000010000",   --102   Add   Temp_left(R08)   Temp_right(R09)   A(R01)      Round rotate A
"00001000111001110000000000000001",   --103   Subi   Rotator(R07)   Rotator(R07)      1
"00110000000000000000000001100011",   --104   Jmp          ¼×   Loop back
"00000000001000110000100000010000",   --105   Add   A(R01)   S[2*i](R03)   A(R01)      A=xxx+s[2*i]
"00000000001000100011000000010010",   --106   And   A(R01)   B(R02)   C(R06)
"00000000110000000011000000010100",   --107   Nor   C(R06)   0(R00)   C(R06)
"00000000001000100011100000010011",   --108   Or   A(R01)   B(R02)   D(R07)
"00000000110001110001000000010010",   --109   And   C(R06)   D(R07)   B(R02)      A Xor B
"00001100001001110000000000011111",   --110   Andi   A(R01)   Rotator(R07)      0000¡-11111   A(4 downto0)
"00101000111000000000000000000101",   --111   Beq   Rotator(R07)   0(R00)      5   ÒÒ
"00010100010010000000000000000001",   --112   SHL   B(R02)   Temp_left(R08)      1
"00011000010010010000000000011111",   --113   SHR   B(R02)   Temp_right(R09)      31
"00000001000010010001000000010000",   --114   Add   Temp_left(R08)   Temp_right(R09)   B(R02)      Round rotate B
"00001000111001110000000000000001",   --115   Subi   Rotator(R07)   Rotator(R07)      1
"00110000000000000000000001101111",   --116   Jmp          ÒÒ   Loop back
"00000000010001000001000000010000",   --117   Add   B(R02)   S[2*i+1](R04)   B(R02)      B=xxx+s[2*i+1]
"00110000000000000000000001011010",   --118   Jmp          ±û   Loop back
"00000000001000001111100000010000",    --119      Add          A(R01)      0(R00)      Dec_out(R31)
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"00000000010000001111000000010000",    --120    Add          B(R02)      0(R00)      Dec_out(R30)
"00000000000000000010100000010000",  --121  Add   0(R00)   0(R00)   Temp1(R05)      Clear R05
"00000000000000000011000000010000",  --122  Add   0(R00)   0(R00)   Temp1(R06)      Clear R06
"00000100000010100000000000011000",  --123  Addi   0(R00)   24(R10)      24
"00000000000010100010100000010000",   --124  Add   0(R00)   24(R10)   I(R05)      Initialize I
"00101000101000000000000000011100",   --125  Beq   I(R05)   0(R00)      28   ±û
"00011100101000110000000000000000",  --126  Lw   I(R05)   S[2*i](R03)      0   Load s[2*i]
"00011100101001000000000000000001",  --127  Lw   I(R05)   S[2*i+1](R04)      1   Load s[2*i+1]
"00001000101001010000000000000010",  --128  Subi   I(R05)   I(R05)      2   I=I-2
"00000000010001000001000000010001",  --129  Sub   B(R02)   S[2*i+1](R04)   B(R02)      B=xxx-s[2*i+1]
"00001100001001110000000000011111",  --130  Andi   A(R01)   Rotator(R07)      0000¡-11111   A(4 downto0)
"00101000111000000000000000000101",  --131  Beq   Rotator(R07)   0(R00)      5   ¼×
"00011000010010000000000000000001",  --132  Shr   B(R02)   Temp_right(R08)      1
"00010100010010010000000000011111",  --133  Shl   B(R02)   Temp_left(R09)      31
"00000001000010010001000000010000",  --134  Add   Temp_left(R08)   Temp_right(R09)   B(R02)      Round right rotate B
"00001000111001110000000000000001",  --135  Subi   Rotator(R07)   Rotator(R07)      1
"00110000000000000000000010000011",  --136  Jmp          ¼×   Rotate loop1 back
"00000000001000100011000000010010",  --137  And   A(R01)   B(R02)   C(R06)
"00000000110000000011000000010100",  --138  Nor   C(R06)   0(R00)   C(R06)
"00000000001000100011100000010011",  --139  Or   A(R01)   B(R02)   D(R07)
"00000000110001110001000000010010",  --140  And   C(R06)   D(R07)   B(R02)      B= B Xor A
"00000000001000110000100000010001",  --141  Sub   A(R01)   S[2*i](R03)   A(R01)      A=xxx-s[2*i]
"00001100010001110000000000011111",  --142  Andi   B(R02)   Rotator(R07)      0000¡-11111   B(4 downto0)
"00101000111000000000000000000101",  --143  Beq   Rotator(R07)   0(R00)      5   ÒÒ
"00011000001010000000000000000001",  --144  Shr   A(R01)   Temp_right(R08)      1
"00010100001010010000000000011111",  --145  Shl   A(R01)   Temp_left(R09)      31
"00000001000010010000100000010000",  --146  Add   Temp_left(R08)   Temp_right(R09)   A(R01)      Round right rotate A
"00001000111001110000000000000001",  --147  Subi   Rotator(R07)   Rotator(R07)      1
"00110000000000000000000010001111",  --148  Jmp          ÒÒ   Rotate loop2 back
"00000000001000100011000000010010",  --149  And   A(R01)   B(R02)   C(R06)
"00000000110000000011000000010100",  --150  Nor   C(R06)   0(R00)   C(R06)
"00000000001000100011100000010011",  --151  Or   A(R01)   B(R02)   D(R07)
"00000000110001110000100000010010",  --152  And   C(R06)   D(R07)   A(R01)      A =A Xor B
"00110000000000000000000001111101",  --153  Jmp          ±û   Outer loop back
"00011100000000110000000000000000",  --154  Lw   0(R00)   S[0](R03)      0(Imm£©   Load s[0] to R3
"00011100000001000000000000000001",  --155  Lw   0(R00)   S[1](R04)      1(Imm)   Load s[1] to R4
"00000000001000110000100000010001",  --156  Sub   A(R01)   S[0](R03)   A(R01)      A= A - s[0]
"00000000010001000001000000010001",  --157  Sub   B(R02)   S[1](R04)   B(R02)      B= B - s[1]
"00000000001000001110100000010000",  --158  Add   A(R01)   0(R00)   Dec_out(R29)
"00000000010000001110000000010000",  --159  Add   B(R02)   0(R00)   Dec_out(R28)
"11111111111111111111111111111111"    --160  Hal
```